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ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 12-1

“Nano Technology”
(«Нанотехнологии»)

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"1/f noise in advanced CMOS transistors"

This paper is a review of 1/f noise in state-of-the-art advanced MOSFETs, where the channel length has deep submicron or nano-scale dimensions. The origin of 1/f noise, models of 1/f noise, and ways of measuring 1/f noise are briefly reviewed. [J1]

"Plasmonic metamaterials for ultrasensitive refractive index sensing at near infrared"

We experimentally report a kind of plasmonic metamaterials for high sensitive refractive index sensing. The metamaterials are an X-shaped metal nanohole array fabricated by holographic lithography followed by electron-beam evaporation and lift-off procedure. Transmission spectrum measurements reveal that the localized surface plasmon resonance (LSPR) wavelength of such nanohole array shows ultrasensitive response to refractive index change in the surrounding medium. A sensitivity of 1398 nm per refractive index unit is achieved at near infrared. The high sensitivity is attributed to the well confined and greatly enhanced electric field created by LSPR as well as the increased spatial overlap between the localized electric field and the surrounding medium. The robust fabrication technique and high sensitivity provide the present plasmonic metamaterials great potentials for the development of chip-based high sensitive nanooptical biomedicine sensors and integrated devices. [J2]

"Highly selective spectral response with enhanced responsivity of n-ZnO /p-Si radial heterojunction nanowire photodiodes"

A radial heterojunction nanowire diode (RND) array consisting of a ZnO (shell)/Si (core) structure was fabricated using conformal coating of a n-type ZnO layer that surrounded a p-type Si nanowire. In both ultraviolet (UV) and visible ranges, the photoresponsivity of the RND was larger than that of a planar thin film diode (PD) owing to the efficient carrier collection with improved light absorption. Compared to a PD, in the forward bias, a 6mcmlong RND resulted in a 2.7times enhancement of the UV responsivity at lambda =365nm, which could be explained based on the oxygen-related hole-trap mechanism. Under a reverse bias, UV-blind visible detection was observed while the UV response was suppressed. [J3]

"Characterization of AlInN/GaN structures on AlN templates for high-performance ultraviolet photodiodes"

The authors characterize AlInN/GaN structures on AlN templates for high-performance ultraviolet photodiodes. AlInN/GaN structures were grown with various growth parameters by metal organic chemical vapor deposition. In the case of nearly lattice-matched to GaN underlying layers, AlInN/GaN structures are found to have smooth interface. AlInN layers grown at the low pressure are confirmed to have high crystal quality from x-ray diffraction measurements and good surface morphology from atomic force microscope images. The noble AlInN-based photodiodes were fabricated. Their performances show the leakage current of 48 nA at a reverse voltage of 5 V and the cutoff wavelength around 260 nm. A cutoff-wavelength responsivity of 21.84 mA/W is obtained, corresponding to quantum efficiency of 10.6%. It may be possible to realize high-performance ultraviolet photodiodes by further optimizing AlInN/GaN structures. [J4]

"Phase diagram of magnetic multilayers with tilted dual spin torques"

A theoretic study is presented on the magnetization dynamics in magnetic multilayers with two tilted spin polarizers. Magnetic phase diagrams are established under the control of the magnitude and direction of dual spin torques. Different magnetic states, including parallel and antiparallel orientations, out-of-plane orientations, in-plane, and out-of-plane precessions, bistable states, can be distinguished in the phase diagrams. For the bistable states, there exists hysteretic switching between static and dynamic states. Selecting different pinned-layer configurations, the reversal between parallel and antiparallel orientation and the switching from stable states to precessional ones can be realized by increasing current. In addition, the dynamic evolutions of

magnetic states are demonstrated. [J5]

"Influence of nano-Cu additive on MgB 2 phase formation, processing temperature, and transport properties"

Pure and nano-Cu doped MgB2/Fesuperconducting wires were prepared by in situ powder-in-tube method at different temperatures (550-675 °C). The phase formation, microstructure, and transport critical current density of the wires were investigated as a function of the heat-treatment temperature. A small amount of nano-Cu addition (2.5wt %)was found to dramatically decrease the reaction temperature of magnesium and boron, forming MgB2without any degradation in the transport critical current. From x-ray diffraction and scanning electron microscopy analyses, it was found that the added Cu form a reacted phase Mg2Cuwith Mg which melts at around 550 °C. This liquid phase helps the formation of MgB2at a significant lower temperature with improved grain connectivity, grain size, and density. All Cu doped samples heat treated in the range of 550-650 °Cexhibited a transport JCquite comparable to that of the pure sample processed at 650 °C, which shows that high quality MgB2conductors can be produced even at 550 °Cwith minor Cu doping. [J6]

"Analysis elastic??plastic behaviour and anisotropy properties of copper film from nanoindentation using numerical computation method"

The determination of mechanical properties of nanoscale structures is becoming increasingly important as micro-system and ultra-large-scale integrated circuit technologies continue to mature. Traditional experimental methods cannot avoid the influence on the hardness measurement from the presence of the substrate. Numerical computation method of finite-element modelling with molecular dynamics simulation is used to determine the mechanical properties of copper thin film from indentation, quantifying the difference between load against displacement-into-surface curves obtained from different length scale. The results show that the materials deformation exhibits strong size dependence when the relevant physical length scales fall into the range of microns or below. The P-H graph justifies that the permanent plastic deformation quickly decreased while the elastic deformation gradually increased in the range of nanometre level which means increasing of material microhardness. The different deformation behaviour of crystal layers inside the films may be the potential key factor of its breaking off from the substrate. There is little anisotropy phenomenon in the elastic deformation stage whereas there is obvious anisotropy phenomenon in the plastic deformation process. The anisotropy of thin film has strict preferred orientation distribution and symmetry. The anisotropy deformation gradually minimised accompanying the increasing of plastic deformation illuminates the copper thin film is a nonlinear anisotropy elastic-plastic material. [J7]

"A 65 nm 0.165 fJ/Bit/Search 256 144 TCAM Macro Design for IPv6 Lookup Tables"

Ternary content addressable memory (TCAM) is extensively adopted in network systems. As routing tables become larger, energy consumption and leakage current become increasingly important issues in the design of TCAM in nano-scale technologies. This work presents a novel 65 nm energy-efficient TCAM macro design for IPv6 applications. The proposed TCAM employs the concept of architecture and circuit co-design. To achieve an energy-efficient TCAM architecture, a butterfly match-line scheme and a hierarchy search-line scheme are developed to reduce significantly both the search time and power consumption. The match-lines are also implemented using noise-tolerant XOR-based conditional keepers to reduce not only the search time but also the power consumption. To reduce the increasing leakage power in advanced technologies, the proposed TCAM design utilizes two power gating techniques, namely super cut-off power gating and multi-mode data-retention power gating. An energy-efficient 256 Ч 144 TCAM macro is implemented using UMC 65 nm CMOS technology, and the experimental results demonstrate a leakage power reduction of 19.3% and an energy metric of the TCAM macro of 0.165 fJ/bit/search. [J8]

"An Asynchronous Spike Event Coding Scheme for Programmable Analog Arrays"

This paper presents a spike time event coding scheme for transmission of analog signals between configurable analog blocks (CABs) in a programmable analog array. The analog signals from CABs are encoded as spike time instants dependent upon input signal activity and are transmitted asynchronously by employing the address event representation protocol (AER), a widely used communication protocol in neuromorphic systems. Power dissipation is dependent upon input signal activity and no spike events are generated when the input signal is constant. Computation is intrinsic to the spike event coding scheme and is performed without additional hardware. The ability of the communication scheme to perform computation will enhance the computation power of the programmable analog array. The design methodology and analog circuit design of the scheme are presented. Test results from prototype chips implemented using a 3.3-V, 0.35-$mu{hbox {m}}$CMOS technology are presented. [J9]

"Dynamics of Cleaning and Rinsing of Micro and Nano Structures in Single-Wafer Cleaning Tools"

Surface cleaning of patterned wafers by batch processing has become a challenge as semiconductor fabrication moves deeper into submicron technology nodes and utilizes larger wafer sizes. Many fabrication plants (fabs) have already employed single wafer cleaning tools. A key challenge in the application of single-wafer processing tools, compared to conventional multi-wafer batch tools, is their lower throughput. Typical surface cleaning consists of exposure to a chemistry intended to remove contaminants, followed by rinsing with ultrapure water, followed by drying. To help reduce cycle time and to minimize resource consumption during rinse processes while producing a highly clean surface, a novel in situ metrology has been developed for the detection of trace residual impurities in fine structures of patterned wafers during surface preparation processes. This technology includes both hardware for in situ measurement of impurities and software for process data analysis. The technology can be used for on-line control in existing processes as well as for development and testing of new recipes and processes. In this paper, the effects of the key rinse process parameters such as water flow rate, wafer spin rate, and water temperatures are studied. Successful incorporation of this metrology into surface preparation steps will eliminate dependence on costlier and more time-consuming external analysis techniques. [J10]

"Accuracy of thickness measurement for Ge epilayers grown on SiGe/Ge/Si(100) heterostructure by x-ray diffraction and reflectivity"

High-resolution x-ray diffraction rocking curve (RC), x-ray reflectivity (XRR), and transmission electron microscopy (TEM) were used to characterize strained Ge epilayers grown on relaxed SiGe/Ge/Si(100) virtual substrates by reduced pressure chemical vapor deposition. The investigation focused on the reliability and accuracy of thickness measurement by these different techniques. The authors found that both XRR and RC could give reliable values that agree well with TEM results over a wide range of Ge epilayer thicknesses. The best-fit thickness from both XRR and RC is within ±5% of the TEM measurement for a thickness in the range of 10-120 nm, with XRR producing more accurate values than RC. However, neither RC nor XRR could give reliable results for very thin Ge epilayers (<7nm)because of the complicated heterostructure and interface/surface quality. Agreement is also not as good for the thickest Ge epilayers (>122nm)due to surface roughening caused by strain relaxation. [J11]

"Buckling Nanoneedle for Characterizing Single Cells Mechanics Inside Environmental SEM"

We propose a buckling nanoneedle as a force sensor for stiffness characterization of single cells. The buckling nanoneedle was easily fabricated by using focused ion beam etching from a commercialized atomic force microscope cantilever. There are notable advantages of using buckling nanoneedle for single cells stiffness characterizations. First, severe cell damage from an excessive indentation force could be prevented. Second, large variations in single cells stiffness property could be easily detected either from the dented mark on the cell surface after the indentation and/or by comparing the buckling length of the nanoneedle during the indentation. The calibrations of the buckling nanoneedle were done experimentally and numerically. The calibration results from both methods showed a good agreement. The calibration data show the relationship between the indentation force and the buckling length of the nanoneedle. This relationship was used for obtaining force data during a nanoindentation experiment between a buckling nanoneedle and single cells. We performed in situ measurements of mechanical properties of individual W303 wild-type yeast cells by using a buckling nanoneedle inside an integrated SEM (ESEM)-nanomanipulator system. Finer local stiffness property of single cells was compared at different pressure and different temperature ranges. This detection method of the stiffness variations of the single cells could be applied in the future fast disease diagnosis based on single-cell stiffness analysis. [J12]

"Read-Out of Cantilever Bending With a Grated Waveguide Optical Cavity"

We present results related to the fabrication of a novel and potentially highly sensitive mechano-optical sensor for hydrogen gas, based on microcantilevers, provided with a selectively gas-absorbing palladium layer, suspended above a Si3N4grated waveguide (GWG). Integrated microcantilever-GWG devices have been fabricated successfully using microelectromechanical systems (MEMS) techniques. Several technical problems encountered during the preparation of such integrated devices (i.e., grating production, surface roughness, facet quality) will be discussed, and solutions to address these issues will be given as well. We also present preliminary experimental results, showing the sensing of cantilever nano-displacements, and so the feasibility of proposed read-out principle. [J13]

"Improving the thermal stability of nickel monosilicide thin films by combining annealing with the

use of an interlayer and a capping layer"

The authors investigated the effects of preannealing a 2-nm-thick Pd interlayer and a 20-nm-thick TiN capping layer on the electrical and thermal stability of nickel silicides as a function of the annealing temperature. The preannealed samples (prepoly-Si) produce lower sheet resistances compared to the samples without preannealing. For the preannealed samples, NiSi remains stable up to 600 °C. Transmission electron microscopy results show that the preannealed samples have a higher resistance against layer inversion. The addition of a Pd interlayer at the Ni film/prepoly-Si interface increases the formation temperature of NiSi2to 900 °C. The use of the capping layer on the Pd-interlayered prepoly-Si samples improves the electrical and morphological stabilities of NiSi. The possible mechanisms for the preannealing and interlayer-induced improvement of the thermal stabilities of the Ni-silicide samples are discussed in terms of grain growth and simple thermodynamic relations. [J14]

"n-type conductivity and phase transition in ultrananocrystalline diamond films by oxygen ion implantation and annealing"

Ultrananocrystalline diamond (UNCD) films were implanted by oxygen ion and annealed at different temperatures. The electrical and structrual properties of O+-implanted UNCD films were investigated by Hall effects, high-resolution transmission electron microscopy (HRTEM) and uv Raman spectroscopy measurements. The results show that O+-implanted nano-sized diamond grains annealed at 800 °C and above give n-type conductivity to the sample and the UNCD film exhibits n-type resistivity with the carrier mobility of 1 11 cm2V-1s-1. With O+dose increasing from 1015to 1016cm-2, diamond phase transits to the amorphous carbon phase accompanied by n-type semiconduction transforming to metallic conduction. In the 1014cm-2O+-implanted UNCD film, some amorphous carbon at grain boundaries transits to diamond phase with annealing temperature (Ta) increasing from 500 °C to 800-900 °C, and some of diamond grains are found to be converted to amorphous carbon phase again after 1000 °C annealing. This phase transition is closely relative to the n-type conductivity of the UNCD films, in which n-type conductivity increases with the amorphous carbon phase transiting to diamond phase in the Tarange of 500-900 °C, and it decreases with diamond phase transiting to amorphous carbon phase in the case of 1000 °C annealing. It is indicated that the O+-implanted nano-sized diamond grains dominantly control the n-type conductivity of UNCD film in the Tarange of 800-900 °C, while the grain-boundary-conduction controls the n-type conductivty in UNCD film annealed at 1000 °C. In this case, a novel conduction mechanism that O+-implanted nano-sized diamond grains supply n---type conductivity and the amorphous carbon grain boundaries give a current path to the UNCD films is proposed. [J15]

"Asymmetric acoustic gratings"

The unidirectional transmission of acoustic waves is realized by a simple geometrically asymmetric steel grating structure. This exotic phenomenon stems from the one-way diffraction effect induced by the different periods of the slits on the both surfaces of the sample. And the frequency range of unidirectional transmission is simply determined by the structure periods. The experimental results agree well with the theoretical simulation. This remarkable effect is expected potential applications in ultrasonic devices, such as acoustic rectifiers and acoustic diodes. [J16]

"Multiple diffraction in two-dimensional magnetophotonic crystals fabricated by the autocloning method"

Quasi-2D magnetophotonic crystals (MPCs) comprising bismuth-substituted yttrium iron garnet/silicon dioxide multilayers were fabricated on top of 1D structured substrates and evaluated. Optical and magneto-optical (MO) spectra showed that light coupling to the structure of these MPCs happened in multiple Bragg diffraction regimes, where a mixing of modes with resonant wavelengths occurred within MPCs and a demultiplexing phenomenon was observed. Responses from the crystals were studied in transmission and diffraction geometries. We show that nano-scale tailoring of MPCs' structure allows one to increase significantly the MO efficiency of magnetic materials and invert their natural MO responses. [J17]

"Field electron emission properties of n -type (111)-oriented single crystal cubic boron nitride"

The authors report the field emission properties of (111)-oriented single crystal n-type semiconducting cubic boron nitride (c-BN). Specifically, c-BN with two different surface conditions was prepared and analyzed. One surface was hydrogen (H) terminated and has negative electron affinity (NEA). The second surface was obtained by annealing in vacuum and has positive electron affinity (PEA). Field emission properties of carbon-reconstructed n-type semiconducting single crystal diamond were also characterized for comparison. The vacuum annealed c-BN surface with PEA showed low threshold voltages compared to the H-terminated NEA surfaces. The internal barrier height of the NEA c-BN surface was estimated to be 3.5 eV, in accordance with

the Schottky barrier-lowering model. This internal barrier prevents electrons from approaching the surface. Thus, a higher electric field is required to reduce the internal barrier for field emission. From the Fowler-Nordheim plots, positive electron affinity of vacuum annealed surface was 0.6-0.8 eV, which dominates field emission from vacuum annealed c-BN surface. [J18]

"In-plane-gate indium-tin-oxide thin-film transistors self-assembled on paper substrates"

Oxide-based thin-film transistors (TFTs) with in-plane gate structure are self-assembled on paper substrates at room temperature by using only one nickel shadow mask. Indium-tin-oxide (ITO) channel and ITO electrodes (gate, source, and drain) can be deposited simultaneously without precise photolithography and alignment process. The equivalent field-effect mobility, subthreshold swing, and on/off ratio of such paper TFTs are estimated to be 22.4cm2/V s, 192 mV/decade, and 8Ч105, respectively. A model based on two capacitors in series is proposed to further understand the operation mechanism. [J19]

"Single Wavelength Blue-Laser Optical Head-Like Opto-Mechanical System for Turntable Thermal Mode Lithography and Stamper Fabrication"

The characterization of novel small size 405 nm blue-laser optical head-like opto-mechanical system for turntable thermal mode lithography system that can provide high quality beam spot profile and real time high precision servo control and feasibility for thermal mode lithography process application are presented. The optical head-like opto-mechanical system consists of a single wavelength laser direct-write blue-laser opto-mechanical module and related servo control main board. An ideally narrow round shape exposure beam spot about 260 nm and high precision power control, focusing servo control are produced for thermal mode inorganic resist exposure. The small size opto-mechanical system combination with thermal mode lithography technology has been successfully applied to fabricate nickel stamper with submicro/nano structure patterns. The minimum pit (or hole) diameter is about 180 nm and ultra-low surface roughness (2 nm) is achieved after electroforming process. [J20]

"High detectivity squaraine-based near infrared photodetector with nA /cm 2 dark current"

We demonstrate an organic photodetector showing high detectivity (3.4Ч1012Hz0.5 cm/W)at a wavelength of 700 nm, based on squaraine/phenyl-C61-butyric-acid-methyl-ester bulk-heterojunction active material. This result is achieved by suppressing the device dark currents while simultaneously preserving its external quantum efficiency, as high as 15% at 700 nm. To this aim, a thin cross-linked film based on poly[2-methoxy-5-(2'-ethyl-hexyloxy)-1,4-phenylene-vinylene] is exploited to suppress electron injection from the device anode into the organic blend, thus reducing the dark currents by a factor of 30, to the extremely low value of 2nA/cm2. Also, the detector bandwidth (1MHz)is unaffected by the introduction of a blocking layer. [J21]

"Analytical approaches for nano-plasmonic and micro-millimetric antennas"

Antenna modelling approaches, based on suitable spherical harmonic expansions of the radiated electromagnetic field, are addressed and thoroughly investigated. Particular emphasis is put on the simultaneous transverse resonance diffraction (STRD) technique for plasmonic antennas. This method efficiently allows evaluation of the near-field distribution because of the interaction of optical sources, such as surface plasmon waves, with perfectly conducting wedges. The STRD technique based on the multipole expansion of Green??s function (MEG) is particularly suitable for the design and rigorous analysis of wireless nano-systems. On the other hand, the characterisation of electromagnetic radiation processes in millimetric/ micrometric short-pulse electrical antennas can be conveniently carried out by means of the dedicated singularity-expansionmethod(SEM)-based methodology detailed in the second part of this study. Together, the proposed new analytical approaches provide a powerful and complete tool for small antenna design GHz and THz frequency ranges. [J22]

"Single electron fault modelling in quantum binary wire"

Quantum cellular automata (QCA) represents an emerging technology at the nanotechnology level. There are various faults that may occur in QCA cells. One of these faults is the single electron fault that can happen during manufacturing or the operation of QCA circuits. The behaviour of the single electron fault in QCA devices is not similar to either previously investigated faults or conventional CMOS logic. A detailed simulation-based logic level modelling of the single electron fault for QCA binary wire is represented in this study. Results show that if a single electron fault occurs in a binary wire, then the logic value of that wire will be inverted. [J23]

"Hard x-ray nano patterning using a sectioned multilayer"

We report a hard x-ray patterning capable of drawing lines with a width below100 nm using x-rays at 0.165 nm.

A specially prepared mask based on multilayer growth technology was used as an x-ray mask effectively. The x-ray Talbot effect in near field was investigated and utilized in the patterning. Since multilayers with a few nanometer layer spacing are readily available, the proposed hard x-ray nano patterning, free of the limit imposed by the Rayleigh criterion in optical range, can potentially be an ultimate optical lithography technique. [J24]

"GHz amplifiers go nano"

Mass-producible carbon nanotube field effect transistors (CNTFETs) have been used for the first time to build a GHz amplifier. US-based collaborating companies RF Nano Corp. and MITEQ Ltd. developed a CNTFET-based single-stage L-band RF amplifier which demonstrates the highest performance circuit published so far for this technology. [J25]

"UV-based nanoimprinting lithography with a fluorinated flexible stamp"

A custom-made copolymer of a perfluoropolyether (PFPE) and a hyperbranched polymer (HP) was employed to prepare an UV-based nanoimprinting lithographic (NIL) flexible HPFPE stamp. The properties of the HP afforded the resultant HPFPE resist with low viscosity, suitable surface energy, high Young's modulus, and enhanced stability. The HPFPE resist also presented excellent properties of antisticking, and durability, no deformation, or distortion after long time usage; therefore, demonstrating an improvement in the NIL pattern transfer fidelity and resolution. By optimizing the UV-based NIL process with this flexible HPFPE stamp, the imprinting results showed near zero residues at the bottom of the resist grooves, and no sticking over a large area. The structure of the HPFPE flexible stamp was transferred intact onto a soft substrate indium tin oxide/polyethylene terephthalate film with good resolution, achieving a 50 nm linewidth and a 200 nm period. [J26]

"RF Nanotechnology-Concept, Birth, Mission, and Perspectives [JMember Benefits]"

Some time ago I wondered how, on the one hand, the concept nano was present at the forefront of the paradigm for many scientific areas, from basic to applied and industrial research, feeding numerous and vigorous activities such as conferences, lectures, thematic groups, committees, journals, and magazines. On the other hand, nano was not yet in the spotlight of our Microwave Theory and Techniques Society (MTT-S), traditionally careful to assess and capture what is emerging and promising in related technologies. [J27]

"An Interconnect-Line-Size Optimization Model Considering Scattering Effect"

Based on the impact of the scattering effect on latency and bandwidth, this letter presents the quality-factor model that optimizes latency and bandwidth effectively with consideration of the scattering effect. Then, we get the optimization analytical model with target interconnect linewidth and line spacing by the curve-fitting method. The proposed model has been verified and compared for nanoscale CMOS technology. The optimization model is simple, and we can apply it to the interconnect system optimal design of nano-CMOS integrated circuits. [J28]

"Photoluminescence studies of high-quality InAlN layer lattice-matched to GaN grown by metal organic chemical vapor deposition"

Temperature-dependent photoluminescence (PL) measurements have been performed on high-quality InAlN layers lattice-matched (LM) to GaN with different thicknesses. It is found that the PL is consisted of two components denoted as IH(high-energy side) and IL(low-energy side), respectively. IHis attributed to exciton luminescence of bulk InAlN with linewidth comparable to those calculated under the assumption of perfect random alloy. While ILis attributed to the emission from the quantum-dotlike structure on the surface of InAlN, revealing the importance of surface effect to the investigations related to InAlN LM to GaN. [J29]

"Progress Review of Electromagnetic Compatibility Analysis Technologies for Packages, Printed Circuit Boards, and Novel Interconnects"

The ever-increasing demands of digital computing and wireless communication have been driving the semiconductor technology to change with each passing day. Modern electronic systems integrate more complex components and devices, which results in a very complex electromagnetic (EM) field environment. EM compatibility has become one of the major issues in ICs redesign, mainly due to the lack of efficient and accurate simulation tools and expertise on noise reduction and immunity improvement. This paper reviews the state of the arts of IC, electronic package, and printed circuit board simulation and modeling technologies. It summarizes the modeling technologies for both available structures [multilayered power-ground planes and macromodeling of interconnect (INC)] and novel structures (nano-INCs and 3-D ICs based on through-silicon via technology). It also illustrates the trends of simulation and modeling technologies in EM compatibility, signal integrity, and power integrity. [J30]

"Droplet electric separator microfluidic device for cell sorting"

A simple and effective droplet electric separator microfluidic device was developed for cell sorting. The aqueous droplet without precharging operation was influenced to move a distance in the channel along the electric field direction by applying dc voltage on the electrodes beside the channel, which made the target droplet flowing to the collector. Single droplet can be isolated in a sorting rate of 100Hzwith microelectrodes under a required pulse. Single or multiple mammalian cell (HePG2) encapsulated in the surfactant free alginate droplet could be sorted out respectively. This method may be used for single cell operation or analysis. [J31]

"Improved efficiency of bulk heterojunction poly(3-hexylthiophene):[J6,6]-phenyl-C 61 -butyric acid methyl ester photovoltaic devices using discotic liquid crystal additives"

Well established poly(3-hexylthiophene):[6,6]-phenyl-C61-butyric acid methyl ester (P3HT:PC61BM)bulk-heterojunction organic photovoltaics (BHJ OPVs) were improved by incorporating a small portion of the discotic liquid crystal (DLC) additives with a strong self-assembling ability and high mobility. Under simulated solar illumination of AM 1.5 (100mW/cm2), the devices fabricated using P3HT:PC61BM(1:1.2 w:w) layer blended with 3 wt % of 2,3,6,7,10,11-hexaacetoxytriphenylene (DLC 2) achieved an average power conversion efficiency (PCE) of 3.97% after thermal annealing, compared to the reference cells with PCE=3.03%. DLCs have been proven here to be a promising new type of additive that can remain embedded in the active layer of high efficiency P3HT:PC61BMBHJ OPVs. [J32]

"Transport properties of corrugated graphene nanoribbons"

The transport properties of the devices made by corrugated graphene nanoribbons were investigated using the density functional theory in combination with the nonequilibrium Green's function method. We find that the transport properties of the zigzag graphene nanoribbons (ZGNRs) with arched corrugation are similar to the flat one, while the transmission of the ZGNRs with step-shaped corrugation is greatly depressed. As for the armchair graphene nanoribbons (AGNRs), arched corrugation enlarges the transmission gap and the threshold voltage of the device. Moreover, the open currents of AGNRs are significantly depressed by both stepped and arched corrugation. [J33]

"Solid-State Lighting: An Integrated Human Factors, Technology, and Economic Perspective"

Solid-state lighting is a rapidly evolving technology, now virtually certain to someday displace traditional lighting in applications ranging from the lowest-power spot illuminator to the highest-power area illuminator. Moreover, it has considerable headroom for continued evolution even after this initial displacement. In this paper, we present a high-level overview of solid-state lighting, with an emphasis on white lighting suitable for general illumination. We characterize in detail solid-state lighting's past and potential-future evolution using various performance and cost metrics, with special attention paid to inter-relationships between these metrics imposed by human factors, technology, and economic considerations. [J34]

"Nonvolatile resistive switching memory based on amorphous carbon"

Resistive memory effect has been found in carbon nanostructure-based devices by Standley etal [Nano Lett. 8, 3345 (2008)]. Compared to nanostructures, hydrogenated amorphous carbon (a-C:H)has much more controllable preparation processes. Study on a-C:H-based memory is of great significance to applications of carbon-based electronic devices. We observed nonvolatile resistance memory behaviors in metal/a-C:H/Ptstructures with device yield 90%, ON/OFF ratio >100, and retention time >105s. Detailed analysis indicates that the resistive switching originates from the formation/rupture of metal filaments due to the diffusion of the top electrodes under a bias voltage. [J35]

"Magnetoelectric behavior of carbonyl iron mixed Mn oxide-coated ferrite nanoparticles"

The dielectric and magnetic properties of manganese oxide-coated Fe3O4nanoparticles (NPs) were measured by the cavity perturbation method at x-band microwave frequencies ranging from 7-12.5 GHz with controlled external magnetic field up to 2.2 kOe at room temperature. Different ratios (5%, 10%, and 20% by weight) of coated NPs were prepared by sol-gel method then mixed with carbonyl iron powder in epoxy matrix. The saturation magnetization is inversely proportional to the NPs ratio in the mixture between 150 and 180 emu/g. The real part of the permittivity decreased with increasing NPs concentration, but the permittivity change by magnetic field increased. The tunability behavior is explained by insulator-ferromagnetic interface magnetoelectricity and the large surface volume ratio for the NPs. [J36]

"Infrared-photovoltaic properties of graphene revealed by electro-osmotic spray direct patterning of electrodes"

Although two-dimensional thin-film nanostructures such as graphene are extremely promising for future optical or electronic devices, the required manufacturing technologies are still lacking. Herein the authors introduce a robotically controlled electro-osmotic spray deposition method of colloids with a high electric potential to create optoelectronic devices directly onto the surface of graphene. Since the process does not require a clean room or lithography method, pure graphene optoelectronic devices can be manufactured at a low cost. Moreover, preliminary experiments revealed that the manufactured graphene optoelectronic devices have excellent photoelectric properties in the infrared wavelengths. [J37]

"Giant electrorheological fluid comprising nanoparticles: Carbon nanotube composite"

We have fabricated suspensions exhibiting the giant electrorheological (GER) effect comprising nanoparticles-multiwall carbon nanotubes (MCNTs) composite particles dispersed in silicone oil. This type of GER fluids display dramatically enhanced antisedimentation characteristic without sacrificing the yield stress. The nanoparticles-nanotubes composites were fabricated by modifying the coprecipitation method with MCNTs and urea-coated barium titanyl-oxylate (BTRU) nanoparticles as the components. The composite solid particles are denoted MCNT-BTRU. In the best cases, stabilized suspensions with MCNT-BTRU particles dispersed in silicone oil have been maintained for several months without any appreciable sedimentation being observed. Both the sedimentary and rheological properties of the MCNT-BTRU suspension were systematically studied and compared with their BTRU counterparts. Yield stress as high as 194 kPa was obtained in the MCNT-BTRU suspensions. The MCNT-BTRU based GER fluids, with their antisedimentation characteristic, may have broad engineering applications. [J38]

"Cost-effective fabrication of nanoscale electrode memristors with reproducible electrical response"

This Letter aims to promote basic research into memristors, which will help provide theorists with much-needed reliable benchmarks and will also aid the technology progress. It addresses an information gap presently in the literature on simple microfabrication techniques for the realisation of such devices. Consequently, a fabrication method is reported for implementing the full active-material stack, requiring a single lithography and evaporation step. A cost-effective technique that can reliably shrink device lateral dimensions towards the nanoscale is also demonstrated. Experimental results confirm the suitability of the proposed methods for fabricating memristors of varying dimensions that exhibit consistent electrical characteristics. [J39]

"Fabrication of nano-mechanical switch using focused ion beam for complex nano-electronic circuits"

A nano-mechanical switch has been fabricated and its switching action has been demonstrated. The device utilises the phenomenon of bending of Pt nanopillars and cantilevers induced by focused ion beam (FIB). Two skew Pt pillars with equal lengths and different cross-sections have been fabricated subtending an angle of approximately 100Г‚В° with each other using FIB-chemical vapour deposition (CVD). One of the pillars is initially made to bend towards the adjacent pillar to achieve a physical contact with it, and then is bent in opposite direction from it. The pillar has been bent along the desired orientation by appropriately choosing the ion beam irradiation directions. The switching action has been demonstrated by applying constant voltage across the Pt pillars and measuring the current passing through it, as a function of time during ion beam scanning. These nano-mechanical switches would find useful applications during the in-situ electrical characterisation of micro- and nano-structures fabricated by FIB. [J40]

"Nano Spiral Inductors for Low-Power Digital Spintronic Circuits"

We propose nano-scaled spiral inductors suitable for future low-power digital spintronic circuits. The proposed nano-spiral inductors can be effectively used to generate magnetic field in a class of spintronic logic/memory circuits such as magnetic random access memory (MRAM) and magnetic quantum cellular automata (MQCA). Measured results on 0.13 Г‚Вїm test-chip demonstrate the effectiveness of the proposed nano-spiral inductors and we estimate 3.36 ГѓВ— lower write-current in MRAMs and 85% lower clocking energy in MQCAs. [J41]

"A Miniaturized Two Axis Sun Sensor for Attitude Control of Nano-Satellites"

This paper describes the design, fabrication, characterization, and satellite integration of a miniaturized two axis sun sensor which has been used in the attitude control system of the Spanish nano-satellite NANOSAT-1B. This device is made of four silicon photodiodes monolithically integrated in a crystalline silicon substrate, protected by

a transparent cover glass assembled on the same silicon die against space radiation damage. The sensor fabrication combines standard silicon processing technology with a high performance solar cell fabrication process. The sensor, including electronics and mechanical and electrical interfacing with the satellite, has a small size (3 cm Ч 3 cm) and low weight (24 gr.), with a sun field-of-view greater than ±60° with an angle accuracy better than 0.15°. Three of these sensors have already been integrated in the NANOSAT-1B platform that has been successfully launched in July 2009. [J42]

"Designing Novel Photonic Devices by Bio-Inspired Computing"

Three bio-inspired optimization schemes, integrated into a robust frequency domain 2-D finite-element code, have been assessed by the design of two novel nonintuitive photonic crystal-type devices: an unbalanced power splitter and a micro-to-nano waveguide coupler. The bio-inspired schemes were taken from three biological-based classes of algorithms: genetic algorithm, evolution strategy, and artificial immune system. The results show that such schemes constitute valuable and powerful tools for the design of advanced and sophisticated photonic devices, where pixels concept was changed by photonic crytals structures to enable their future fabrication. [J43]

"Efficient sensor for robust low-power design in nano-CMOS technologies"

Conventional design methods add pessimistic safety margins to mitigate increased variability in scaled technologies that incur high power and performance losses. An efficient sensor design is presented that can significantly reduce design margins yet provide robust circuit operation. The proposed design uses the delay of the master latch of a conventional flip-flop to predetect timing failures and enable low-power error-free operation. HSPICE simulation of a 45 nm 16 ГґВ— 16 carry save multiplier indicates a 37% reduction in the total power consumption for the proposed design compared to a conventional worst case design when subjected to high statistical variability. Similarly, gate level simulations show a 26% reduction in the total power consumption of a 32 nm 32-bit carry select adder when subjected to temperature variations. [J44]

"Emission color control from blue to red with nanocolumn diameter of InGaN/GaN nanocolumn arrays grown on same substrate"

A novel technology for controlling the In composition of InGaN quantum wells on the same wafer was developed, which paved the way for the monolithic integration of three-primary-color nano-light-emitting diodes. In the experiment, InGaN/GaN multiple quantum well nanocolumn arrays with nanocolumn diameters from 137 to 270 nm were prepared on the same substrate with the Ti-mask selective area growth by rf-plasma-assisted molecular beam epitaxy. The emission color changed from blue to red (from 479 to 632 nm in wavelength) with increasing nanocolumn diameter. The emission color change mechanism was clearly explained by the beam shadow effect of the neighboring nanocolumns. [J45]

"Optoelectronic Mixer Based on Composite Transparent Gate InAlAs-InGaAs Metamorphic HEMTs"

In this study, sputtered indium-tin-oxide (ITO) formed ITO/Au/ITO was used to form composite transparent gate InAlAs-InGaAs metamorphic HEMTs (CTG-MHEMT), with an optoelectronic mixer significantly markedly improved front-side optical coupling efficiency. The proposed CTG-MHEMT exhibits a high responsivity (λ = 1310 nm) of 1.71 A/W under optimal bias conditions. A -3 dB electrical bandwidth of 400 MHz is produced by the photovoltaic effect and dominated by the long lifetime of the excess holes. The -3 dB electrical bandwidth associated with the photoconductive effect is 2.3 GHz, and is determined mainly by the short electron life time. A power gain cut-off frequency (fmax) of CTG-MHEMT of 18.2 GHz was achieved. This value, is much larger than that of TG-MHEMT (14.6 GHz) because Au nano particles improved the gate resistance. The optoelectronic mixing efficiency was enhanced by tuning the gate bias conditions. The CTG-MHEMT optoelectronic mixer is a cost-effective device, and based on the optical and electrical characteristics, is a promising candidate for simplifying the system architecture in fiber-optic microwave transmission applications. [J46]

"Analytical Design of Total-Internal-Reflection Grating Demultiplexers With a Low Noise Floor"

Etched diffraction grating (EDG) demultiplexers using total-internal-reflection (TIR) facets with a low noise floor have theoretically been designed based on silicon nanowire wafers. The transfer function (TF) of EDG demultiplexers is derived based on Fourier analysis. Since the Goos-Hajnchen shift and the finite size of facets result in most of the loss of EDG demultiplexers with TIR facets, we can reshape the TF into an approximate Gaussian distribution by slightly adjusting each grating facet's size and structure. Thus, we design an EDG demultiplexer with a very low noise floor based on silicon waveguide. [J47]

"Oxygen vacancy controlled tunable magnetic and electrical transport properties of (Li, Ni)-codoped ZnO thin films"

We investigated the electrical, magnetic, and magnetotransport properties of Li-Ni codoped ZnO thin films in the electron dominated, hole dominated, and insulating regimes. In a narrow window of oxygen growth pressure, 10-3-10-2mbar, the films exhibited p-type conductivity with a maximum hole concentration 8.2Ч1017cm-3. Magnetoresistance exhibited by the films is attributed to scattering of charge carriers due to localized magnetic moments. Insulating films showed superparamagnetic behavior, whereas both n-type and p-type films showed room temperature ferromagnetism. Our findings suggest that oxygen vacancies and Ni ions in cation site are jointly responsible for ferromagnetism that is not dependent on the carrier type. [J48]

"Tailoring the luminescence emission of ZnO nanostructures by hydrothermal post-treatment in water"

ZnO nanorods and nanowires fabricated from solution methods exhibit poor optical properties. Using hydrothermal post-treatment in pure water, the green emission can be significantly suppressed at 250 °Cand completely eliminated at 350 °C. Meanwhile, the near-band-edge UV radiative recombination efficiency is greatly improved and the UV emission intensity is increased up to 50 times. The morphology and structure of the ZnO nanostructures remain intact after the treatment. As evidenced by the electron paramagnetic resonance investigation, this simple treatment can completely remove or passivate the point defects responsible for the green emission of as-grown ZnO. [J49]

"Multiscale Modeling of Head Disk Interface"

Multiscale modeling opens a new paradigm by providing a novel methodology of establishing molecular design criteria and potentially gives several order of magnitude advances in nano-technology. The head disk interface in hard disk drive system investigated here can be used as a benchmark for multiscale modeling. Our approach, stemmed from novel middle-out approach in modern multiscale modeling, uses lattice Boltzmann method (LBM) as a base formulation marches towards continuum level (top) and molecular level (bottom). This approach will be an extremely valuable tool in generating design criteria of head/disk interface. [J50]

"Molecular Spreading of Pure and Binary Mixture PFPE Nano Films on Carbon-Overcoated Disks"

Due to continuous increase in areal density, the head-media spacing combining head & media overcoat, lubricant film and fly height, is expected to be less than 6.5 nm for 1 Tbits/in2hard disk drives (HDDs). The intermittent contacts between head and disk during operation are unavoidable and cause lubricant depletion in the film. Therefore, the nanoscale conformation and self-healing ability (i.e., spreading) of perfluoropolyether (PFPE) lubricant nano films is critically important in the head-disk interface to maintain long-term reliability of HDDs. In this paper, the spreading phenomena for pure and binary mixture PFPE lubricant nano films on the carbon-overcoated media were examined via molecular dynamics simulation. [J51]

"Observation of Spin-Orbit Interaction Parameter Over a Wide Temperature Range Using Potentiometric Measurement"

Spin-orbit interaction parameter (Г,Вї) can be obtained by measuring the Shubnikov-de Haas oscillation, but this method is valid at only very low temperature. The current induced spin polarization in a 2-D electron gas layer is measured by potentiometric geometry which measures spin dependent chemical potential shifts. Subsequently, a spin-orbit interaction parameter can be extracted up to T = 250 K. In an inverted In0.52Al0.48As/In0.53Ga0.47As/In0.52Al0.48As quantum well system, a of 5.65 ГґВ— 10-12eVm and 3.85 ГґВ— 10-12eVm are obtained at T = 1.8 and 250 K, respectively. [J52]

"The Effect of Thermal Radiation on Thermal Flying Height Control Sliders"

Thermal flying height control (TFC) technology has recently been applied in hard disk drives. In calculating the thermal deformation caused by the resistance heater, radiation as predicted by Plank's blackbody radiation law is usually neglected because of its small magnitude compared to conduction. Recent experimental investigations have shown that Planck's law breaks down in a small gap of nano-scale dimensions and that the heat transfer coefficient at distances on the order of nano-meters can exceed Plank's blackbody radiation by more than three orders of magnitude. This paper investigates numerically the effect of enhanced thermal radiation for thermal flying height control sliders at very small flying heights. [J53]

"Strain relaxation effect by nanotexturing InGaN/GaN multiple quantum well"

The relaxation of lattice-mismatched strain by deep postetching was systematically investigated for InGaN/GaN multiple quantum wells (MQWs). A planar heterojunction wafer, which included an In0.21Ga0.79N(3.2 nm)/GaN (14.8 nm) MQW, was etched by inductively coupled plasma dry etching, to fabricate high-density nanopillar, nanostripe, and nanohole arrays. The etching depth was 570 nm for all nanostructures. The diameter of the nanopillars was varied from 50 to 300 nm, then the mesa stripe width of the nanostripes and the diameter of the nanoholes were varied from 100 nm to 440 nm and 50 nm to 310 nm, respectively. The effect of strain relaxation on various optical properties was investigated. For example, in an array of nanopillars with diameter 130 nm and interval 250 nm, a large blueshift in the photoluminescence (PL) emission peak from 510 nm (as-grown) to 459 nm occurred at room temperature (RT). PL internal quantum efficiency (defined by the ratio of PL integral intensity at 300 K to that at 4.2 K) was enhanced from 34% (as-grown) to 60%, and the PL decay time at 4.2 K was reduced from 22 ns (as-grown) to 4.2 ns. These results clearly indicate the reduction of lattice-mismatched strain by postetching, which enhanced strain reduction with decreasing nanopillar diameter down to a diameter of 130 nm, where the strain reduction became saturated. The dependence of RT-PL decay time on nanopillar diameter was measured, and the surface nonradiative recombination velocity was estimated to be 5.8Ч102cm/s. This relatively slow rate indicates a little etching damage. [J54]

"Enhancement of ultraviolet electroluminescence based on n-ZnO /n-GaN isotype heterojunction with low threshold voltage"

Ultraviolet light-emitting diodes based on simple n-ZnO/n-GaNisotype heterojunction have been fabricated using a radio frequency magnetron sputtering system. Ultraviolet emission peaking around 368nmwith a full-width at half maximum of 7nmwas observed at room temperature when the devices were under sufficient forward bias. With the presence of an i-MgOlayer inserted between the ZnO and GaN layers, the ultraviolet emission intensity and output power have been much enhanced, while the threshold voltage drops down to 2.5 V. The electroluminescence mechanisms in these devices were discussed in terms of the band diagrams of the heterojunctions. [J55]

"Microwave silicon on insulator-based design of a power management system for jet propulsion laboratory's rechargeable micro-scale batteries"

In the area of power storage for aerospace applications, Jet Propulsion Laboratory, California Institute of Technology, has developed an all solid-state rechargeable micro-scale lithium ion battery cell (micro-battery) rated at 4.25 V, with nano-Ampere hour capacity. One of the advantages of this development is the ability to fabricate approximately 20 000 individual micro-battery cells adjacent to each other on the same four-inch silicon wafer. To take advantage of a pre/post-fabricated series, parallel or series/parallel connection of the cells, a power management system has been developed and sub-system circuits designed using a combination of device and circuit techniques meeting high voltage switching requirements in silicon on insulator (SOI) technology to reconfigure and control the charge/discharge operation of the cells for practical application. This study will present a detailed analysis of the power management system and its sub-circuit components. The circuit components have been simulated using 3.3 V SOI SPICE models and have been fabricated in a 0.35 m Microwave SOI process. A description of the system and the results will also be discussed and analysed. [J56]

"Magnetoimpedance and magnetodielectric properties of single phase 45PMN-20PFW-35PT ceramics"

Phase pure and dense polycrystalline 45PMN-20PFW-35PT sample has been synthesized using a columbite precursor method. Structure and surface morphology of the samples were studied using x-ray diffraction and scanning electron microscope. The sample showed the expected reduction in dielectric constant and polarization (Pmax=17mu C/cm2)compared with that of the parent compound, 65PMN-35PT (Pmax=22mu C/cm2). The sample is also found to be paramagnetic, which is confirmed by magnetization measurements as a function of temperature and an applied magnetic field. The sample was also tested for magnetoelectric coupling by measuring its dielectric constant and impedance at different applied magnetic fields. The observed colossal negative magnetodielectrics (177%) and colossal positive magnetoimpedance (130%) effect at 7 MHz, which is due to piezoelectric radial vibration. This is an indirect confirmation of the coupling between the electric and magnetic order parameters. [J57]

"Development of a laser-focused ion beam combination machine"

We have developed a laser and focused ion beam (FIB) compound system to process an optical component device with an ultrafine precision minute surface structure and a micromedical device. This machine consists of an FIB and three types of lasers with an atomic force microscope. This system can fabricate decamicrometer area by laser and submicrometer area by FIB at one chuck. When processing the press mold die of a microlens

array (10Ч10)in a glasslike carbon with a femtosecond laser, a diameter of 3.2mcmand depth of 0.43mcmare obtained. However, the surface roughness is more than Rz=0.5mcm. After this process, we finished this surface with the use of the FIB. As a result, the surface roughness is less than Rz=0.05mcm. [J58]

"Enhancement of light emission from silicon nanocrystals by post-O 2 -annealing process"

This study investigated the effects of the post-O2-annealing process on light emission from silicon nanocrystals. Using pulsed laser ablation in an O2-filled atmosphere, the SiOx(x 2)thin layers were synthesized prior to O2-annealing. We observed a strong photoluminescence from the silicon nanocrystals embedded in the annealed layers at 500 °C, which depended on the post-O2-annealing time. We also found that the interface property between the silicon nanocrystal and stoichiometric SiO2matrix is critical for efficient light emission. The electroluminescence spectra in the visible range were obtained above the on-current density of 0.7A/cm2under several forward-bias voltages. The blueshift in the electroluminescence was attributed to the band-filling effect under high current injection mode. The external emission efficiency was estimated to be about 0.3% by using the band-filling model. [J59]

"Analysis of Energy Quantization Effects on Single-Electron Transistor Circuits"

In this paper, the effects of energy quantization on different single-electron transistor (SET) circuits (logic inverter, current-biased circuits, and hybrid MOS-SET circuits) are analyzed through analytical modeling and Monte Carlo simulations. It is shown that energy quantization mainly increases the Coulomb blockade area and Coulomb blockade oscillation periodicity, and thus, affects the SET circuit performance. A new model for the noise margin of the SET inverter is proposed, which includes the energy quantization effects. Using the noise margin as a metric, the robustness of the SET inverter is studied against the effects of energy quantization. An analytical expression is developed, which explicitly defines the maximum energy quantization (termed as Г,Вї quantization thresholdГ,Вї) that an SET inverter can withstand before its noise margin falls below a specified tolerance level. The effects of energy quantization are further studied for the current-biased negative differential resistance (NDR) circuit and hybrid SETMOS circuit. A new model for the conductance of NDR characteristics is also formulated that explains the energy quantization effects. [J60]

"Parallel growth and healing of DNA self-assembly for interconnects"

Self-assembly has been employed in nano-technology to build crystals using individual components (commonly referred to as tiles) with limited control. Templates of regular lattice structures for two-dimensional scaffolds and interconnects have been recently implemented by self-assembly. This study proposes a diagonally based growth scheme that is applicable to these templates of interconnects (as an example). Differently from previous techniques (mostly sequential in execution), growth is allowed along two different directions in the aggregate, thus permitting a parallel mode of operation. This is made possible by utilising a tile set and binding scheme to allow multiple seed tiles to grow along the main diagonal of the pattern. The conditions by which this type of new growth is possible at a reduced error occurrence in mismatched tiles, are presented; error tolerance is achieved by employing healing and so-called robust generation of the seed tiles, thus ensuring that pattern growth is controlled along both directions. Simulation results are presented under different scenarios of growth direction (inclusive of backward growth for healing). [J61]

"Characterisation of the fabrication process of freestanding SU-8 microstructures integrated in printing circuit board in microelectromechanical systems"

The characterisation of the fabrication process to develop freestanding SU-8 structures integrated in printing circuit board in microelectromechanical systems (PCBMEMS) technology is presented. SU-8 microcantilevers, microbridges, microchannels and micromembranes have been fabricated following the described procedure. Adherence between FR4 substrate and SU-8 has been examined using the destructive blister method, evaluating the surface energy. Residual thermal stress has also been analysed for this integration and compared when using other substrates. Moreover, an estimation of the copper wet etching with cupric chloride has been performed in order to understand how this isotropic etching affects the geometry of the copper structures. Finally, stiction has been observed and examined, estimating the adhesion energy responsible for this effect. [J62]

"Highly sensitive passive radio frequency identification based sensor systems"

A novel platform for sensor applications based on radio frequency (rf) identification technology, where passive tags are powered by the rf-field of a reader, is presented. The sophisticated energy harvesting system of the tag enables a blanking of the rf-field for a defined period, while supplying the tag electronics with a highly stable voltage and a power of 25 mW for 100 ms. During this time, span measurements can be performed without

interferences of the rf-field. The presented tags work without batteries and are designed for impedance measurements on microbiological cell cultures under physiological relevant conditions as well as in harsh environments. [J63]

"Robust asymmetric 6T-SRAM cell for low-power operation in nano-CMOS technologies"

An asymmetric 6T-SRAM cell design is presented for reliable low-power circuit operation under large variability. A low overhead write assist circuit is added to increase the write-noise-margin (WNM) and improve the write speed/power. Sizing is used to strengthen the pull-down transistor of the feedback inverter of the single ended read circuit to enhance the static-noise-margin (SNM). Monte Carlo simulations indicate a 90% improvement in SNM and a boost in the WNM of 108% compared to the conventional 6T-SRAM design. Comparative analysis of a 65nm 64 ΓŕB— 32 bit SRAM designed using both SRAM cells (Symmetric-6T and Asymmetric-6T) shows the write delay and power decrease by 46% and 35%, respectively, while total power decreases by 52% using the proposed design. [J64]

"Effect of combined addition of nano-SiC and nano-Ho 2 O 3 on the in-field critical current density of MgB 2 superconductor"

MgB2superconducting samples added with nano-Ho2O3(n-Ho2O3)and/or nano-SiC (n-SiC) have been prepared by an in situ solid state reaction method to investigate and compare the combined and individual effects of n-SiC and n-Ho2O3on a crystal structure, critical temperature (TC), and critical current density (JC)of MgB2. All the doped samples exhibit significantly enhanced in-field JCand the codoped sample with 2.5 wt % n-Ho2O3and 5 wt % n-SiC gives the best performance in in-field JC, and the enhancement is around 100 times and 2 times greater than the undoped and monodoped n-SiC samples, respectively, at 5 K and 8 T. For the n-SiC added sample, lattice distortions due to C substitution on the B site and the formation of reacted phase Mg2Sias flux pinners cause enhanced JCup to the maximum field studied (8 T). While in the n-Ho2O3added sample, a reacted phase HoB4having a strong magnetic moment forms, without any substitution at the Mg or B site, which acts as a flux pinner in order to enhance the in-field JC. Accordingly the best codoped sample exhibits these combined benefits of n-SiC and n-Ho2O3in MgB2superc- onductor. [J65]

"A 9-pJ/Pulse 1.42-Vpp OOK CMOS UWB Pulse Generator for the 3.1-10.6-GHz FCC Band"

This paper presents the design of a fully integrated ultra-wideband (UWB) pulse generator for the Federal Communications Commission (FCC) 3.1-10.6-GHz band. This generator is reserved for medium rate applications and achieves pulses for an on-off keying (OOK) modulation, pulse position modulation, or pulse interval modulation. This UWB transmitter is based on the impulse response filter method, which uses an edge combiner in order to excite an integrated bandpass filter. The circuit has been integrated in an ST-Microelectronics CMOS 0.13-??m technology with 1.2-V supply voltage and the die size is 0.54 mm2. The pulse generator power consumption is 9 pJ per pulse and achieves a peak to peak magnitude of 1.42 V. The pulse is FCC compliant and the generator can be used with a rate up to 38 Mbs-1with an OOK modulation. Based on the FCC power spectral density limitation, a sizing method is also presented. [J66]

"Theory of Nano-Electron-Fluidic Logic (NFL): A New Digital "Electronics" Concept"

A new digital "electronics" concept is introduced. The concept, called nano-electron-fluidic logic (NFL), is based on the generation, propagation, and manipulation of plasmons in a 2-D electron gas behaving as an electron fluid. NFL gates are projected to exhibit femtojoule power dissipations and femtosecond switching speeds at finite temperatures. NFL represents a paradigm shift in digital technology and is poised as a strong candidate for "beyond-CMOS" digital logic. [J67]

"Combined -Feedback Control and Iterative Learning Control Design With Application to Nanopositioning Systems"

This paper examines a coordinated feedback and feedforward control design strategy for precision motion control (PMC) systems. It is assumed that the primary exogenous signals are repeated; including disturbances and references. Therefore, an iterative learning control (ILC) feedforward strategy can be used. The introduction of additional non-repeating exogenous signals, including disturbances, noise, and reset errors, necessitates the proper coordination between feedback and feedforward controllers to achieve high performance. A novel ratio of repeated versus non-repeated signal power in the frequency domain is introduced and defined as the repetitive-to-non-repetitive (RNR) ratio. This frequency specific ratio allows for a new approach to delegating feedback and feedforward control efforts based on RNR value. A systematic procedure for control design is given whereby the feedback addresses the non-repeating exogenous signal content (RNR 0 dB) and the feedforward ILC

addresses the repeating signal content (RNR 0 dB). To illustrate the design approach, two case studies using different nano-positioning devices are given. [J68]

"Exploration of Whole Human Body and UWB Radiation Interaction by Efficient and Accurate Two-Debye-Pole Tissue Models"

We have developed a computationally efficient finite-difference time-domain (FDTD) model of a whole human body based on accurate 2-pole Debye dispersion dielectric tissue properties. Comprehensive FDTD analyses of the interaction between a whole human body and ultrawideband (UWB) radiation are carried out by including the proposed frequency dependent tissue models. The 2-pole Debye models have been obtained for 50 individual human tissues from Gabriel's Cole-Cole data by the least squares fitting technique over the frequency range from 100 MHz to 6 GHz. A whole human body composed of the 2-pole Debye models is exposed to spread spectrum radiation. Local energy absorption in a human body is compared between the proposed model and the conventional model of frequency-independent permittivity and conductivity. Resonance states are then investigated in the human body exposed to electromagnetic nano-second pulse radiation. For the extraction of the frequency contents from the highly damped FDTD time signals, a spectrum analysis technique based on an auto-regressive (AR) model has been applied. Pulse propagation in the vicinity of the human body is also characterized by the proposed model for the wireless body area network (WBAN) application that has been proposed recently for computer assisted medical diagnostics and rehabilitation. [J69]

"Low-temperature electroluminescence quenching of AlGaN deep ultraviolet light-emitting diodes"

The temperature-dependent electroluminescence (EL) properties of AlGaN deep ultraviolet light-emitting diodes (LEDs) have been studied. The low-temperature EL quenching is observed in 265 nm LEDs with p-type AlGaN heterostructure, which has not previously been reported in such short wavelength devices. However, this phenomenon disappears in those with a thin i-AlN electron blocking layer (EBL). It is found that the electron overflow becomes more severe at low temperature in the LEDs without EBL, whereas it is suppressed effectively in those with AlN EBL. On the basis of a model of temperature-dependent efficiency, the EL quenching is explained by the competition of electron overflow and radiative recombination. [J70]

"Dielectric Properties of Epoxy- Nanocomposite System for Packaging Applications"

In recent times, there has been an ever-growing need for polymer-based multifunctional materials for electronic packaging applications. In this direction, epoxy-Al2O3nanocomposites at low filler loadings can provide an excellent material option, especially from the point of view of their dielectric properties. This paper reports the dielectric characteristics for such a system, results of which are observed to be interesting, unique, and advantageous as compared to traditionally used microcomposite systems. Nanocomposites are found to display lower values of permittivity/tan delta over a wide frequency range as compared to that of unfilled epoxy. This surprising observation has been attributed to the interaction between the epoxy chains and the nanoparticles, and in this paper this phenomenon is analyzed using a dual layer interface model reported for polymer nanocomposites. As for the other dielectric properties associated with the nanocomposites, the nano-filler loading seems to have a significant effect. The dc resistivity and ac dielectric strength of the nanocomposites were observed to be lower than that of the unfilled epoxy system at the investigated filler loadings, whereas the electrical discharge resistant properties showed a significant enhancement. Further analysis of the results obtained in this paper shows that the morphology of the interface region and its characteristics decide the observed interesting dielectric behaviors. [J71]

"Thread Relocation: A Runtime Architecture for Tolerating Hard Errors in Chip Multiprocessors"

As the semiconductor industry continues its relentless push for nano-CMOS technologies, device reliability and occurrence of hard errors have emerged as a dominant concern in multicores. Although regular memory structures are protected against hard errors using error correcting codes or spare rows and columns, many of the structures within the cores are left unprotected. Even if the location of hard errors is known a priori, disabling faulty cores results in a substantial performance loss. Several proposed techniques use microarchitectural redundancy to allow defective cores to continue operation. These techniques are attractive, but limited due to either added cost of additional redundancy that offers no benefits to an error-free core, or limited coverage, due to the natural redundancy offered by the microarchitecture. We propose to exploit the intercore redundancy in chip multiprocessors for hard-error tolerance. Our scheme combines hardware reconfiguration to ensure reduced functionality of cores, and a runtime layer of software (microvisor) to manage mapping of threads to cores. Microvisor observes the changing phase behavior of threads and initiates thread relocation to match the computational demands of threads to the capabilities of cores. Our results show that in the presence of degraded cores, microvisor mitigates performance losses by an average of two percent. [J72]

"Smart Garments for Emergency Operators: The ProeTEX Project"

Financed by the European Commission, a consortium of 23 European partners, consisting of universities, research institutions, industries, and organizations operating in the field of emergency management, is developing a new generation of ??smart?? garments for emergency-disaster personnel. Garments integrate newly developed wearable and textile solutions, such as commercial portable sensors and devices, in order to continuously monitor risks endangering rescuers' lives. The system enables detection of health-state parameters of the users (heart rate, breathing rate, body temperature, blood oxygen saturation, position, activity, and posture) and environmental variables (external temperature, presence of toxic gases, and heat flux passing through the garments), to process data and remotely transmit useful information to the operation manager. The European-integrated project, called ProeTEX (Protection e-Textiles: Micro-Nano-Structured fiber systems for Emergency-Disaster Wear) started on February, 2006 and will end on July, 2010. During this 4.5 years period, three subsequent generations of sensorized garments are being released. This paper proposes an overview of the project and gives a description of the second-generation prototypes, delivered at the end of 2008. [J73]

"Comment on "Microwave attenuation of hydrogen plasma in carbon nanotubes" [JJ. Appl. Phys. 104, 124315 (2008)]"

In a recent article, Babaei and Solari [J. Appl. Phys. 104, 124315 (2008)] studied the effects of the electron temperature, and the external static magnetic field on the attenuation (ATT) of the microwave in the hydrogen plasma embedded inside the carbon nanotubes (CNTs), which were grown by iron-catalyzed high-pressure disproportionation (HiPco). They showed that the position of ATT peak shifts significantly toward high frequency with increasing thermal frequency and in the presence of an external magnetic field in the Faraday configuration, for upsilon c<20GHz, the ATT coefficient increases with increasing cyclotron frequency, and for upsilon c>20GHz, the ATT level variations extremely increase, where upsilon cis the cyclotron frequency. Here we derive the correct form of the microwave absorption coefficient of the magnetized hydrogen plasma embedded inside the CNTs and show that the absorption band moves from low to high frequencies when the magnetic field strength increases. Also, we show that the ATT of the microwave in the system is not sensitive to the thermal frequency. [J74]

"Effective incorporation of nanoceria into polycrystalline MgB 2"

A series of polycrystalline MgB2samples were prepared with different amounts of nanosized CeO2inclusions. Samples were subjected to x-ray diffraction, scanning electron microscopy, and atomic force microscopy characterization. We found that nano-CeO2inclusions affect the lattice parameters as well as the microstructure of MgB2superconductor. An increase in the lattice parameters aand cwas observed due to nanoinclusions up to 2 wt %. The morphology of the surface of pure samples reveals a considerable number of weak-links, randomly oriented grains and clean grain boundaries. While in samples with nanoinclusions, grain surfaces and boundaries were decorated with nanosized CeO2particles and low traces of secondary phases. A reduction in the average grain size and roughness was also observed for samples with highest inclusions. The superconducting properties have been measured using the magnetization measurement M(H)in magnetic field up to 5 T. Significant enhancement of the superconducting critical current density Jcand the pinning force Fpin applied magnetic field was observed due to nano-CeO2addition. However, no considerable change in the transition temperature Tcand transition width was observed. These results were interpreted in terms of the scaling of the flux pinning in granular superconducting networks which leads to a better basic understanding of the performance of MgB2system in relatively high applied magnetic fields. [J75]

"Pulse Power Generation in Nano- and Subnanosecond Range by Means of Ionizing Fronts in Semiconductors: The State of the Art and Future Prospects"

Ionization front propagation in a high-voltage reversely biased silicon p-n diode is the fastest nonoptical process of electron-hole plasma generation in semiconductors. It is capable of switching a high-voltage semiconductor structure from the blocking to the conducting state within several hundreds of picoseconds. Double-donor electron traps with ionization energies of 0.28 and 0.54 eV are the main source of carriers which initiate formation and propagation of these fronts. Dinistor n+-p-n-p+structures with such a switching mechanism are capable of generating electric pulses with several kiloamperes of amplitude and nanosecond and even subnanosecond pulse rise time. High-power pulse generators based on these devices have been developed and found applications in many modern technologies. Our numerical simulations indicate a possibility to excite new types of impact ionization fronts which are capable of switching high-voltage devices within dozens of picoseconds. [J76]

"Guest editorial bio-inspired networking"

Technology is taking us to a world where myriads of heavily networked devices interact with the physical world in multiple ways, and at multiple scales, from the global Internet scale down to micro- and nano-devices. Many of these devices are highly mobile and autonomous, and must adapt to the surrounding environment in a totally distributed and unsupervised way. fundamental research challenge is the design of robust decentralized computing systems, which are capable of operating under changing environments, and yet exhibit the desired behavior and response time, under unpredictable operating constraints, such as traffic demand, energy consumption, size, and processing power. These systems should be able to adapt and learn how to react to unforeseen scenarios, as well as to display desired emergent properties. [J77]

"Design Hardening of Nanometer SRAMs Through Transistor Width Modulation and Multi-Vt Combination"

Memory design in the nanometer regime imposes specific restrictions to the cell layout structure requiring regular disposition of transistors to minimize the impact of process parameter variations. These layout restrictions invalidate many of the traditional design techniques oriented to improve cell immunity to radiation-induced events that, in turn, get worsened with technology scaling. We analyze two design alternatives to improve cell hardening compatible with regular cell layouts providing an extensive analysis to illustrate the benefits of each technique. One of the proposed solutions is based on transistor width modulation that provides an immunity enhancement at the cost of a moderate cell-size increase. The other solution is based on multithreshold voltage selection showing a moderate immunity improvement at the cost of no impact on the cell area. The combination of both techniques is shown to be optimum when considering other design metrics like static noise margin, read/write stability, access time, and leakage. Results are demonstrated on 90- and 65-nm commercial technologies. [J78]

"Enhanced thermoelectric performance of (Sb 0.75 Bi 0.25)2 Te 3 compound from first-principles calculations"

The electronic properties of (Sb0.75Bi0.25)2Te3compound are examined by using the full-potential linearized augmented plane-wave method. The transport coefficients are then calculated within the semiclassical Boltzmann theory, and further evaluated as a function of chemical potential assuming a rigid band picture and constant relaxation time. The ZTvalue is thus estimated by inserting an averaged thermal conductivity. Our theoretical calculations give a valuable insight on how to enhance the thermoelectric performance of this compound, and many potential doping elements and their optimal concentrations are suggested. [J79]

"Study of sensitivity and noise in the piezoelectric self-sensing and self-actuating cantilever with an integrated Wheatstone bridge circuit"

A detection method using a self-sensing cantilever is more desirable than other detection methods (optical fiber and laser beam bounce detection) that are bulky and require alignment. The advantage of the self-sensing cantilever is its simplicity, particularly its simple structure. It can be used for the construction of an atomic force microscopy system with a vacuum, fluids, and a low temperature chamber. Additionally, the self-actuating cantilever can be used for a high speed scanning system because the bandwidth is larger than the bulk scanner. Frequently, ZnO film has been used as an actuator in a self-actuating cantilever. In this paper, we studied the characteristics of the self-sensing and self-actuating cantilever with an integrated Wheatstone bridge circuit substituting the ZnO film with a lead zirconate titanate (PZT) film as the actuator. We can reduce the leakage current (to less than 10-4A/cm2) in the PZT cantilever and improve sensor sensitivity through a reduction of noise level from the external sensor circuit using the Wheatstone bridge circuit embedded into the cantilever. The self-sensing and actuating cantilever with an integrated Wheatstone bridge circuit was compared with a commercial self-sensing cantilever or self-sensing and actuating cantilever without an integrated Wheatstone bridge circuit. The measurement results have shown that sensing the signal to noise level and the minimum detectable deflection improved to 4.78 mV and 1.18 nm, respectively. We believe that this cantilever allows for easier system integration and miniaturization, provides better controllability and higher scan speeds, and offers the potential for full automation. [J80]

"Hot electron transport in magnetic tunnel transistors with an epitaxial MgO tunnel barrier"

We fabricated fully epitaxial magnetic tunnel transistors (MTTs) consisting of a Fe(001)/MgO(001) emitter and a Fe(001) based on a n-GaAs(001)collector. We observed much higher transfer ratio (alpha)and magnetocurrent (MC) ratio than those of the previously reported MTTs that had an amorphous AlO barrier. These improvements are due to the coherent tunneling and single-crystalline base layer. In addition, a pronounced peak structure appeared in the emitter bias dependence of alpha, which might be attributed to the interface resonance states at the Fe(001)/GaAs(001) interface. [J81]

"Guest Editorial Special Section on Personal Health Systems"

This special section on personal health systems (PHSs) features 13 papers in three main areas: new-micro-nano instrumentation, sensors, and sensor-based systems; new information processing technology via embedding intelligence in PHS; and PHS platforms to address specific clinical applications. [J82]

"Nano- and Biotechniques in Electronic Packaging"

Packaging is a part of technology that merges the functional components to systems and ensures the operation of these systems for all environmental conditions allowed. It comprises the geometric arrangement of the components within the system, energy supply, signal distribution, heat dissipation, and the implementation of protective functions. The Research Training Group (RTG) "Nano- and Biotechniques for Electronic Packaging" contributes to this process by developing and investigating new and innovative packaging solutions that apply methods from nano- and biotechnology. This work focused on the materials and technologies not yet used for packaging. This approach enables new packaging solutions that are totally different from the ones used up to now. [J83]

"Advanced Package Prototyping Using Nano-Particle Silver Printed Interconnects"

To reduce manufacturing cost, lead time, and process complexity, an embedded-active approach that targets rapid prototyping and low-volume production in micro-system packaging is being developed. The approach involves a rapid prototyping of micro-system packaging by a data-driven chip-first packaging process using direct printing of nano-particle metals. In the chip-first process, bare dice are first embedded into a copper or stainless steel carrier substrate, fixed by filling the gap between the chips and the substrate with thermoplastic adhesives, and planarized to a common planar surface. On the coplanar substrate, polyimide film is laminated to form a dielectric layer. Through the dielectric layer to the chip metal pads, micro vias are drilled by laser ablation. The vias are filled with nano-particle silver (NPS). The NPS is deposited by screen printing or aerosol-jet printing and an electrical circuit is formed. This packaging approach is a dry process and it does not require any photo masks for circuit patterning, resulting in reducing packaging turn-around time from months to days. It is also less limited by substrate composition and morphology, eliminates the need for special chip processing such as flip chip solder bumps, and permits using any chip technology and any chip supplier allowing mixed devices. The embedded-active process with NPS avoids the extreme processing conditions required for standard IC fabrication such as wet chemistry processing and vacuum sputtering. The NPS can be sintered at plastic-compatible temperatures as low as 230?C to form material nearly indistinguishable from the bulk metal. The embedded-active packaging shows good reliability performance in terms of thermal shock, which is performed in the range of -40?C and 125?C. These results represent an important step to a system packaging characterized by high-density, low-cost, and data-driven fabrication for rapid package prototyping. This paper presents details of the rapid prototy--ping process sequence, an initial reliability characterization of the package architecture, and a failure mode analysis of the packages. [J84]

"High-performance CdS:P nanoribbon field-effect transistors constructed with high-kappa dielectric and top-gate geometry"

High-performance field-effect transistors (FETs) based on single phosphorus-doped n-type CdS nanoribbon with high-kappa HfO2dielectric and top-gate geometry were constructed. In contrast to the nano-FETs that were fabricated on SiO2/Sisubstrate with back-gate device configuration, the top-gate FETs exhibit a substantial improvement in performances, i.e., work voltage was reduced to a small value of within ±5 V, the subthreshold swing was reduced to 200 mV/dec and the Ion/Ioffratio was increased by about six orders of magnitude. The top-gate CdS:P nano-FET shows high sensitivity upon light irradiation, revealing that the top-gate FETs are promising candidates for nanoelectronic and optoelectronic applications. [J85]

"Colossal electroresistance and colossal magnetoresistance in spinel multiferroic CdCr 2 S 4"

Colossal magnetoresistance (CMR) and colossal electroresistance (CER) induced by the electric field in spinel multiferroic CdCr2S4are reported. It is found that a metal-insulator transition in CdCr2S4is triggered by the electrical field. In magnetic fields, the resistivity rho of CdCr2S4responds similarly to that of CMR manganites. Combing previous reports, these findings make CdCr2S4the unique compound to possess all four properties of the colossal magnetocapacitive, colossal electrocapacitive, CER, and CMR. The present results open a new venue for searching new materials to show CMR by tuning electric and magnetic fields. [J86]

"Compact and low crosstalk waveguide crossing using impedance matched metamaterial"

A waveguide crossing mechanism based on metamaterial is proposed and numerically investigated using finite difference in time domain method. The waveguide cross is filled with impedance matched metamaterial, which has a large absolute value of refractive index, and effectively suppresses the diffraction of the guiding mode in the crossing region. The waveguide cross is ultra compact, and valid for a wide range of crossing angle with negligible crosstalk and insertion loss. The compactness and high efficiency make this crossing mechanism valuable in micro and nano photonics. [J87]

"Rate-Harmonized Scheduling and Its Applicability to Energy Management"

This paper presents a family of Rate-Harmonized Schedulersthat can be used in reservation-based operating systems to naturally cluster task execution and lump processor idle durations. While traditional approaches to energy management have focused on reducing dynamic switching powerthrough Dynamic Voltage and Frequency Scaling (DVFS), processor technology trends predict a future in which static leakage powerwill begin to dominate. To this end, most modern processors provide built-in support for sleep modes with low leakage power. However, substantial time is required to switch in/out of such sleep modes due to mechanical oscillator stabilization delays. Significant opportunities for energy saving are potentially missed due to idle gaps between executing tasks that are shorter than the time required to enter the sleep mode. Armed with apriori workload information, reservation-basedoperating systems can potentially eliminate such wasted idle durations using Rate-Harmonized Scheduling. An Energy-Saving Rate-Harmonized Schedulerguarantees that everyidle duration can be used to switch into sleep mode. This paper also provides extensions to Rate-Harmonized Scheduling to support multicore processors. Empirical evaluation results are provided from an implementation in the nano-RK operating system for wireless sensor networks. Energy-Saving Rate-Harmonized Scheduling saves 16.8% energy compared to conventional Rate-Monotonic Scheduling for the task set used in Sensor Andrewproject. At low utilization levels, Energy-Saving Rate-Harmonized Scheduling can save up to 39% energy on randomly generated task sets. [J88]

"The temperature dependence of magnetic properties for cobalt ferrite nanoparticles by the hydrothermal method"

Cobalt ferrite nanoparticles were synthesized via the hydrothermal route with the addition of trisodium citrate dihydrate (Na3CA·2H2O). The characterizations including x-ray diffraction (XRD) and transmission electron microscope showed that the products of this hydrothermal reaction are composed of cobalt ferrite nanocrystallite and a small amount of FeOOH, and the average crystallite size of the nanoparticles is 7.6±0.3nmby XRD. The magnetic measurements revealed the temperature-dependent magnetic properties: The superparamagnetism occurs above 380 K due to the overcoming of energy barrier for the flip of spins, which arises from the magnetocrystalline anisotropy energy and the interparticle interactions due to the aggregation of the nanoparticles; a frozen spin-glasslike state was observed below 20 K, which is accompanied with the decrease in coercivity and high-field paramagnetic susceptibility, as well as the enhancement of saturated magnetization and the effective magnetic anisotropy constant. [J89]

"Formation of three-dimensional and nanowall structures on silicon using a hydrogen-assisted high aspect ratio etching"

The authors report the realization of highly featured three-dimensional structures on silicon substrates with a single masking layer using a hydrogen-assisted deep reactive ion etching process. Oxygen, hydrogen, and SF6are used in a sequential passivation and etching process to achieve high aspect ratio features. By controlling the flows of these gases and the power and timing of each subsequence, it is possible to achieve desired deep vertical etching, controlled underetching, and recovery, yielding three-dimensional features directly on silicon substrates. Etch rates up to 0.75mcm/minhave been achieved with a low plasma power density of 1W/cm2. In addition, features with a controllable underetching and recovery with more than 8mcmin sidewall recession have been achieved. Furthermore, values of aspect ratio higher than 40 can be obtained. The formation of three-dimensional features with nanowall structures is reported. [J90]

"Design of Photonic Crystal Semiconductor Optical Amplifier With Polarization Independence"

Slow-light effects in photonic crystal (PC) waveguides can enhance light-mater interaction near the photonic band edge, which can be used to design a short cavity length semiconductor optical amplifier (SOA). In this paper, a novel SOA based on slow-light effects in PC waveguides (PCSOA) is presented. To realize the amplification of the optical signal with polarization independence, a PCSOA is designed with a compensated structure. The cascaded structure leads to a balanced amplification to the TE and TM polarized light. [J91]

"Subwavelength imaging by a simple planar acoustic superlens"

We experimentally realized a planar acoustic superlens by a simple structure consisting of periodically arrayed rigid slabs. Based on the excitation of guided modes and the moderate amplification of the evanescent waves, we have broken the diffraction limit and obtained a subwavelength image with a half-power beamwidth of 0.07lambda . All the experimental results are in good agreement with the theoretical simulations via finite difference time domain method. [J92]

"Comprehensive analysis of the deposition caused by scattered Ga ions during focused ion-beam-induced deposition"

The authors report a detailed study on the deposition because of scattered Ga ions during the focused ion beam chemical vapour deposition (FIB-CVD). The scattered ions strike the surface of the substrate nearby the base of the structure being fabricated by the primary ions, and decompose the organometallic molecules adsorbed on it, leading to the broadening of the base. Such deposition is dominant up to several micron distances from the base of the nanostructures depending on the primary ion flux. During the FIB-CVD, similar deposition occurs on the surface of nearby pre-fabricated structures, situated up to a few micrometre distances from the nanostructure being fabricated. The scattered-ion-induced deposition complicates the fabrication of complex 3D structures. The authors present the parametric dependence of the deposition because of scattered Ga ions during FIB-CVD. [J93]

"Antibiased Electrostatic RF MEMS Varactors and Tunable Filters"

This paper presents a new approach for substantially enhancing the linearity and reducing the effects of bias noise for electrostatic RF microelectromechanical systems (MEMS) devices. The proposed method relies on applying bias voltages with opposite polarities to cancel the dynamic vibration of the MEMS structures. In this paper, the method has been applied to a shunt RF MEMS varactor and a MEMS tunable evanescent-mode tunable filter. In the first case, the shunt MEMS varactor is split into two identical parts that are biased with opposite voltages. This results in almost complete cancelation of the odd-order modulation components, leading to 20-28-dB linearity enhancement depending on the noise and the design. Analytical results, a computer-aided design model and measurements validate the proposed approach. In the tunable filter case, opposite bias voltages are applied on the tuners of its resonators. Simulated and measured results are also presented in this case. Measurements show a sideband reduction as high as 13 dB. In both cases, the effectiveness of the proposed method in the presence of fabrication uncertainties are also considered. [J94]

"Totally solution-processed ferroelectric-gate thin-film transistor"

We have fabricated inorganic ferroelectric-gate thin film transistors (FGTs) using only a chemical solution deposition (CSD) process. All layers, including the channel [indium-tin-oxide (ITO)], ferroelectric-gate insulator [Pb(Zr,Ti)O3], gate electrode (LaNiO3)and source/drain electrodes (ITO), were formed by the CSD process. The fabricated FGT exhibited typical n-channel transistor operation with good saturation in drain current and drain voltage (ID-VD)characteristics. The obtained on/off current ratio, memory window, and subthreshold voltage swing were about 107, 2.5 V, and 420 mV/decade, respectively. [J95]

"In It to WIN It"

Nanotechnology and its applications are poised for explosive growth in the years ahead. The Waterloo Institute for Nanotechnology (WIN), with a new state-of-theart Quantum Nano Centre, a young and dynamic research faculty, and home to hundreds of Canada's best nanotechnology engineering students, is positioned to contribute to that growth as one of the foremost centers for nanoresearch and innovation in the world. From developments in advanced lithium-ion battery technologies, next-generation solar photovoltaic cells, and thermoelectric conversion materials to hybrid bionanocomposite materials and nanocatalysts, advances in fundamental understanding of materials design will lead to real-world applications. WIN anticipates major progress in organic electronic devices, large-area displays, and miniaturized CNTs or graphene-based X-ray sources. Single-electron and single-photon quantum devices enabled by nanotechnology will be fabricated and employed in quantum information processing. Handheld lab-on-a-chip diagnostic devices with microfluidic flow in channels controlled by electric fields will become a reality for disease and pathogen diagnosis, replacing more bulky and expensive analytical instrumentation. Drugs encapsulated in nanoparticles delivering therapies directly to a cancerous tissue will be in clinical trials for early adoption, and new, innovative nanotools for imaging and measurement will be introduced. These are only a few of the exciting results researchers expect to see from the next ten years of research at WIN. [J96]

"Inductive detection and concentration measurement of nano sized zero valent iron in the

subsurface"

Nano sized zero valent iron (nZVI) can be used for the in-situ remediation of ground water contaminations by halogenated hydrocarbons or other contaminants. A novel approach is presented to detect nZVI and measure the concentration of nZVI in-situ during the remediation process. The presented inductive measurement system makes use of the magnetic material properties of nZVI. A specified magnetic field is generated locally in the aquifer and the magnetic flux density, which depends on susceptibility, is measured. Since the total susceptibility is very small, highly accurate measurements are necessary. Here, accuracy along with sensitivity is significantly improved by post-processing the measured data. Numerical simulations of magnetic fields and 3D visualisation techniques have been applied for development of the measurement technique. Finally, an experiment has been performed to verify the presented measurement method. [J97]

"Novel transport properties of gold-single wall carbon nanotubes composite contacts"

Using the density functional theory and nonequilibrium Green's function method, we report the effect of the gold-single wall carbon nanotubes (SWCNTs) composite contacts on the electronic structures and the transport properties of the device constructed by SWCNTs [SWCNT(10,0) or SWCNT(5,5)] and gold electrodes. The transmissions of the devices are greatly improved due to the strong couplings between carbon and gold atoms of the composite contacts. As for SWCNT(10,0), the gold atoms in the composite contacts behave as n-type dopant and depress the Schottky barrier between SWCNT(10,0) and the gold electrode. Moreover, the negative differential resistance characteristics occurs in the devices constructed by gold-SWCNT(10,0) composite contacts. [J98]

"Stress-induced nano-oxidation of silicon by diamond-tip in moisture environment: A hybrid quantum-classical simulation study"

This paper reports a numerical simulation study about the chemical reactions of a nanosized water droplet inserted between H-terminated Si(001) surface and a nanosized, H-terminated diamond-tip when the tip is either slid on or pushed to the surface. The hybrid quantum-classical simulation method, in which the quantum region described with the density-functional theory is embedded in the total system of classical atoms, is used to perform the simulation runs in realistic settings. A feature to select the quantum region adaptively during the run is added to trace the time evolution of the contact area of the tip and surface. When the tip pushes the water droplet, while the Si surface interacts weakly with the water molecule, the tip draws a water molecule from the droplet into a unique metastable state in close proximity to the end of the tip. When the tip is further slid on or pushed to the Si surface, the water molecule in the metastable state decomposes due to high stresses concentrated at the contact area and oxidizes the surface if the molecule is trapped in a dimple structure of the surface. On the other hand, if the water molecule finds enough space between the tip and surface, it runs away without changing the bonding characteristics of both tip and surface. [J99]

"Cyclic Magnetic Actuation for Potential Characterization of Interfacial Fatigue Fracture"

An innovative fixtureless test technique to study interfacial fatigue fracture in thin film stacks is proposed and implemented. Cyclic noncontact magnetic actuation is employed to supply the fatigue crack driving force along the interface between a released metal thin film cantilever and the supporting substrate. In-situ crack growth measurements with nanometer resolution are possible through electrical resistance monitoring of nanoscale metal traces that are located along the edge of the delaminating interface. Ti/Au nano metal traces are fabricated using electron-beam lithography and characterized to show stable electrical behavior. The fatigue test results were then used to assess the reliability of micro contact springs under fatigue loading for wafer probing applications. [J100]

"Dynamic phase transformation of crystalline silicon under the dry and wet impact studied by molecular dynamics simulation"

Molecular dynamics simulation is applied in analyzing quantitatively the dynamic phase transformation of crystalline silicon under the dry and wet impact, respectively. At the impact loading stage, the phase transformation between fourfold silicon atoms and fivefold or threefold silicon atoms is affected only by the local pressure. The influence of the local temperature or the contact area on the phase transformation will emerge from the impact unloading stage. And the dynamic process of phase transformation between fourfold atoms and fivefold or threefold atoms will obey the Boltzmann distribution law by stages. The variance of the number of fivefold or fourfold atoms at impact loading stage is almost the same as the impact unloading stage. Furthermore, the dynamic residence time of fivefold or threefold atoms formed during the impact process will be about 250 fs. The half-life of these atoms is about 50 fs. [J101]

"Inverse Hall-Petch relationship in the nanostructured TiO 2 : Skin-depth energy pinning versus surface preferential melting"

The functional dependence of stress, elastic modulus, melting point, and their interdependence on the identities (bond order, nature, length, and strength) of a representative bond of the specimen has been established for deeper insight into the transition from the conventional Hall-Petch relationship (HPR) to the inverse HPR (IHPR) for nanostructured TiO2. Theoretical reproduction of the observed inverse HPR suggests that the intrinsic competition between the energy-density gain (elastic modulus enhancement) and the cohesive-energy remnant (melting point depression) in the grain boundaries originates and the extrinsic competition between the activation and the inhibition of atomic dislocations activates the IHPR. [J102]

"1.28-Tb/s Demultiplexing of an OTDM DPSK Data Signal Using a Silicon Waveguide"

This letter demonstrates optical demultiplexing of a 1.28-Tb/s serial differential phase-shift-keying data signal using a nano-engineered silicon waveguide. We first present error-free performance at 640 Gb/s and then at 1.28 Tb/s with characterization of all 128 channels. Bit-error rates below 10-9are achieved for some channels and below forward-error-correction limit for all channels, corresponding to a 1.19-Tb/s error-free data signal. [J103]

"Fast and accurate estimation of SRAM read and hold failure probability using critical point sampling"

Owing to increase in parametric variations with technology scaling, accurate estimation of bit-cell failure probability in nano-scale static random access memory (SRAM) has become an extremely challenging task. In this study, the authors propose a method to detect the SRAM bit-cell failure, named `critical point sampling`. Using this technique, read and hold failure probability of an SRAM bit-cell can be efficiently estimated in a simulation-based way. Simulation results show that our estimation method provides high accuracy, while being `50` faster in computational speed compared to transient Monte-Carlo simulation. The method can be applied to optimise SRAM design for better yield and contributes significantly in reducing the overall design time. [J104]

"Interface formation between tris(8-hydroxyquinoline) aluminum and ZnO nanowires and film"

The energy level alignments at the interface between tris(8-hydroxyquinoline) aluminum (Alq3)and ZnO nanowires and thin film were studied with in situ x-ray and ultraviolet photoemission spectroscopy. The changes of work functions, highest occupied molecular orbitals, and core levels were measured with step-by-step deposition of Alq3on each ZnO substrate. Although both substrates show similar electronic structures, a larger interface dipole is induced at the interface between Alq3and ZnO nanowires. This results in the reduction of the electron injection barrier at the interface of Alq3/ZnOnanowires. Thus, the ZnO nanowire substrate is expected to show better performance than that of ZnO film when used as a cathode. We discussed the different interface dipole formation at each interface. [J105]

"Silicon nanograss as micro fuel cell gas diffusion layer"

This Letter describes a microfabricated fuel cell (MFC) that uses hydrogen as fuel and a polymer proton exchange membrane as electrolyte. Microchannels have been etched in highly conductive silicon, and silicon nanograss (black silicon) has been formed on the surface; thus implementing a support structure, current collector, flowfield and gas diffusion layer all in one. The devices are thus very compact, simple to fabricate and low cost. The MFC presented here shows promising performance of 70 mW cm-2power density and 100 mA cm-2current density at 0.7 V, comparable to that of other similar monolithic devices found in the literature. [J106]

"Valve-based microfluidic device for droplet on-demand operation and static assay"

A valve-based microfluidic device was developed for droplet on-demand operation and static assay. Droplet generation with precise and expectant volume, transportation, fusion, and trapping was achieved by integration of microvalves with programed control. Based on this automatic unique function combination, a droplet team was created with a controllable proportion of components. A DNA sample was encapsulated into the aqueous droplets, selectively merged with probe droplet in the desired ratio, well mixed, and then trapped for the static fluorescence assay with a total reagent consumption of no more than 2mu l. This method would have a powerful potential for biochemical or chemical research. [J107]

"High performance ZnO nanorod strain driving transistor based complementary metal-oxide-semiconductor logic gates"

ZnO nanorod strain driving transistor (SDT) with 107scale "on"-"off" ratio has been fabricated on Kapton substrate by a single-step hydrothermal reaction. The transistor is driven by strain due to the change in Schottky barrier height caused by piezoelectric effect as well as the change of contact area between ZnO bridging nanorods. Moreover, via utilizing two SDTs on the top and bottom surfaces of the substrate as two complementary metal-oxide-semiconductor transistors, several logic operations such as inverter, NAND, NOR, XOR, MUX, and DEMUX with good rectifying behaviors have been demonstrated. [J108]

"Performance enhancement of multilevel cell nonvolatile memory by using a bandgap engineered high-kappa trapping layer"

A high-kappa based charge trap flash (CTF) memory structure using bandgap engineered trapping layer HfO2/Al2O3/HfO2(HAH) has been demonstrated for multilevel cell applications. Compared to a single HfO2trapping layer, a CTF memory device based on the HAH trapping layer exhibits a larger memory window of 9.2 V, faster program/erase speed, and significantly improved data retention. Enhancements of memory performance and reliability are attributed to the modulation of charge distribution by bandgap engineering in trapping layer. The findings provide a guide for future design of CTF. [J109]

"Investigation of thermal and electrical conductivity of graphene based nanofluids"

We report for the first time, the synthesis of highly stable exfoliated graphene based nanofluids with water and ethylene glycol as base fluids with out any surfactant and the subsequent studies on their thermal and electrical conductivities. Graphene was synthesized by thermal exfoliation of graphene oxide at 1050 °Cin Ar atmosphere. The as-synthesized graphene has been suitably functionalized and further dispersed it in the base fluids without any surfactant. Thermal and electrical conductivities of these nanofluids were measured for varying volume fractions and at different temperatures. An enhancement in thermal conductivity by about 14% has been achieved at 25 °Cwith deionized water (DI) as base fluid at a very low volume fraction of 0.056% which increases to about 64% at 50 °C. Electrical conductivity measurements for these nanofluids indicate an enormous enhancement at 25 °Cfor a volume fraction of 0.03%in DI water. [J110]

"Stability of top- and bottom-gate amorphous polymer field-effect transistors"

Performance and stability between the top- and bottom-gate field-effect transistor configurations are investigated in dual-gate transistor structures consisting of the same insulator and gate materials. The transistors behave similarly for both gate modes with on/off ratio in excess of 105, subthreshold swing of 0.5-1 V/decade, and mobility of 0.03-0.04cm2/V s, retained over several months, with fabrication, storage, and characterization, performed in ambient conditions. [J111]

"Piezoresistive effect in the three-dimensional diamondlike carbon nanostructure fabricated by focused-ion-beam chemical vapor deposition"

In this study, the electrical material characteristics of a three-dimensional (3D) diamondlike carbon (DLC) structure fabricated by focused-ion-beam chemical vapor deposition (FIB-CVD) were evaluated to realize functional 3D nano- and micromechanical devices based on the piezoresistive material. However, the DLC cantilever structure fabricated by FIB-CVD did not exhibit piezoresistive properties due to the incorporated gallium (Ga), which was implanted by Ga+FIB irradiation. Therefore, a method for the modification of material characteristics was examined to introduce piezoresistive properties in the 3D DLC structure fabricated by FIB-CVD. Long-time annealing (12 h or more) at a low temperature (300 °C)was found to be an effective method to realize a 3D DLC structure with piezoresistive properties. Long-time annealing at low temperatures caused Ga elimination from the DLC without any change in the sp2/(sp2+sp3)ratio. The values of the gauge factor were in the range of 2-34. 3D nano- and microstructures with piezoresistive properties could be realized by FIB-CVD and annealing treatment. [J112]

"Nonstoichiometric BiFe 0.9 Ti 0.05 O 3 multiferroic ceramics with ultrahigh electrical resistivity"

BiFeO3, BiFe0.9Ti0.1O3, and BiFe0.9Ti0.05O3ceramics of relatively high perovskite phase content were prepared for a comparison study. While both BiFe0.9Ti0.1O3and BiFe0.9Ti0.05O3exhibit similarly improved weak ferromagnetism over BiFeO3, there exists a major difference in the x-ray diffraction patterns of BiFe0.9Ti0.1O3and BiFe0.9Ti0.05O3, and the leakage current of BiFe0.9Ti0.05O3is decreased by five orders of magnitude from that of BiFe0.9Ti0.1O3. With an ultrahigh electrical resistivity, over 1Ч1014Omega cm, BiFe0.9Ti0.05O3ceramic displays an especially low dielectric loss, 0.015 at 100 Hz, a remanent polarization Prof 0.23mu C/cm2and a remanent magnetization Mrof 0.13 emu/g at room temperature. It is proposed that the Fe-deficiency in BiFe0.9Ti0.05--O3decreases the amount of Fe2+and leads to the ultrahigh electrical resistivity.

Nonstoichiometric compositions should receive more attention for developing high quality BiFeO3multiferroic materials. [J113]

"Instantaneous nano-order fragmentation in mullite ceramics triggered by a shock-induced phase transition"

Mullite, a conventional refractory material, was observed to exhibit a peculiar nano-order fragmentation accompanying a phase transition induced by a shock wave. We propose a mechanism for this nanofragmentation, based on a comparative study of mullite-related materials. The microtextures of the mullite-related materials were affected by their initial crystal structure and chemical composition, indicating that oxygen vacancies in the crystal structure play an important role in the nanofragmentation. The results of the present study will help enable the deliberate control of the physical and mechanical properties of materials during high-velocity impact. [J114]

"Tunable optofluidic nano-Bragg microcavity filter"

An optofluidic nano-Bragg microcavity filter is designed using three-dimensional finite difference time domain technique and fabricated using electron-beam lithography and reactive ion etching techniques on a silicon-on-insulator (SOI) material. Continuous filter tuning is possible via small refractive index changes by introducing different fluids. An index change of 0.03 corresponds to a peak resonance wavelength shift of approximately 1 nm. The SOI chip is also integrated with a polydimethlysiloxane microfluidic chip for the fluid delivery. [J115]

"Dielectric properties and effect of electrical aging on space charge accumulation in polyimide/TiO 2 nanocomposite films"

In situ polymerized polyimide/TiO2(PI/TiO2)nanocomposite films with good electrical aging resistance are studied. Space charge distribution in the PI/TiO2nanocomposite films are measured using the pulsed electroacoustic method. Dielectric properties of the films are measured in the frequency range of 102Hz-106Hzby an impedance analyzer (Agilent 4294A) at room temperature. These nanocomposite films are also characterized by Fourier transform infrared spectroscopy and scanning electron microscopy (SEM). It is demonstrated that the nano-TiO2particles strongly affect dielectric breakdown, lifetime and space charge distribution, and increase the voltage endurance of the nanocomposite films significantly. SEM analyses show that the nanocomposite films are destroyed after corona aging. The relation of space charge distribution with the concentration of the nano-TiO2particles and the aging time is explored. Results show that an increase in dielectric permittivity of the nanocomposite films is observed with increasing filler concentration. However, the accumulation of space charge decreases with increasing nano-TiO2particles concentration for the same corona aging time, and depends on the dielectric permittivity of the nanocomposite films. [J116]

"A quasicore-shell structure of FeCo and FeNi nanoparticles"

Based on semiempirical generalized embedded atom method (GEAM), we carried out molecular dynamics and Monte Carlo simulations to study the structural properties of FeCo and FeNi nanoparticles. It is found that these two kinds of nanoparticles possess a new stable quasicore-shell structure, no matter whether they are in molten or condensed state and whether they are prepared by annealing or quenching. In FeCo (FeNi) nanoparticles of various sizes and atom compositions, the quasicore-shell structure is always preferred, with the shell formed only by Fe atoms and the core formed by randomly distributed Co(Ni) and Fe atoms. We have also investigated the formation mechanism of the quasicore-shell structure by energy difference analysis of the pure and doped icosahedra structure of FeCo and FeNi nanoparticles. [J117]

"Structure and properties of InAs/AlAs quantum dots for broadband emission"

The InAs quantum dots (QDs) on an AlAs layer are grown on GaAs substrates by molecular beam epitaxy technique. The properties of materials and optics of such QD structures have been investigated by cross sectional transmission electron microscopy and photoluminescence (PL) techniques. It is discovered that the inhomogeneous strain filed mainly exists below InAs QDs layers in the case of no wetting layer. The full width at half maximums (FWHMs) and intensities of PL emission peaks of InAs QDs are found to be closely related to the thickness of the thin AlAs layers. The InAs QDs on an eight monolayer AlAs layer, with wide FWHMs and large integral intensity of PL emission peaks, are favorable for producing broadband QD superluminescent diodes, external-cavity QD laser with large tuning range. [J118]

"Microelectromechanical systems for biomimetical applications"

An etch release process capable of releasing long resonant gate transistor bridges from a sacrificial layer has

been studied as a step towards developing a system to mimic the cochlear mechanism inside the human ear. The developed etch release process involves the use of a gentle etch tool that is capable of a clean and damage-free etch release. The influence of temperature and oxygen/nitrogen gas flow rates on the undercut etch rates and the profiles of photoresist and polyimide sacrificial layers have been investigated. An array of aluminum bridges of length 0.278-1.618 mm, which cover the frequencies from 1 to 33.86 kHz, has been designed and released from a sacrificial layer. The resonating beams have been measured. [J119]

"Field emission from diamond micropowders with sharp edges"

The authors examined the field emission from diamond micropowders with sharp edges whose current followed the Fowler-Nordheim relationship, and confirmed that the micropowders functioned as field emission sources. In addition, the fluctuation in emission current improved as the current was increased. The emission current was constant at pressures ranging from 10-6to 10-3Paunder a fixed applied voltage. [J120]

"Study of the synthesis of tungsten trioxide nanostructured arrays by tungsten hot filament chemical vapor deposition method and their field emission properties"

Tungsten trioxides (WO3)nanorod arrays had been fabricated at different substrate temperatures by hot filament chemical vapor deposition. The morphology of the WO3nanorod array is significantly dependent on the substrate temperature in a relatively narrow range (600-800 °C). Through the x-ray diffraction pattern, different preference growth directions of WO3nanorods at different substrate temperatures were observed. A discussion of the possible growth mechanism is given. Furthermore, the substrate temperature during the growth was also found to be closely related with the morphologies of the nanorod arrays and their field emission properties. [J121]

"Numerical simulations on capture area of gas molecules for high brightness gas field ion source"

The emitter shape dependence of an ion current from a gas field ion source was examined using numerical simulations. A tip shape with a nanoscale protrusion on the apex was adopted. The results demonstrated that the effective capture area becomes large, when the shank angle is small. For a He gas temperature of 40K, the effective capture areas of the emitters with the taper half angles of 2° and 15° were estimated to be 0.310 and 0.200mcm2, respectively. With conditions where the electric field strength and gas pressure are constant, the larger effective capture area leads a larger ion current. The ion currents from the emitters with the taper half angles of 2° and 15° were estimated to be 100 and 67pAat a He gas pressure of 0.01Pa, respectively. Therefore, the emitter of the smaller shank angle is capable of emitting the higher ion current. The simulation results showed good agreement with the experimental results. [J122]

"Comparison of structural and photoluminescence properties of zinc oxide nanostructures influenced by gas ratio and substrate bias during radio frequency sputtering"

Zinc oxide (ZnO) nanostructured films were prepared on quartz glasses by radio frequency magnetron sputtering deposition of ZnO films at different argon to oxygen (Ar/O2)gas ratios and post-treated in a reducing ambient at a low temperature. The effects of Ar/O2gas ratio and substrate bias on the photoluminescence and structural properties were investigated. It was found that the formed ZnO nanostructures significantly depended on the O2fraction. The crystallinities of the ZnO nanostructures were improved, and the green emission was enhanced with the decrease of the O2fraction in the Ar/O2mixtures. A green emission peak centered at 510nmwas obtained after the post-treatment. In addition, the applied substrate bias contributed to remarkably improving the crystallinity of the ZnO films. The strongest green emission was obtained from the ZnO nanostructures prepared from the ZnO film deposited in a pure Ar ambient with the substrate bias applied. [J123]

"Temperature-Dependent RF Small-Signal and Noise Characteristics of SOI Dynamic Threshold Voltage MOSFETs"

In this paper, temperature-dependent RF small-signal and noise characteristics of silicon-on-insulator (SOI) dynamic threshold voltage (DT) MOSFETs are experimentally examined. In the low-voltage regime, both the cutoff and maximum oscillation frequencies (ftand fmax) tend to increase with temperature. In addition, the inherent body-related parasitics and the series resistance have much more impact on fmaxthan ft. Besides, we found that the noise stemmed from the body resistance (Rb) would contribute to the output noise current, and degrade the minimum noise figure (NFmin). Our study may provide insights for RF circuit design using advanced SOI DT MOSFETs. [J124]

"Effect of electric field on CuO nanoneedle growth during thermal oxidation and its growth mechanism"

Different electric field intensities were added along the growth direction of CuO nanoneedles when using a thermal oxidation process. The results show that: (1) the length of CuO nanoneedles increased with the electric field, but when the voltage was greater than a certain value, the growth stopped and (2) the diameter of CuO nanoneedles from top to root became more uniform. Therefore, it is further demonstrated the "solid state based-up diffusion growth mechanism" for CuO nanoneedles prepared by thermal oxidation. The recent study also provides a possibility for controlling the growth of metal oxide nanowires which will promote their potential applications in nanodevices. [J125]

"Differential conductance as a promising approach for rapid DNA sequencing with nanopore-embedded electrodes"

We propose an approach for nanopore-based DNA sequencing using characteristic transverse differential conductance. Molecular dynamics and electron transport simulations show that the transverse differential conductance during the translocation of DNA through the nanopore is distinguishable enough for the detection of the base sequence and can withstand electrical noise caused by DNA structure fluctuation. Our findings demonstrate several advantages of the transverse conductance approach, which may lead to important applications in rapid genome sequencing. [J126]

"Current-perpendicular-to-plane spin transport properties of CoFe alloys: Spin diffusion length and scattering asymmetry"

From measurements of the current-perpendicular-to-plane magnetoresistance of magnetic multilayers and exchange-biased spin-valves combining the ferromagnetic (F) alloys Co50Fe50and Co70Fe30with the nonmagnetic metal Cu, we extract values of the bulk scattering asymmetry, beta F, the spin-diffusion length, lsfF, the interface scattering asymmetry, gamma F/Cu, and twice the enhanced specific resistance, 2ARF/Cu*. The parameters of the two alloys lie within mutual uncertainties of each other. The values of beta F 0.88are unusually large, those of lsfF 10nmare moderate and consistent with values for other F-alloys, and those of 2ARF/Cu* 0.6fOmega m2and gamma F/Cu 0.6are both less than those for Co/Cu. We do not need to include any spin-flipping at the F/Cu interfaces to fit our data. [J127]

"In situ tunneling measurements in a transmission electron microscope on nanomagnetic tunnel junctions"

We showed that a chain of nanomagnetic tunnel junctions (MTJs) devices can be electrically addressed individually, in situ, in a transmission electron microscope, such that transport properties can be in principle, quantitatively correlated with each device's defects and microstructure. A unique energy barrier was obtained for each device measured. Additionally, in situ tunneling magnetoresistance (TMR) measurements were obtained for a subset of devices. We found that TMR values for our nano-MTJs were generally smaller than TMR in the unpatterned film. [J128]

"Deposited nanorod films for photonic crystal biosensor applications"

Planar photonic crystals have been used as the basis of many biological sensing devices. Here, the authors successfully demonstrated that the combination of the photonic crystal structures and a dielectric nanorod coating prepared by the glancing-angle deposition technique can lead to significant increases in the device sensitivity. By incorporating a TiO2nanorod coating onto the label-free photonic crystal biosensor structure, the surface area of the device is increased. The results for detection of polymer films and proteins indicate up to a 5.5 fold enhancement of detected adsorbed mass density. [J129]

"Imprinting of guide structure to weave nylon fibers"

The authors have proposed electrical circuits accumulated by injecting electroconductive materials into patterns imprinted on the surface of fibers and weaving the fibers like a mesh. For these circuits, a built-in guide structures, which determine the positions where the fibers are to make contact with each other and exchange pertinent information, must be fabricated on fibers. In the experiments, a concave 21-mcm-deep structure to serve as weaving guide was processed on the surface of 90-mcm-diameter nylon fibers by thermal imprinting with a plane mold. The guides were made with two types of cross sections: rectangular and arc shaped. The rectangular structure was fabricated by a combination of microelectromechanical systems processing and Ni-electroforming technologies, whereas the arc-shaped structure involved dicing and fine machining operations. These structures on molds were designed to imprint weaving-guide structures on fibers with arrays of poles (20mcmin diameter and 10mcmin height) at their bottom to serve as fixation points for fibers and to make electric contacts after metallization. Both types of molds were made with a two-step structure that could be transferred

on fibers in one single stamping operation. In thermal imprint experiments, to speed things up, the contact time was set for 1 s only. In order to compensate for the short contact time, the heating temperature was set at 100 °C, which is 50 °Chigher than the glass transition temperature of nylon. Regardless of the type of mold, weaving guides and contact supports were successfully formed on the surface of nylon fibers. Thus, the capability to process complex microstructures by thermal nanoimprinting on the surface of fin--e fibers was experimentally proven. Moreover, the authors report on the results of the trial run for weaving imprinted nylon fibers to form fabrics. [J130]

"Acoustic far-field focusing effect for two-dimensional graded negative refractive-index sonic crystals"

Focusing effect is experimentally observed for acoustic plane wave normally incident onto a two-dimensional sonic crystal with gradient negative refractive index. The gradual refractive-index is achieved by gradual modification of the lattice spacing both along the transverse and longitudinal directions. It is found that the focal length is controllable by modulation of the lattice spacing. The experiment results are in excellent agreement with theoretical calculation by a multiple scattering theory method. [J131]

"Electrical field induced direct-to-indirect bandgap transition in ZnO nanowires"

As a wide bandgap (3.37 eV) compound semiconductor with the exciton binding energy of 60 meV, ZnO nanowires have attracted considerable interest because of great potential applications in micro-optoelectronics and nano-optoelectronics. However, ZnO nanowires as basic units of microelectronic and optoelectronic nanodevices usually work in the circumstance of the electrical field. Therefore, the influence of electrical field on the electronic structure of ZnO nanowires partly determines the performance of nanodevices. For this issue, we inhere have studied the effects of the applied electrical field on the electronic structure of ZnO nanowires using the density functional theory. It was found that the applied electrical field cannot only effectively modulate the bandgap of ZnO nanowires but also leads to the bandgap transition from direct to indirect. Meanwhile, the above effects of electrical field depend on the size and shape of ZnO nanowires. The physical understanding of the electrical field effects of the energy band structure of ZnO nanowires is attributed to the bond length changes in lattice and the charge transfer between Zn and O atoms. Thus, these valuable investigations are important for designing the microelectronic and optoelectronic nanodevices based on ZnO nanowires. [J132]

"A Versatile Integration Technology of SOI-MEMS/CMOS Devices Using Microbridge Interconnection Structures"

In this paper, a versatile integration technology for thick-film silicon-on-insulator microelectromechanical systems (SOI-MEMS) devices with CMOS electronics using novel microbridge interconnections is reported. The microbridge interconnection proposed in this paper solves the problem regarding the electrical isolation and interconnection between CMOS and SOI-MEMS devices. The integration of SOI-MEMS requires only three additional photolithography steps for the CMOS wafers fabricated by a standard process. On the basis of the developed technology, SOI-MEMS devices integrated with CMOS circuits were fabricated using 20-μm-thick SOI wafers. No significant damage was observed in the measured characteristics of the fabricated CMOS after the integration of MEMS devices. In addition, the electrical isolation of SOI-MEMS from the CMOS substrate was successfully realized and confirmed in the experiment, keeping electrical connectivity between CMOS circuit terminals. The measured isolation resistance between MEMS and the CMOS substrate was more than 1012Ω, and a proof voltage above 60 Vdc was observed. These values guarantee a small leakage current and a sufficient voltage swing for driving electrostatic microactuators. On the other hand, the resistance of the interconnection over a microbridge structure was below 1 Ω, which is sufficiently low for integrating low-noise microsensors. This integration technology can be used in realizing monolithically integrated SOI-MEMS sensor and actuator devices with high-aspect-ratio structures using the most cost-effective and versatile CMOS fabrication technologies. [J133]

"High power single-lateral-mode operation of InAs quantum dot based ridge type laser diodes by utilizing a double bend waveguide structure"

We report on the high-power, single-lateral-mode operation of InAs quantum dot (QD) based ridge type laser diodes (LDs) by utilizing a double bend (DB) waveguide structure. The LDs were designed so that only fundamental modes propagate and higher optical modes are suppressed through the bent regions. DB waveguide LDs allow the use of wide ridge widths for fundamental mode operations, which helps to increase their output power via the increase in their net gain. We measured continuous wave single-lateral-mode output power of up to 310 mW from InAs QD DB waveguide LDs manufactured with 10-mcm-wide stripes without facet coating. [J134]

"Correlation between structural and optical properties of a -plane GaN films grown on r -plane sapphire by metal organic chemical-vapor deposition"

The authors have studied the photoluminescence (PL) intensities of a-plane (11-20) GaN films (a-GaN) as a function of x-ray rocking-curve (XRC) linewidth values measured in both c- and m-axis directions. PL intensity of well-known luminescence lines such as 3.47 eV (bound exciton emission), 3.41 eV (basal-plane stacking fault related emission), and 3.29 eV (defect induced emission) are discussed in terms of XRC linewidth values. PL intensities reveal a close relationship with XRC linewidth measured in the c-axis direction, while an unusual relationship was observed between PL intensity and XRC linewidth in the m-axis direction. Inhomogeneous strain along the m-axis direction of a-GaN film is discussed as a cause of XRC linewidth broadening, rather than the formation of structural defects. [J135]

"Metal-organic chemical vapor deposition of quasi-normally-off AlGaN/GaN field-effect transistors on silicon substrates using low-temperature grown AlN cap layers"

Low-temperature AlN grown on AlGaN/GaN heterostructure in situ by metal-organic chemical vapor deposition is used as gate insulator and passivation layer to form quasi-normally-off field-effect transistors on 4 in. silicon substrate. The AlN layer not only increases the sheet carrier density and mobility, which results in the increase of the maximum drain current and transconductance, but also decreases gate leakage and current collapse. Simulated band diagrams indicate that only a small potential difference exists between the AlN surface barrier height and the AlN/AlGaN interface. We show that low-temperature grown AlN is effective in suppressing trapping effects and in improving device performance. [J136]

"Highly Sensitive and Selective Explosive Detector Based on Nanoporous Silicon Photonic Crystal Infiltrated with Emissive Organics [JNanoproducts]"

Emitech Inc. (www.emitechinc.com) is developing a porous silicon (PSi) microcavity (MC)-based fluorescent detector for explosives. It was initially funded by the Army Small Business Innovation Research Phase II contract (Figure 1). The sensory part of the device is composed of a nano-PSi photonic crystal with MC, infiltrated with fluorescent organics that are specific to target explosive vapors and particulates. It is important that the nanodevice structure provides an extremely large interfacial area between the sensory material and the analyte vapors leading to its highest sensitivity, which is critical for fast trace detection of low vapor pressure explosives. An important feature of the nanodevice is the real-time sampling system (integrated with sensory head) based on the proprietary thermal air-jet technology. [J137]

"A Strategy to Efficiently Extend the Change Rate of Period for Comb-Drive Micromechanical Pitch-Tunable Gratings"

In this paper, we present a new design strategy with two major considerations to efficiently extend the change rate of period for comb-drive micromechanical pitch-tunable gratings. The proposed strategy is mainly based on the critical state when "side instability" happens. All the ideas were originated from our previous study to develop a silicon-on-glass (SOG)-based pitch-tunable grating with a large change rate of period, from which we found that once the comb structure was connected with the grating beams, the maximum displacement of movable fingers would be sharply decreased according to the experiments. Detailed discussions and analysis are thus performed to explain the finding. Finally, another grating sample based on the silicon-on-insulator (SOI) technology is developed to prove the new design strategy, and a change rate of period of 10.34% is ultimately achieved. The so-developed pitch-tunable grating will greatly expand the device's application domains. [J138]

"A low-temperature crystallization path for device-quality ferroelectric films"

We show a path for low-temperature crystallization of device-quality solution-processed lead zirconate titanate films. The essential aspect of the path is to circumvent pyrochlore formation at around 300 °Cduring temperature increase up to 400 °C. By maintaining enough carbon via pyrolysis at 210 °C, well below the temperature for pyrochlore formation, Pb2+can be reduced to Pb0. This leads to the lack of Pb2+in the film to suppress the development of pyrochlore, which accounts for the usual high-temperature conversion to perovskite. Films on metal, metal/oxide hybrid, and oxide bottom electrodes were successfully crystallized at 400-450 °C. [J139]

"A Passive UHF RFID Demodulator With RF Overvoltage Protection and Automatic Weighted Threshold Adjustment"

This paper presents a passive UHF RFID ASK demodulator that operates over a +24 dBm to -14 dBm RF input power range. The demodulator automatically adjusts between high sensitivity mode for weak RF signal power

and overvoltage protection mode for high RF power. The input overvoltage protection circuit is designed to protect the IC from high input power while not impacting the sensitivity at weak input power. The demodulator is comprised of a RF rectifier, a variable gain attenuator with automatic threshold adjustment and a nano-power data slicer. The demodulator handles demodulating signals with a minimum to maximum envelope ratio of 0.8 over the entire input power range, and the data slicer consumes only 160 nA from a 0.9 to 1.25 V rectified supply. The RFID chip is fabricated in a 0.13 µm analog-CMOS technology and the entire chip occupies an area of 0.55 mm2. [J140]

"Si-based ultrasmall multiswitching single-electron transistor operating at room-temperature"

An ultrasmall single-electron transistor has been made by scaling the size of a fin field-effect transistor structure down to an ultimate limiting form, resulting in the reliable formation of a sub-5 nm Coulomb island. The charge stability data feature the first exhibition of three and a half clear Coulomb diamonds at 300 K, each showing a high peak-to-valley current ratio. Its charging energy is estimated to be more than one order magnitude larger than the thermal energy at room-temperature. The hybrid literal gate integrated by this single-electron transistor combined with a field-effect transistor displays >5bitmultiswitching behavior at 300 K with a large voltage swing of 1V. [J141]

"Full spin-coated multilayer structure hybrid light-emitting devices"

We report on a multilayer structure hybrid light-emitting device (HLED) using a water/alcohol-soluble polymer poly(9,9-bis{30-[(N,N-dimethyl)-N-ethylammonium}-propyl]-2,7-fluorene dibromide) as an electron-transporting layer and a close-packed quantum dot-layer (QD-layer) as an emitting layer. The device was realized by full spin-coating technology without thermal evaporation process for the deposition of organic layers. The QD-layer was a mixture of QDs with two different sizes, in which large size QD-emitters were dispersed in small size QDs to weaken the concentration quenching. The device achieved a maximum power efficiency of 0.58 lm/W, which nearly quadrupled that of the HLED with a plain large size QD-EML. [J142]

"Composite Nano-Antenna Integrated With Quantum Cascade Laser"

Exploiting optical nano-antennas to boost the near-field confinement within a small volume can increase the limit of molecular detection by an order of magnitude. We present a novel antenna design based on Au-SiO2-Au single nanorod integrated on the facet of a quantum cascade laser operating in the midinfrared region of the optical spectrum. Finite-difference time-domain simulations showed that for sandwiched dielectric thicknesses within the range of 20-30 nm, peak optical intensity at the top of the antenna ends is 500 times greater than the incident field intensity. The device was fabricated using focused ion beam milling. Apertureless midinfrared near-field scanning optical microscopy showed that the device can generate a spatially confined spot within a nanometric size about 12 times smaller than the operating wavelength. Such high intensity, hot spot locations can be used in increasing photon interaction with bio-molecules for sensing applications. [J143]

"TCAD Simulations on CMOS Propagation Induced Pulse Broadening Effect: Dependence Analysis on the Threshold Voltage"

Propagation induced pulse broadening (PIPB) effect is becoming a major concern for electronic designers since new technologies are fast enough to propagate and capture Single Event Transients (SET). In this paper, we explore the influence of the MOSFET threshold voltage (VT) on PIPB effect by TCAD simulating the propagation of an SET after an ion strike, showing up this dependence by the modification of some CMOS technology parameters affecting VT. For this work, the test vehicle used to measure PIPB effect is a self-feedback chain of CMOS inverters. The conclusions outlined can be useful when designing with Multi-Vt nano-metric CMOS technologies. Our results suggest that the |VT|/VDDratio could be a figure of merit for SET propagation broadening. [J144]

"Hierarchical Simulation of Statistical Variability: From 3-D MC With " ab initio" Ionized Impurity Scattering to Statistical Compact Models"

Quantum corrections based on density gradient formalism, recently introduced in the 3-D Monte Carlo (MC) module of the Glasgow "atomistic" simulator, are used to simultaneously capture quantum confinement effects as well as "ab initio" ionized impurity scattering. This has allowed us to consistently study the impact of transport variability due to scattering from random discrete dopants on the on-current variability in realistic nano-CMOS transistors. Such simulations result in an increased drain current variability when compared with the drift diffusion (DD) simulation. For the first time, a method that is used to accurately transfer the increased on-current variability obtained from the " ab initio" MC simulations to the DD simulations is subsequently presented. The

MC-corrected DD simulations are used to produce the target I-V characteristics from which the statistical compact models are extracted for use in preliminary design kits at the early stage of new technology development. [J145]

"A 6- W Chip-Area-Efficient Output-Capacitorless LDO in 90-nm CMOS Technology"

An output-capacitorless low-dropout regulator (LDO) compensated by a single Miller capacitor is implemented in a commercial 90-nm CMOS technology. The proposed LDO makes use of the small transistors realized in nano-scale technology to achieve high stability, fast transient performance and small voltage spikes under rapid load-current changes without the need of an off-chip capacitor connected at the LDO output. Experimental result verifies that the proposed LDO is stable for a capacitive load from 0 to 50 pF (estimated equivalent parasitic capacitance from load circuits) and with load capability of 100 mA. Moreover, the gain-enhanced structure provides sufficient loop gain to improve line regulation to 3.78 mV/V and load regulation to 0.1 mV/mA, respectively. The embedded voltage-spike detection circuit enables pseudo Class-AB operation to drive the embedded power transistor promptly. The measured power consumption is only 6 μW under a 0.75-V supply. The maximum overshoot and undershoot under a 1.2-V supply are less than 66 mV for full load current changes within 100-ns edge time, and the recovery time is less than 5 μs. [J146]

"Modeling of MEMS-Based Fuel Cells Using SUGAR and Reliability Calculations"

Unified approach for modeling and simulation of microelectro mechanical systems (MEMs) and nano-enabled fuel cells has been proposed. A novel way to approach reliability of MEMS-enabled fuel cells is discussed incorporating recent developments and proposals. We know that reliability modeling and accurate prediction of properties in nano domains remains a major challenge where still theories are still under development. Hence accurate prediction and modeling still remains a challenging area. A direct methanol fuel cell (DMFC) has benefited maximum from progression in MEMS technologies in bringing out advances in its existing framework. The necessity of a porous membrane has been eminent in recent fuel cells, where a comprehensive computation model in this area is still not available. This need for MEMS-based models for porous silicon-based membranes based on nano imprints technology has been met by modeling it in SUGAR-MATLAB environment. MEMS technologies are explored in modeling of tubes, capillary pump, micro channels and other structures which is an emerging area for fuel cells. Finally, the reliability analysis is done to assess their application in real devices. Development of strong reliability theories backed by computational and theoretical proofs can assist in rapid commercialization of such technologies. MEMS enable fuel cells can reduce carbon emissions and provide a sustainable future based on green energy solutions. [J147]

"Performance Analysis of Resonance-Based Transducers in Terahertz Bio-Chips Using Equivalent Surface Impedance Model"

The concept of equivalent surface impedance is applied for electromagnetic modeling of thin-film samples, e.g., nano-layers of deoxyribonucleic acid, placed on a metallic surface. For the first time, it is shown that by using such a concept, the performance of resonance-based terahertz bio-chips can be easily evaluated in terms of analytic sensitivity and selectivity. Numerical results are presented for the performance of a planar resonator as an example when used as a transducer in a bio-chip sensor. The proposed model is general and can be applied to any resonant transducer with metallic surface for receiving thin-film samples. [J148]

"Thermal Dynamics of Multicore Integrated Systems"

This paper presents an analysis of thermal dynamics in multicore systems, focusing on time response to heat generated in a single core and its connection with very large scale integration (VLSI) design principles. For the purpose of this paper, a point heating time (PHT) concept is introduced. PHT is a value that describes the time of temperature growth to its limited value. The PHT value is used for estimating the thermal capabilities of multicore systems. The physical properties of VLSI systems are taken into account for determining easy-to-apply rules of thermal dynamic response in common chip designs. The authors compare PHT in different physical conditions and its value versus displacement of the active thermal module away from the center position on the chip. An equation derived from analytical assumptions is the basis for asynchronous control of core activity toward minimizing its peak temperature. Final analysis leads to the conclusion that the paper can be used as a supplementary guide in VLSI chip development for better thermally optimized multicore chips. [J149]

"Achieving Power Transmission Enhancement by Using Nano-Rings Made of Silver Spheres"

In this letter, we propose the employment of nano-rings made of silver spheres, to enhance the transmission through a subwavelength aperture drilled in a metallic screen at optical frequencies. We show that the increase in the transmission is due to the excitation of a strong magnetic resonance in close proximity of the aperture.

Compared to similar configurations presented in the literature, the proposed layout allows us to significantly reduce the size of the setup. The effectiveness of the approach is demonstrated through proper full-wave simulations, taking into account material dispersion and losses. In addition, it is shown how the nano-ring response can be tuned by embedding the structure in a host material, doped with liquid crystals. [J150]

"Design and Fabrication of Perpendicular Patterned Magnetic Media Using Nanoimprinted Nano Pillar Patterns"

Perpendicular patterned magnetic media have been regarded as a one of candidate to achieve an ultrahigh density magnetic data storage media of over 1 Tb/in2. One approach to producing patterned magnetic media is deposition of thin magnetic films on pre-etched nano pillar array prepared with nanoimprinting technology. In this paper, we have investigated the feasibility of the polymeric nano pillar patterns on glass substrate, which were replicated by UV nanoimprinting process with the polymeric nanostamp, and magnetic layer deposition technology without additional etching process to fabrication for perpendicular patterned magnetic media. The polymeric nano pillar patterns were replicated by 2-step UV nanoimprinting process by using a silicon nanomaster with nano pillar patterns. We deposited magnetic layers on the nanoimprinted nano pillar patterns to make the perpendicular patterned magnetic media. Finally, we show that the fabricated magnetic media could be used for perpendicular patterned magnetic media by measurement of magnetic characteristics. [J151]

"Application of Organic/Inorganic Hybrid Photopolymer to Fabricate Ultra-High-Density Patterned Substrate"

The UV nano imprinting process is a promising technology to fabricate nano patterns at low cost and high throughput. To adopt the UV nano imprinting process for production of nano patterned substrates for patterned media, the replicated polymer layer must fulfill certain requirements of the patterned media. In this research, a UV nano imprinting process using an organic/inorganic hybrid photopolymer was developed and the replicated ultra-high-density patterned substrate was evaluated. A silicon mold with full track of nano patterns with pattern size of 35 nm diameter, 70 nm pitch was used. The geometrical properties, surface hardness and adhesion property with magnetic layer of the organic/inorganic hybrid photopolymer patterned substrate were analyzed. [J152]

"Coarse particle dynamics applied to the nanocontact"

The multiscale method has become a promising tool that could make a significant contribution to the fields of nano-science and technology. The objective of the multiscale method makes it possible to treat ever larger systems.Current study proposes a new model that combines the atomistic and continuum approaches. The continuum model is built on the lattice view and its critical deformation extent is defined for refinement (broken down into smaller lattices or atoms). Both the lattice and atoms can be calculated together using atomistic and coarse potentials without a calculation interface. This coarse particle model was applied to a nanocontact study and the results were compared to a traditional contact model. [J153]

"Fabrication of arrays of carbon micro- and nanostructures via electrochemical etching"

New methods to pattern and etch a variety of materials are proving to be extremely important owing to the broad impact of microfabrication technology on chemistry and biology. A method, for etching graphitic carbon materials that opens pathways for the creation of arrays of carbon structures, has been developed. The method involves standard photolithographic pattern transfers to a thin carbon film and anodisation of the exposed carbon substrate in basic electrolytes. Structures of various shapes can be fabricated that range in size from tens of microns to submicrons. Arrays of these structures can be fabricated over areas encompassing hundreds of microns with low failure rates. The shape, size and distance between array objects are easily controlled by the fabrication procedure. Scanning electron microscopy is used to visualise the various structures fabricated. The authors show that this technology is useful for the fabrication of microelectrode arrays. [J154]

"Neutralization efficiency estimation in a neutral beam source based on inductively coupled plasma"

This study examined the optimal conditions of neutral beam generation to maintain a high degree of neutralization and focusing during beam energy variation for a neutral beam source based on inductively coupled plasma with a three-grid ion beam acceleration system. The neutral beam energy distribution was estimated by measuring the energy profiles of ions that "survived" the neutralization after reflection. The energy measurements of the primary and reflected ions showed narrow distribution functions, each with only one peak. At higher beam energies, both the ratio of the ion energy loss to the primary energy and the degree of energy divergence

decreased, confirming the precise alignment of the neutral beam. The neutralization efficiency of the neutral beam source with a three-grid acceleration system was found to be affected mainly by the beam angle divergence rather than by the particle translation energy. [J155]

"Quantification of disease marker in undiluted serum using an actuating layer-embedded microcantilever"

In this study, we describe the application feasibility of a dynamic microcantilever with regard to the detection of a specific protein in human serum or real blood using an end-point analysis. The mechanical response (i.e., resonant frequency) of a functionalized dynamic microcantilever was shown to be altered by molecular interactions, which allowed for the detection of biomolecules present in small quantities without any additional signal enhancements, such as labeling. For the application of the microcantilever sensors to bioassays of serum samples, the mechanical response from the nonspecific adsorption of abundant proteins must be reduced, because it significantly influences the output signal deviation of the microcantilever sensor. We implemented a label-free prostate specific antigen (PSA) detection protocol in standard serum via our established process, which was designed to minimize nonspecific protein adsorption. PSA is a tumor marker for prostate cancer, with a threshold concentration of 2-4 ng/ml (7.2-14.4 pM) for the distinction between patients and normal individuals. The dynamic range of our dynamic microcantilever-based PSA assay on the background of standard serum ranged between 0.1 and 100 ng/ml (3.6 and 3600 pM). It was suggested that the dynamic microcantilever might allow for the sensitive label-free detection of disease markers in an actual human sample. [J156]

"Structural and ferroelectric properties of spray deposited sodium nitrite:poly(vinyl alcohol) composite films"

The composite films of sodium nitrite (NaNO2)and poly(vinyl alcohol) (PVA) have been deposited by spray technique at different substrate temperatures. The x-ray diffraction study revealed structural distortion (b/aratio) in the composite films. The field-emission scanning electron microscopy images suggest that PVA polymer facilitate the homogeneous distribution of spherical grains of NaNO2with less porosity. The grain size is found to increase with the deposition temperature. The study of hysteresis loop characteristics gave optimum Prat deposition temperature of 200 °C, which may be due to large structural distortion and less porosity. The back switching calculations and the switching characteristics indicate that 180° domains contribute more in the composite than the pure NaNO2film. The 1/E0(dP/dE)-Ecurves exhibit two coercive fields correspond to 180° and 90° domains. The composite film also showed improved fatigue characteristics. [J157]

"Magnetoimpedance behavior and its equivalent circuit analysis of Co/Cu/Co/Py pseudo-spin-valve with a nano-oxide layer"

Magnetoimpedance behaviors and thermal effects of a Co/Cu/Co/Py pseudo-spin-valve (PSV) with a nano-oxide layer (NOL) were studied. The PSV can be regarded as a combination of resistances, inductances, and capacitances. In addition, equivalent circuit theory can be used to analyze the ac behavior of this system. The imaginary part of the magnetoimpedance (magnetoreactance) ratio is more than 1700% at the resonance frequency (fr)=476kHzat room temperature (RT). The dc magnetoresistance (MR) ratio decreases as the annealing temperature increases because the NOL is formed at the interface between the spacer and the magnetic layer. The NOL deteriorates the differential spin scattering and reduces the dc MR ratio. Impedance spectroscopy was utilized to analyze the capacitance effect from NOL after annealing. The effective capacitance of the PSV was 21.8 nF at RTand changed to 11.8 nF after annealing at 200 °C. The useful equivalent capacitor circuit not only is a nondestructive measurement technology but can also explain the experimental results and prove the formation of the NOL. [J158]

"Current-driven ferromagnetic resonance in magnetic trilayers with a tilted spin polarizer"

We theoretically investigate the current-excited and adjusted ferromagnetic resonance in magnetic trilayers with a tilted spin polarizer. The current- and frequency-swept resonant spectra are obtained by the linearization method. We find that the precessional frequency, the equilibrium position, the energy pumping and damping, and the resonant linewidth and location can be adjusted by changing the current and the magnetization in the pinned layer. By optimizing the current density and the direction of the pinned magnetization, the energy pumping will be more efficient. [J159]

"Thermal probing of energy dissipation in current-carrying carbon nanotubes"

The temperature distributions in current-carrying carbon nanotubes have been measured with a scanning thermal microscope. The obtained temperature profiles reveal diffusive and dissipative electron transport in

multiwalled nanotubes and in single-walled nanotubes when the voltage bias was higher than the 0.1-0.2 eV optical phonon energy. Over 90% of the Joule heat in a multiwalled nanotube was found to be conducted along the nanotube to the two metal contacts. In comparison, about 80% of the Joule heat was transferred directly across the nanotube-substrate interface for single-walled nanotubes. The average temperature rise in the nanotubes is determined to be in the range of 5-42 K per microwatt Joule heat dissipation in the nanotubes. [J160]

"Morphology alterations during postsynthesis oxidation of Zn nanowires"

Zinc metal nanowires have been oxidized at temperatures of 200-500 °Cin ambient air in order to obtain ZnO nanowires. X-ray diffraction investigations reveal a complete transformation from Zn to ZnO at a temperature of ≥300 °Cwithin 30 min. Temperature-induced grain growth attains saturation at about 350 °C. Scanning electron microscopy studies show a pronounced morphology change from smooth, unidirectional to rough, bursted nanorods at a temperature of 250 °C. The corresponding transformation mechanism is discussed. [J161]

"Optical Proximity Communication With Passively Aligned Silicon Photonic Chips"

We report high-fidelity 10-Gb/s optical-proximity-communication using reflecting mirrors micro-machined into silicon and co-integrated with low-loss silicon-on-insulator waveguides for packaged chip-to-chip communication. Device integration was carried out by dry etching a rib waveguide 8 mum wide that was tapered to a width of 13 mu m and subsequently truncated with a wet-etched, micro-mirror facet forming a 54deg angle with the (100) surface. Light in waveguides on a bottom chip can couple to waveguides on a top chip upon face-to-face positioning so that the reflecting mirrors form a coupled pair and complete an optical proximity hop. High-speed link measurements were accomplished with chips aligned with a six-axis nano-positioner stage and compared with results for a new precision alignment approach that packages silicon chips for proximity signaling. Our new packaging approach is based on the co-integration of pyramidal etch pits micro-machined into silicon that match a precision micro-sphere for accurate chip alignment. Assemblies of chips can self-align in the package using chip placement that is initially coarse. The final chip alignment accuracy of our new packaging approach is limited by photolithographic resolution. Additionally, multichip arrays can be aligned together with global positioning having similar precision. Nonreturn-to-zero data was fiber launched into the waveguides and transported across a package consisting of a three-chip assembly with two optical proximity hops for inter-chip communication. Continuous wave optical losses, eye diagrams, bit error rates, and power penalties were measured. A passively aligned chip-to-chip optical proximity hop in the package was measured to have optical coupling loss of 4.0 dB, which was 1 dB more than when measured with precision-aligned chips with a nano-positioning stage. RMS jitter and amplitude metrics for the eye quality are shown to be nearly identical (to within 1%) when OPxC hops associated with the--package is inserted into 10-Gb/s links. This self-aligned mechanism enables chip packages for several classes of proximity communication. [J162]

"Design and fabrication of surface acoustic wave delay line for surface acoustic wave chemical-agent sensors"

This article presents a method for designing and fabricating a surface acoustic wave (SAW) delay line for chemical-agent sensors. To improve the frequency stability and detection sensitivity, the authors designed and fabricated a SAW dual delay line with electrode-width control/single-phase unidirectional transducer and single-mode selection capability. Electron-beam direct writing lithography, x-ray lithography, and metal lift-off are applied to the fabrication of a SAW delay line with a submicron feature size. The experimental results are approximately in agreement with the design goals. [J163]

"Vibration analysis of nano-single-layered graphene sheets embedded in elastic medium based on nonlocal elasticity theory"

In the present work, nonlocal elasticity theory has been implemented to study the vibration response of single-layered graphene (SLGS) sheets. The nonlocal elasticity theory accounts for the small size effects when dealing with nanostructures. Influence of the surrounding elastic medium on the fundamental frequencies of the SLGS is investigated. Both Winkler-type and Pasternak-type models are employed to simulate the interaction of the graphene sheets with a surrounding elastic medium. On the basis of Hamilton's principle governing differential equations for the aforementioned problems are derived. The nonlocal small scale coefficients get introduced into the nonlocal theory through the constitutive relations. Differential quadrature method is being employed and numerical solutions for the frequencies are obtained. Numerical results show that the fundamental frequencies of SLGS are strongly dependent on the small scale coefficients. Further, a nonlinear frequency response is observed for the SLGS with larger nonlocal effects and "Winkler-type modeled" surrounding medium. [J164]

"The Fracture Resistance of Bonded Au Wires for Interconnection"

This paper presents the effects of the local strength degradation due to recrystallization and grain growth and the large deformation induced in wire bonding process on the fracture resistance of the bonded Au wires for interconnection. The experimental and numerical results show that, for a wire to deform to the required shape without reduction in the fracture resistance, sufficient ductility is more important than the strength of the wire. [J165]

"Fringing-Induced Drain Current Improvement in the Tunnel Field-Effect Transistor With High- Gate Dielectrics"

The tunnel field-effect transistor (tunnel FET) is a promising candidate for future CMOS technology. Its device characteristics have been subject to a variety of experimental and theoretical studies. In this paper, we evaluate the influence of using a high-kappa gate dielectric in the tunnel FET compared to a standard silicon oxide with same equivalent oxide thickness, which exhibits a quite different behavior compared to a conventional MOSFET due to its totally different working principle. It turns out that the fringing field effect, while deteriorating conventional MOSFET characteristics, leads to a much higher on-current comparable with actual conventional MOSFETs, a subthreshold slope of the tunnel FET lower than the theoretical limit for conventional MOSFETs, and a massive improved inverter delay, underlining its prospect for future applications. This leads to the conclusion that high-kappa materials with permittivities > 30 can advantageously be used in CMOS technology, giving rise to further technological development. [J166]

"Bionic batteries-[Jelectronics power]"

Lithium still rules in battery design but nano- and biotechnologies could massively improve on what we have. Things don't change quickly in battery design. The choice of materials to make better batteries is pretty limited and the core material-lithium-has been a feature of batteries with high energy densities for a long time already. The first lithium battery appeared in the early 1970s, although they were not rechargeable systems. [J167]

"A Fast Liquid-Metal Droplet Microswitch Using EWOD-Driven Contact-Line Sliding"

Liquid-metal (LM) droplet-based MEMS switches have mostly been restricted to slow applications until now due to the following reasons: (1) a relatively large switching gap (distance) needed to accommodate imprecise volumes and locations of droplets on the device and (2) lack of high-speed actuation to move the droplets quickly across the switching gap. To combat these problems, we explore switching by sliding the solid-LM-gas triple contact line rather than the entire droplet. This new approach allows us to use a microframe, which not only consistently positions the LM droplet but also makes the switching gap less sensitive to the errors in the deposited-droplet volume, allowing us to design microswitches with very small switching gaps (e.g., 10 mum for 600 mum-diameter droplets). Furthermore, a study of electrowetting-on-dielectric identifies a regime of fast contact-line sliding at the onset of droplet spreading. By moving the contact line fast across a small switching distance, we demonstrate a low-latency LM switch with 60 mus switch-on latency (~ 20 times better than other LM-switch technologies) and better than 5 mus signal rise/fall time, while boasting no contact bounce, as expected from an LM switch. High power-handling capability and long-term reliability are also discussed. [J168]

"Moving Toward Nano-TCAD Through Multimillion-Atom Quantum-Dot Simulations Matching Experimental Data"

Low-loss optical communication requires light sources at 1.5 mum wavelengths. Experiments showed, without much theoretical guidance, that InAs/GaAs quantum dots (QDs) may be tuned to such wavelengths by adjusting the In fraction in an InxGa1-xAs strain-reducing capping layer. In this paper, systematic multimillion-atom electronic structure calculations explain, qualitatively and quantitatively, for the first time, available experimental data. The nanoelectronic modeling NEMO 3-D simulations treat strain in a 15-million-atom system and electronic structure in a subset of ~ 9 million atoms using the experimentally given nominal geometries, and without any further parameter adjustments, the simulations match the nonlinear behavior of experimental data very closely. With the match to experimental data and the availability of internal model quantities, significant insight can be gained through mapping to reduced-order models and their relative importance. We can also demonstrate that starting from simple models has, in the past, led to the wrong conclusions. The critical new insight presented here is that the QD changes its shape. The quantitative simulation agreement with experiment, without any material or geometry parameter adjustment in a general atomistic tool, leads us to believe that the era of nanotechnology computer-aided design is approaching. NEMO 3-D will be released on nanoHUB.org, where the community can duplicate and expand on the results presented here through interactive simulations. [J169]

"Pool Boiling Experiments on a Nano-Structured Surface"

The effect of nano-structured surfaces on pool boiling was investigated. Saturated and subcooled pool boiling experiments were performed on a horizontal heater surface coated with vertically aligned multiwalled carbon nanotubes (MWCNTs). MWCNTs were synthesized using the chemical vapor deposition (CVD) process. In this paper, MWCNT forests of two distinctly different heights (Type A: 9-mum height, and Type B: 25-mu m height) were synthesized separately on silicon wafers. PF-5060 was used as the test liquid. The results show that Type-B MWCNTs yield distinctly higher heat fluxes under subcooled and saturated conditions for both nucleate and film boiling. Type-A MWCNTs provide similar enhancement in nucleate boiling (as Type-B) for both saturated and subcooled conditions. Type-B MWCNTs enhanced critical heat flux (CHF) by 40%. Increasing the height of the MWCNTs is also found to extend the wall super heat required for CHF. In contrast, Type-A MWCNTs provide only marginal enhancement in film boiling compared to bare silicon wafer, for both saturated and subcooled film boiling. Type-B MWCNTs enhanced the heat flux in the film boiling regime for the Leidenfrost point by 175% (compared to bare silicon wafer). [J170]

"Analysis of Defect Tolerance in Molecular Crossbar Electronics"

Molecular electronics such as silicon nanowires (NW) and carbon nanotubes (CNT) demonstrate great potential for continuing the technology advances toward future nano-computing paradigm. However, excessive defects from bottom-up stochastic assembly have emerged as a fundamental obstacle for achieving reliable computation using molecular electronics. In this paper, we present an information-theoretic approach to investigate the intrinsic relationship between defect tolerance and inherence redundancy in molecular crossbar systems. By modeling defect-prone molecular crossbars as a non-ideal information processing medium, we determine the information transfer capacity, which can be interpreted as the bound on reliability that a molecular crossbar system can achieve. The proposed method allows us to evaluate the effectiveness of redundancy-based defect tolerance in a quantitative manner. Employing this method, we derive the gap of reliability between redundancy-based defect tolerance and ideal defect-free molecular systems. We also show the implications to the related design optimization problem. [J171]

"3-D Hyperintegration and Packaging Technologies for Micro-Nano Systems"

Three-dimensional (3-D) hyperintegration is an emerging technology, which vertically stacks and interconnects multiple materials, technologies, and functional components to form highly integrated micro-nano systems. This 3-D hyperintegration is expected to lead to an industry paradigm shift due to its tremendous benefits. Worldwide academic and industrial research activities currently focus on technology innovations, simulation and design, and product prototypes. Anticipated applications start with memory, handheld devices, and high-performance computers and extend to high-density multifunctional heterogeneous integration of InfoTech-NanoTech-BioTech systems. This paper overviews the 3-D hyperintegration and packaging technologies, including motivations, key technology platforms, status, and perspectives towards commercialization. The challenges associated with the 3-D technologies are addressed, including integration architectures and design tools, yield and cost, thermal and mechanical constraints, and manufacturing infrastructure. [J172]

"Proposed Nonlinear Microring Resonator Arrangement for Stopping and Storing Light"

A simple system of an all-optical system for stopping and storing is proposed. A system consists of two microring and a nanoring resonators that can be integrated into a single system. The large bandwidth is generated by a soliton pulse within a Kerr-type nonlinear medium where an all-optical adiabatic and pulse bandwidth compression can be performed. The balance between the dispersion and nonlinear lengths of the soliton pulse exhibits the soliton behavior known as self-phase modulation, which produces a constant optical output. This means that light pulse can be trapped, i.e., stopped optically within the nano waveguide. [J173]

"Lube-Surfing Recording and Its Feasibility Exploration"

Reducing the spacing between the magnetic head and the magnetic disk media is of crucial importance in enabling further increased recording density of the magnetic disk drives. The head-disk interface technology explored up to now can be classified into the following two categories: in-fly recording and in-contact recording. Pushing the areal density towards 10 Tb/in2requires the magnetic spacing down to 3 nm level, which it is difficult for the conventional in-fly or in-contact schemes to achieve so small a magnetic spacing. This paper reports the authors' exploration of lube-surfing recording mechanism-majority of slider surface flying over the disk surface and only the tiny protruded read/write head area surfing on the lubricant surface of the disk. The key factors for achieving such a mechanism include technology to sense slider-lubricant contact, nano-actuator and active contact depth control, advanced slider air-bearing design to make the slider well follow up the disk surface

waviness and secure the contact depth, super-smooth slider and disk surfaces, and so on. Results presented in this work suggest that the read head can be a promising transducer for slider-lubricant contact detection. Results also suggest that contact depth control is important for this scheme and it is possible to have stable slider surfing on the lubricant, if the contact depth is within a certain range. [J174]

"Ultra-Low Bending Loss Single-Mode Fiber for FTTH"

A new ultra-low bending loss single-mode fiber with ring comprising nanometer sized features is designed and manufactured. Bending loss less than 0.1 dB/turn at 1550 nm and a bend radius of 5 mm is demonstrated. Other optical parameters of the fiber are fully compatible the standard telecommunications grade single-mode fibers. [J175]

"Dielectric constant at x -band microwave frequencies for multiferroic BiFeO 3 thin films"

The magnetic-induced dielectric responses of BiFeO3(BFO) thin films were measured at the X-band microwave frequency ranged from 7 to 12.5 GHz. The measurement was given initially by a high-precision cavity microwave resonator without magnetic field. Both the real and imaginary parts of the permittivity showed its dielectric property as a function of the measuring frequency. The X-band dielectric responses of the BFO thin film were then measured by a controlled magnetic field at room temperature. The data demonstrated up to 2.2% dielectric tunability by using only 3.46 kOe magnetic field at TE107mode (9.97705GHz). [J176]

"High-energy negative ion beam obtained from pulsed inductively coupled plasma for charge-free etching process"

Negative ions in conventional inductively coupled plasma are often more chemically active than positive ions (for example, in CF4or SF6plasmas), but inconveniently they are trapped inside the sheath and cannot be used for high-energy surface etching in sources with a grid-type acceleration system. In this work we describe a method of positive and negative ion extraction that allows the energy and flux of oppositely charged particles to be varied independently. Then by scattering the ions off from a metal surface, it is possible to form a high-energy beam of neutrals from the negative ions by using the low-energy positive component of the beam current for better charge compensation. [J177]

"Polymer Inverter Fabricated by Inkjet Printing and Realized by Transistors Arrays on Flexible Substrates"

We have fabricated organic thin-film transistors (OTFTs) and implemented inverters on flexible substrates using polythiophene (PHT) as the semiconductor and polyvinylphenol (PVP) as the gate dielectric. The semiconductor was defined by inkjet printing. The poor consistency of the printing process has affected the uniformity of inkjet-printed OTFTs enormously. We also proposed a method to increase the yield by incorporating a pre-testing step during circuit fabrication. We designed and fabricated a basic unit of circuits called a thin-film transistor (TFT) array. These devices were then connected to each other to form a gate via printed nano-silver. To verify the implementation flow, we designed and measured bootstrap inverters and ring oscillator composed of them. The five-stage ring oscillator has been fabricated and oscillated at the frequency, 60 Hz, when the supply voltage is 40 V. [J178]

"Metal Grating Patterning on Fiber Facets by UV-Based Nano Imprint and Transfer Lithography Using Optical Alignment"

UV-based nano imprint and transfer lithography (NITL) is proposed as a flexible, low cost and versatile approach for defining sub-micron metal patterns on optical fiber facets in a single-processing step. NITL relies on a specially prepared mold carrying the pattern that is to be transferred to the facet. The fiber's light-guiding properties allow control of the position of the metal structures by optical alignment. [J179]

"Single nanoparticle alignment by atomic force microscopy indentation"

Unavoidable bulge formation during an indentation process is a serious obstacle to trapping nanoparticles in dent holes or trenches. We found an easy method of removing polymethyl methacrylate (PMMA) bulges formed during atomic force microscopy indentation. The method allowed the creation of dent holes or trenches in PMMA without bulges, which, using capillary interaction, allowed us to place 40-nm-diameter Au particles at precise locations. Furthermore, we could adjust the gap distance (10nm)between the nanoparticle and the bottom electrode. The method will be helpful in characterizing the nanoparticles and molecules and, ultimately, will help in the development of nanoparitcle- or molecule-attached devices. [J180]

"Design and Test of Filter of High Gradient Magnetic Separation System for Trapping Immunoglobulin in Serum"

Recently, affinity magnetic beads have been widely used in immunomagnetic cell sorting (IMCS) technology. Today, we can easily sort and analyze DNA and antibodies (immunoglobulin) using various types of affinity magnetic beads available in the market. The diameters of these affinity magnetic beads used in immunomagnetic cell sorting are limited to above approximately 1 mum because of the low magnetic fields induced by permanent magnets. Now, nano-sized affinity magnetic beads are strongly desired to achieve high resolutions. We have been studying and attempting to develop a high-gradient magnetic separation (HGMS) system that employs a superconducting magnet to induce a considerably higher magnetic field than that induced by a permanent magnet in order to trap smaller nano-sized affinity magnetic beads by a filter made of fine stainless steel wool. In this study, we constructed a prototype of a desktop-type HGMS system using a cryocooler-cooled LTS magnet and conducted preliminary experiments on trapping the nano-sized magnetic particles. Furthermore, we investigated the magnetic field distribution and magnetic force around a magnetic wire in the filter by means of a numerical simulation. [J181]

"Optical Ceramic Scintillator for PET"

Phase-pure transparent LSO ceramic was obtained, with its scintillation properties rivaling those of single crystalline LSO. The transparent LSO ceramic was prepared by a nano-technology approach. The densities of the LSO ceramic increased with increasing sintering temperature. Further SEM examination confirmed the decrease of the porosity during densification of the ceramic. Pores were segregated at grain boundaries after sintering. Hot isostatic pressing (HIPing) was employed to further densify the ceramic and eliminate porosity after sintering. Transparent polycrystalline LSO ceramics were obtained after the final HIP. XRD examination confirms single monoclinic LSO phase. A light output as high as 30,100 ph/MeV was obtained using a 22Na excitation source. LSO ceramic showed an energy resolution of 15% (FWHM) at 662 keV (137Cs source) and a fast scintillation decay of 40 ns due to the 5d ura 4f transition of Ce3+. The excellent scintillation and optical properties make LSO ceramic a promising candidate for future gamma-ray spectroscopy as well as medical imaging applications. [J182]

"Fabrication and Evaluation of Nano-Scale Optical Circuits Using Sol-Gel Materials With Photo-Induced Refractive Index Variation Characteristics"

Nano-scale optical circuits with core thickness of ~ 230 nm and core width of ~ 1 mum were fabricated and evaluated, using the photo-induced refractive index variation sol-gel materials, whose refractive index gradually increases by UV light exposure and baking. Propagation loss of linear waveguides was 1.86 dB/cm for TE mode and 1.89 dB/cm for TM mode at 633 nm in wavelength, indicating that there were small polarization dependences of ~ 0.03 dB/cm. Spot sizes of guided beams along core width direction and along core thickness direction were, respectively, 0.6 and 0.3 mu m for both TE mode and TM mode. Bending loss of S-bending waveguides was reduced from 0.44 to 0.24 dB for TE mode with increasing the bending curvature radius from 5 to 60 mu m. Although the bending loss for TM mode was slightly higher than that for TE mode, the difference was less than 10%. Branching loss of Y-branching waveguides was reduced from 1.33 to 0.08 dB for TE mode, and from 1.34 to 0.12 dB for TM mode with decreasing the branching angle from 80deg to 20deg. From these results, it is concluded that the photo-induced refractive index variation sol-gel materials can realize miniaturized optical circuits with sizes of several tens of microns and guided beam confinement within a cross section area less than 1.0 mum2with small polarization dependences, indicating potential applications to intra-chip optical interconnects. [J183]

"Maximizing the electron field emission performance of carbon nanotube arrays"

The field emission screening effect is one of great importance when aiming to design efficient and powerful cathodes. It has long been assumed that the degrading effect is at a minimum when neighboring emitters are at least twice their height from each other. In this work, we show that the screening effect is underestimated and diminishes at far greater separations of five times the height of the emitter. We further observe that to achieve maximum emission efficiency in an array, one requires a trade off between screening and emitter number, resulting in a separation of three times their height. [J184]

"Complete photonic bandgaps in the visible range from spherical layer structures in dichromate gelatin emulsions"

We have fabricated spherical layer structures that exhibit complete photonic bandgaps in the visible range in dichromate gelatin emulsions by holographic interference. The complete bandgap was not a result of the high

dielectric contrast but was due to the fact that the spherical layer structure was isotropic with equal spacing in all accessible directions. Angular dependence spectral measurements of the spherical layer structures were in good agreement with the expected results from an ideal structure of dielectric concentric spherical shells with equal spacing. Our fabrication technique and results could pave the way for new applications using complete bandgap photonic crystals. [J185]

"Modification of graphene properties due to electron-beam irradiation"

The authors report micro-Raman investigation of changes in the single and bilayer graphene crystal lattice induced by the low and medium energy electron-beam irradiation (5-20 keV). It was found that the radiation exposures result in the appearance of the strong disorder Dband around 1345cm-1, indicating damage to the lattice. The Dand Gpeak evolution with increasing radiation dose follows the amorphization trajectory, which suggests graphene's transformation to the nanocrystalline and then to amorphous form. The results have important implications for graphene characterization and device fabrication, which rely on the electron microscopy and focused ion beam processing. [J186]

"A Simultaneous Short-Wave and Millimeter-Wave Generation Using a Soliton Pulse Within a Nano-Waveguide"

A novel system of a simultaneous short-wave and millimeter-wave generation using a soliton pulse within a nano-waveguide is proposed, whereas the broad spectrum of optical output can be generated. By using the suitable parameters, for instance, input soliton power, coupling coefficients, and ring radii, the short-wave and millimeter-wave output signals can be simultaneously generated and filtered in a single system. Such a system consists of two microring resonators and a nanoring resonator that can be integrated to be a single system. Initially, the large bandwidth signal is generated by using a soliton pulse within a Kerr-type nonlinear medium, whereas the signals with broad bandwidth or wavelength can be generated. Results obtained have shown the potential of using the technique for a broad light spectra generation, where the required filtering signals are allowed to form the simultaneous up-link and down-link conversion using two different frequency (wavelength) carriers within a single system. [J187]

"Optical properties and carrier dynamics of polarity controlled ZnO films grown on (0001) Al 2 O 3 by Cr-compound intermediate layers"

We report on optical properties and carrier dynamics of polarity controlled ZnO films grown on (0001) Al2O3by Cr-compound intermediate layers using photoluminescence (PL), PL excitation, temperature dependent PL, and time-resolved PL techniques. At low temperature, a dominant donor-bound exciton peak at 3.36 eV has been observed in the O-polar ZnO grown on Cr2O3intermediate layer, while a dominant acceptor-bound exciton peak at 3.32 eV has been observed in the Zn-polar ZnO grown on CrN intermediate layer. Native defects and/or impurities introduced by the Cr-compound intermediate layers play an important role in the optical properties of the polar ZnO samples. [J188]

"Nanostructured zinc oxide platform for cholesterol sensor"

Nanostructured zinc oxide (nano-ZnO) film has been fabricated onto indium tin oxide (ITO) containing preferred (002) plane and 10 nm crystallite size using sol-gel technique for immobilization of cholesterol oxidase (ChOx). Electrochemical response of ChOx/nano-ZnO/ITO bioelectrode determined as a function of cholesterol concentration using cyclic voltammetry technique reveals improved detection range (5-400 mg/dl), low detection limit (0.5 mg/dl), fast response time (10 s), sensitivity (0.059mu A/mg dl-1 cm-2), and low value (0.98 mg/dl) of Michaelis-Menten constant (Km). It is shown that nano-ZnO film provides better environment and enhanced electron transfer between ChOx and electrode. [J189]

"Origins of nonzero multiple photon emission probability from single quantum dots embedded in photonic crystal nanocavities"

This work explores the origins of nonzero multiphoton emission probability for quantum dots embedded in photonic crystal nanocavities using different excitation energies to inject excitons into either the GaAs barrier or the quantum-dot excited state. The detected multiphoton events are established to arise from both the recapture of excitons and background emissions from the wetting layer tail states. The exciton emission is analyzed using rate-equation calculations, which suggest that multiphoton emission is dominated by the recapture effect. [J190]

"Fabrication of functional structures at Si (100) surface by mechanical scribing in the presence of aryl diazonium salts"

A combination of chemical and mechanical method has been proposed to fabricate modified surface on the oxide-coated silicon. When the diamond tool scribes the silicon sample in the presence of 4-benzoic acid diazonium tetrafluoroborate (COOHC6H4N2BF4), the chemoactive COOHC6H4radical can be generated from aryldiazonium salt due to the breaking of chemical bond of silicon substrate. They may then induce grafting of an organic monolayer on the substrate via Si-C connection. The surface morphologies before and after chemomechanical reaction are characterized with atomic force microscopy. X-ray photoelectron spectroscopy confirms the presence of COOHC6H4and shows a steady increase in the amount of carbon on the exposed fresh Si surface. Infrared spectroscopy suggests that COOHC6H4groups bond with surface Si atoms via Si-C covalent bonds. To the best of the authors knowledge, this is the first report of the chemomechanical preparation of self-assembled monolayers on oxide-coated silicon in the presence of aryldiazonium salt. The method described in this article will have important implications for building nano- or microscale functional structures. [J191]

"Effect of nanocomposite gate dielectric roughness on pentacene field-effect transistor"

The effects of the surface roughness of the nanocomposite gate dielectric on the correlation between grain size and mobility of pentacene organic thin-film transistors were investigated. In this work, the nanocomposite as gate dielectric film was carried out by blending polyimide and nano-TiO2particles to enhance the capacitance of the gate dielectric. The roughness of the nanocomposite gate dielectric is varied from 0.8to20nmwith increasing TiO2concentration from 0to5vol%in polyimide. Grain size of pentacene decreases with increasing roughness of the nanocomposite gate dielectric film. Two distinguishable regions are observed on the correlation between grain size and mobility of pentacene. In region (I), the nanocomposite gate dielectric with 0-2vol%TiO2content shows that mobility does not significant change with decreasing grain size of pentacene, similar to the behavior of the organic polymer gate dielectric. In region (II), the nanocomposite gate dielectric with 3-5vol%TiO2content shows that mobility is remarkably decreased with decreasing grain size of pentacene, similar to the behavior of the inorganic gate dielectric. [J192]

"Inductively coupled plasma etching in fabrication of 2D InP-based photonic crystals"

The authors developed an inductively coupled plasma etching process for the fabrication of hole-type photonic crystals in InP. The etching was performed at 70°Cusing BCl3/Cl2chemistries. A high etch rate of 1.4mcm/minwas obtained for 200nmdiameter holes. The process also yields nearly cylindrical hole shape with a 10.8 aspect ratio and more than 85° straightness of the smooth sidewall. Surface-emitting photonic crystal laser and edge emitting one were demonstrated in the experiments. [J193]

"Room temperature ferromagnetic ordering in indium substituted nano-nickel-zinc ferrite"

Nano-nickel-zinc-indium ferrite (NZIFO)(Ni0.58Zn0.42InxFe2-xO4)with varied quantities of indium (x=0,0.1,0.2)have been synthesized via reverse micelle technique. X-ray diffraction and transmission electron microscopy confirmed the size, structure, and morphology of the nanoferrites. The addition of indium in nickel-zinc ferrite (NZFO) has been shown to play a crucial role in enhancing the magnetic properties. Room temperature Mossbauer spectra revealed that the nano-NZFO ferrite exhibit collective magnetic excitations, while indium doped NZFO samples have the ferromagnetic phase. The dependence of Mossbauer parameters, viz. isomer shift, quadrupole splitting, linewidth, and hyperfine magnetic field, on In3+concentration has been studied. Mossbauer study on these nanosystems shows that the cation distribution not only depends on the particle size but also on the preparation route. Mossbauer results are also supported by magnetization data. Well defined sextets and appearance of hysteresis at room temperature indicate the existence of ferromagnetic couplings which makes nano-NZIFO ferrite suitable for magnetic storage data. [J194]

"Pulsed laser deposited tetrahedral amorphous carbon with high sp3 fractions and low optical bandgaps"

Amorphous carbon films with sp3bonded carbon fractions over 70% are deposited by pulsed laser deposition. However, the optical bandgap obtained from optical transmittance and spectroscopic ellipsometry analysis shows the values to be below 1.0 eV. A wide range of measurements such as electron energy loss spectroscopy, visible Raman, spectroscopic ellipsometry, optical transmittance, and electrical characterization are performed to elucidate the bonding configurations that dictate microstructural, optical and electrical properties, and their linkage to band structure changes. It is found that stress-induced electronic localized states play an important role in the physical properties of the films deposited. The optical bandgap is shown not to be a good measure of the electrical bandgap, especially for high electric field conduction in these tetrahedral amorphous carbon films. [J195]

"A versatile fiber-optic coupled system for sensitive optical spectroscopy in strong ambient light"

In this work we describe design and use of a fiber-optic based optical system for the spectroscopic studies on the samples under the presence of strong ambient light. The system is tested to monitor absorption, emission, and picosecond-resolved fluorescence transients simultaneously with a time interval of 500 ms for several hours on a biologically important sample (vitamin B2) under strong UV light. An efficient stray-light rejection ratio of the setup is achieved by the confocal geometry of the excitation and detection channels. It is demonstrated using this setup that even low optical signal from a liquid sample under strong UV-exposure for the picosecond-resolved fluorescence transient measurement can reliably be detected by ultrasensitive microchannel plate photomultiplier tube solid state detector. The kinetics of photodeterioration of vitamin B2 measured using our setup is consistent with that reported in the literature. Our present studies also justify the usage of tungsten light than the fluorescent light for the healthy preservation of food with vitamin B2. [J196]

"Carbon nanotube array vias for interconnect applications"

The purpose of this study is to investigate the effect of carbon nanotube (CNT) growth parameters on CNT via resistance and examine the transverse motion of electrons in the CNT bundle vias. Single vias of 3.85Ч3.85and 2.45Ч2.45mcm2correspond to 0.35Ч0.35mcm26Ч6and 4Ч4array vias, respectively. With nickel catalyst, CNTs were grown by microwave plasma-enhanced chemical vapor deposition method. Two-terminal CNT via chains of single via and array vias were fabricated on the tantalum metal electrodes. The increase in pretreatment power or substrate temperature resulted in the decrease in CNT diameters and thus the increase in CNT packing density due to the etching effect of exciting hydrogen. This led to the decrease in CNT via resistance owing to more conducting channels. The increase in growth power or substrate temperature enhanced the CNT graphitization and hence yielded the decrease in CNT resistances as well as CNT via resistances. In the same via area, the CNT via resistance of array vias is lower than that of a single via. This could be ascribed to less tube-tube junctions and thus lower electrical resistance in the array vias. Accordingly, the transverse motion of electrons in the CNT bundle vias was demonstrated. Therefore, the integration of CNT array vias with CNT bundles is proposed for optimizing the conductivity of CNT vias in the global interconnects where the via dimensions are more alleviated. [J197]

"Thermal infrared detection using dipole antenna-coupled metal-oxide-metal diodes"

This work focuses on dipole antenna-coupled metal-oxide-metal diodes, which can be used for the detection of long wave infrared radiation. These detectors are defined using electron beam lithography and fabricated with shadow evaporation metal deposition. Along with offering complementary metal oxide semiconductor compatible fabrication, these detectors promise high speed and frequency selective detection without biasing, a small pixel footprint, and full functionality at room temperature without cooling. Direct current current-voltage characteristics are presented along with detector response to 10.6mcmradiation. The detection characteristics can be tailored to provide for multispectral imaging in specific applications by modifying device geometries. [J198]

"Improved performance of InAlN-based Schottky solar-blind photodiodes"

The authors report the growth of InxAl1-xNwith high crystal quality by metal organic chemical vapor deposition, the Pd/InxAl1-xNSchottky contacts with reverse current densities as low as 6.0Ч10-7A/cm2at -5 V and 2.1Ч10-5A/cm2at -10 V, and consequently significant improvement in the performance of InAlN-based Schottky solar-blind photodiodes with peak responsivity of 133 mA/W at 242 nm, corresponding to a quantum efficiency of 68.5%. The illumination is detectable under the intensity as weak as 10nW/cm2. The rejection ratios by 300 nm are one order of magnitude for 10nW/cm2illumination and three orders of magnitude for 1mu W/cm2illumination. [J199]

"Reproducible manipulation of spin ordering in ZnCoO nanocrystals by hydrogen mediation"

Through a simple post hydrogen plasma treatment, we show the strong inducement of the room temperature ferromagnetism in Zn0.9Co0.1O:Hnanocrystals fabricated by sol-gel process. X-ray diffraction, high resolution transmission electron microscopy, and neutron high resolution powder diffraction measurements of Zn0.9Co0.1Onanocrystals before and after hydrogenation process confirmed that there are no structural changes in nanocrystal and any creation of magnetic secondary phase. Nevertheless, the clear ferromagnetic hysteresis loop of the hydrogenated Zn0.9Co0.1Onanocrystal was observed in superconducting quantum interference device. These results indicate that the ferromagnetism can be derived from a short-range spin ordering by hydrogen mediation in Co doped ZnO. [J200]

"Enhanced surface blistering of germanium with B + /H + coimplantation"

The surface blisters in B+/H+coimplanted germanium (Ge) and H-only-implanted Ge were compared. The surface-blister phenomenon in B+/H+coimplanted Ge emerged after annealing at 330-340°C; but in H-only-implanted Ge, the blistering emerged after annealing at over 400°C. The results indicate that the preimplanted boron can facilitate the coalescence of implanted H into bubbles, and so, it decreases the temperature for surface-blister formation. The exfoliation mechanism of B+/H+coimplanted Ge during the annealing step was investigated. The transmission electron microscopy results indicate that the B+/H+coimplantation creates both (100) and {111} platelet defects, and the nucleation of H bubbles occurs at regions where the (100) defects are concentrated. The bottoms of popped-off blisters show a very rough surface because the (100) and {111} platelets occur at different depths, and the wide distribution of (100) platelets also contributes to this roughness. The results show that boron appears to be one of the choices for prebonding implantation because it reduces the splitting temperature of the H-implanted Ge wafer. [J201]

"Dry etching of GaAs in high pressure, capacitively coupled B Cl 3 /N 2 plasmas"

The authors found high etch rates (0.4mcmmin-1)for GaAs in a capacitively coupled plasma (CCP) system using BCl3/N2discharges even at an operating pressure of 150mTorr, which allows the use of simple mechanical pumps. There was a catalytic effect of the N2gas in BCl3/N2plasmas during the CCP etching. Optical emission spectroscopy data show an increased neutral atomic chlorine, and positive ion density is the cause of the increased GaAs etch rate with N2addition to the BCl3. [J202]

"Enhancement mode GaAs metal-oxide-semiconductor field-effect-transistor integrated with thin AlN surface passivation layer and silicon/phosphorus coimplanted source/drain"

By using thin AlN film as a passivation layer between the GaAs and HfO2, GaAs metal-oxide-semiconductor (MOS) devices exhibited well-behaved accumulation and inversion capacitance-voltage characteristics with low leakage current of 6Ч10-5A/cm2at Vg=1Vand interface state density of 4.9Ч1010cm-2eV-1. In order to improve the N+source/drain activation efficiency, the Si/Pcoimplantation technique was adapted to fabricate GaAs n-type metal-oxide-semiconductor field-effect-transistor (MOSFET). High quality N+/PGaAs junction was achieved with extremely low junction leakage current of 3Ч10-6A/cm2at reverse bias of 1Vand high forward current to reverse current ratio of Iforward/Ireverse 107at GaAs source/drain junction. GaAs n-MOSFETs integrated with HfO2gate dielectric and TaN gate electrode were fabricated by using AlN passivation layer and Si/Pcoimplantation techniques. The results show that our GaAs n-MOSFETs operate in enhancement mode with Ion/Ioffratio of approximately six orders and good transfer and output characteristics. [J203]

"Superconductive Three-Terminal Amplifier/Discriminator"

We describe a new superconductive three-terminal device that acts as a fast pulse amplifier and discriminator. The device is based on a parallel nano-wire configuration. The nano-wires are properly biased near their critical current. When a current pulse of sufficient amplitude is injected into one of the wires, a transition to the normal state of all the wires occurs, thus generating a large output current pulse. This device could be used as a pulse amplifier for signals generated by nano-wire detectors or by RSFQ circuits. The parallel nano-wire structure can be realized with the same fabrication process used for NbN Superconducting Single Photon Detector (SSPD), so its integration into the existing technology is straightforward. Here we present numerical simulations of the device, with special attention to circuit requirement for the correct operation. [J204]

"Operational SER Calculations on the SAC-C Orbit Using the Multi-Scales Single Event Phenomena Predictive Platform (MUSCA)"

In this paper, the Multi-Scales Single Event Phenomena Predictive Platform (MUSCA SEP3) is presented. This platform is dedicated to predicting SEE cross sections or rates and evaluated thanks to on-board operational results on memories from the ICARE experiment (SAC-C mission). It allows for investigating the single and multiple events thus, MUSCA SEP3helps at estimating sensitivity trend for nano-metric technology and more particularly investigating the emerging effect related to the direct proton ionization. It is a critical problematic which concerns both the space and atmospheric environments. [J205]

"Antennas for Modern Small Satellites"

Modern small satellites (MSS) are revolutionizing the space industry. They can drastically reduce the mission cost, and can make access to space more affordable. The relationship between a modern small satellite and a ldquoconventionalrdquo large satellite is similar to that between a modern compact laptop and a ldquoconventionalrdquo work-station computer. This paper gives an overview of antenna technologies for applications in modern small satellites. First, an introduction to modern small satellites and their structures is

presented. This is followed by a description of technical challenges in the antenna designs for modern small satellites, and the interactions between the antenna and modern small satellites. Specific antennas developed for modern small-satellite applications are then explained and discussed. The future development and a conclusion are presented. [J206]

"Improvement of Resistive Switching Properties in -Based ReRAM With Implanted Ti Ions"

In this letter, the resistive switching properties of a ZrO2-based memory film with implanted Ti ions are investigated. The testing results demonstrate that doping Ti in ZrO2can remove the electroforming process and reduce the variations of switching parameters such as set voltage and resistance in off state. Furthermore, the Ti-doped ZrO2resistive switching memory also exhibits high device yield (nearly 100%), low operating voltage, fast speed, large on/off ratio (>104), and long retention time (>107s). The formation and rupture of conducting filaments are suggested to be responsible for the resistive switching phenomenon. The doped Ti impurities can improve the formation of conducting filaments and switching behaviors. [J207]

"Electron transport of folded graphene nanoribbons"

Recently, the AA-stack bilayer graphene nanoribbon (BGN) with a closed edge is observed in experiment. This new type of GN, we called folded GN (FGN), can be formed by folding a monolayer GN (MGN). Electron transport of the folded structures with different edges is studied. The FGNs show unique transport properties different from those of MGNs and BGNs. A metallic MGN with armchair edge (MAGN) is still metallic after folding. However, a semiconducting MAGN can be either semiconducting or metallic after folding, which depends on the width of MAGN and strength of interlayer coupling in the folded structure. The energy gap decreases with the increase of the coupling strength or width. As to the MGNs with zigzag edge (MZGNs), after folding they exhibit interesting conductance characteristics. The conductance steps around the Dirac point are even multiple of G0=2e2/h, while other conductance steps are odd multiple of G0. It indicates that the electron transport around the Dirac point in zigzag-edged FGNs (FZGNs) is similar to that in zigzag-edged BGNs (BZGNs), while electron transport far from the Dirac point is similar to that in zigzag-edged MGNs (MZGNs). [J208]

"Patterned electrode vertical field effect transistor fabricated using block copolymer nanotemplates"

We report the design and implementation of a vertical organic field effect transistor which is compatible with standard device fabrication technology and is well described by a self consistent device model. The active semiconductor is a film of C60molecules, and the device operation is based on the architecture of the nanopatterned source electrode. The relatively high resolution fabrication process and maintaining the low-cost and simplicity associated with organic electronics, necessitates unconventional fabrication techniques such as soft lithography. Block copolymer self-assembled nanotemplates enable the production of conductive, gridlike metal electrode. The devices reported here exhibit On/Off ratio of 104. [J209]

"Inverted method for fabricating a nano-aperture device with subwavelength structures"

An inverted method for fabricating a plasmonic nanoaperture device by using focused ion beam (FIB) milling and focused electron beam (FEB) induced deposition is proposed here. The device structure presented consists of a periodic annulus grating pattern along the interface of a quartz substrate and sputtered aluminum layers and a cylindrical high-index filled nanoaperture through the aluminum film in the center of the grating. FIB milling was used to process the annulus pattern on the quartz substrate. A dielectric nanopost (or inverted nanoaperture) was fabricated by FEB-induced deposition using tetraethyl orthosilicate as a precursor. The device geometry was characterized by atomic force microscopy and scanning electron microscopy. The structural processability of the device was proven with adequate accuracy and the properties of the materials also met the conditions of the device model in terms of functionality. [J210]

"Intrinsic Polarization of Self-Assembled Guanosine Supramolecules in GaN-Based Metal-Semiconductor-Metal Nano-Structures"

The transport properties of self-assembled guanosine supramolecules (SAGS) confined within nanoscale metal electrodes on transparent GaN semiconductor substrates have been studied. The modified guanosine molecules have been used as self-assembled nanowires to realize nanoscale UV-Visible photodetectors with self-assembly length ranging from 30 to 450 nm. The ribbon-like guanosine supramolecules exhibit semiconductor properties and have polarization along its axis due to the strong intrinsic dipole moment of guanosine molecules. The charge transport through the SAGS wire with nanoscale metal-semiconductor-metal structure on passivated Ga-terminated GaN surface can be explained by Schottky type conductivity and near-surface-states. The intrinsic polarization in SAGS nano-wires changes the band-offset at the metal-semiconductor interface similar to semiconductor photodiodes. [J211]

"Hybrid NEMS-CMOS integrated circuits: A novel strategy for energy-efficient designs"

Substantial increase in gate and sub-threshold leakage of complementary metal-oxide-semiconductor (CMOS) devices is making it extremely challenging to achieve energy-efficient designs while continuing their scaling at the same pace as in the past few decades. Designers constantly sacrifice higher levels of performance to limit the ever-increasing leakage power consumption. One possible solution to tackle the leakage issue, which is proposed in this work, is to integrate nano-electro-mechanical switches (NEMS) with CMOS technology. Hybrid NEMS-CMOS technology takes advantage of both near-zero-leakage characteristics of NEMS devices along with high ON current of CMOS transistors. The feasibility of integration of NEMS switches into a CMOS process is illustrated by a practical process flow. Moreover, co-design of hybrid NEMS-CMOS as low-power dynamic OR gates, static random access memory (SRAM) cells and sleep transistors is explored. Simulation results indicate that such hybrid dynamic OR gates can achieve 60-80- lower switching power and almost zero-leakage power consumption with minor delay penalty. However, the hybrid OR gate outperforms its CMOS counterpart both in terms of delay and switching power consumption with increase in fan-in beyond 12. Additionally, it is shown that a hybrid NEMS-CMOS SRAM cell can achieve almost 8- lower standby leakage power consumption with only minor noise margin and latency cost. Finally, application of NEMS devices as sleep transistors results in up to three orders of magnitude lower OFF current with negligible performance degradation as compared to CMOS sleep switches. [J212]

"Thermal conductivity studies of metal dispersed multiwalled carbon nanotubes in water and ethylene glycol based nanofluids"

High thermal conducting metal nanoparticles have been dispersed on the multiwalled carbon nanotubes (MWNTs) outer surface. Structural and morphological characterizations of metal dispersed MWNTs have been carried out using x-ray diffraction analysis, high resolution transmission electron microscopy, energy dispersive x-ray analysis, and Fourier transform infrared spectroscopy. Nanofluids have been synthesized using metal-MWNTs in de-ionized water (DI water) and ethylene glycol (EG) base fluids. It has been observed that nanofluids maintain the same sequence of thermal conductivity as that of metal nanoparticles Ag-MWNTs Au-MWNTs Pd-MWNTs. A maximum enhancement of 37.3% and 11.3% in thermal conductivity has been obtained in Ag-MWNTs nanofluid with DI water and EG as base fluids, respectively, at a volume fraction of 0.03%. Temperature dependence study also shows enhancement of thermal conductivity with temperature. [J213]

"Nano-Motion Stage for High-Speed and Precision Positioning on an X-Y Plane"

Precision positioning technology with high speed on an X-Y plane which was a coplanar coupling type required a manufacturing inspection for semiconductor and flat display areas, and so on. However, a precise positioning technology with high-speed motion had not been established on the X-Y plane which was coplanar without rotation around a Z axis yet. The authors proposed a new actuator called "Nano-Motion Actuator (NMA)" for track following on a spin-stand that evaluated magnetic heads and media for high density magnetic recording. We applied technologies of the NMA to a new actuator mechanism that had two degrees of freedom called "Nano-Motion Stage (NMS)." A pair of the NMAs was arranged in the directions of the X and Y axes to join two adjacent sides of a floating stage through a pair of parallel links. The floating stage was supported by four directionally elastic springs. As the parallel link changed from a quadrangle to a parallelogram, the floating stage rotation was effectively suppressed by a translational motion. The NMS could be realized a high resonance frequency and a high crossover frequency for its open-loop transfer function. As a result, the position of the NMS could be controlled on the X-Y plane which was coplanar with high speed and subnanometer precision. [J214]

"Temperature dependence of buried channel ion sensitive field effect transistors"

In this paper we describe the temperature dependence of buried channel (BC) ion sensitive field effect transistor (ISFET). The device response depends on the temperature; hence, temperature variations can cause erroneous readings. A theoretical model describing the temperature dependence of BC-ISFET and a theoretical solution to eliminate the signal variations due to temperature changes are presented here. The suggested solution is based on an inverter containing n-BC-ISFET and p-BC-ISFET. The influence of various parameters on the operation of the inverter and its sensitivity are investigated. We discuss the influence of self-assembled monolayers on the operation of the inverter. [J215]

"Reversible ferromagnetic spin ordering governed by hydrogen in Co-doped ZnO semiconductor"

We report a reversible manipulation of short-range spin ordering in Co-doped ZnO through hydrogenation and

dehydrogenation processes. In both magnetic-circular dichroism and superconducting quantum interference device measurements, the ferromagnetism was clearly induced and removed by the injection and ejection of hydrogen, respectively. The x-ray photoelectron spectroscopy results and the first-principles electronic structure calculations consistently support the dependence of the ferromagnetism on the hydrogen position and the contribution of transition metal ions. The results suggest the ferromagnetic interaction between Co ions can be reversibly controlled by the hydrogen-mediated intrinsic spin ordering in Co doped ZnO. [J216]

"Low-power hybrid complementary metaloxide- semiconductor-nano-electro-mechanical systems field programmable gate array: circuit level analysis and defect-aware mapping"

Conventional programmable fabric implemented in nanoscale complementary metal-oxide-semiconductor (CMOS) technologies suffer from large leakage power dissipation and volatility of the storage cells, which require reconfiguration at each power-on. In this study, the authors present a hybrid field programmable gate array design approach that can leverage on carbon nanotube (CNT)-based nano-electro-mechanical systems (NEMS) switches to implement memory elements leading to significant saving in static power dissipation. Besides, because of the non-volatile nature of the CNT-NEMS switches, the proposed framework eliminates the requirement of reconfiguration on start-up. To implement the programmable interconnects, the authors propose two alternative structures leveraging on non-volatile CNT-NEMS switches. To overcome the high defect density of a nano-fabric, the authors also propose a novel application mapping technique that can take advantage of certain defects modelled as stuck-at faults in the lookup tables (LUTs), thus considerably improving the yield. Simulations show that the proposed CMOS-NEMS LUT-based circuits can achieve an average reduction of 90% in leakage power at iso-performance, compared to the conventional CMOS-based LUT circuits. The proposed defect-aware mapping achieves an average improvement of 87% in the number of mapped functions over conventional mapping for 10% defect rate. [J217]

"Enhanced mass transport in ultrarapidly heated Ni/Si thin-film multilayers"

We investigated multilayer and bilayer Ni/Si thin films by nanodifferential scanning calorimetry (nano-DSC) at ultrarapid scan rates, in a temperature-time regime not accessible with conventional apparatus. DSC experiments were completed at slower scan rates as well, where it was possible to conduct parallel rapid thermal annealing experiments for comparison. Postexperimental characterization was accomplished by x-ray diffraction, and by transmission electron microscopy (TEM) and energy-filtered TEM of thin cross sections prepared by focused ion beam milling. We found that rate of heating has a profound effect on the resulting microstructure, as well as on the DSC signal. After heating to 560 °Cat 120 °C/s, the general microstructure of the multilayer was preserved, in spite of extensive interdiffusion of Ni and Si. By contrast, after heating to 560 °Cat 16 000 °C/s, the multilayer films were completely homogeneous with no evidence of the original multilayer microstructure. For the slower scan rates, we interpret the results as indicating a solid state diffusion-nucleation-growth process. At the higher scan rates, we suggest that the temperature increased so rapidly that a metastable liquid was first formed, resulting in complete intermixing of the multilayer, followed by crystallization to form solid phases. The integrated DSC enthalpies for both multilayer and bilayer films are consistent with this interpretation, which is further supported by thermodynamic predictions of metastable Ni/Si melting and solid state Ni/Si interdiffusion. Our results suggest that use of heating rates 10 000 °C/smay open new avenues for intermetallic micro- and nanofabrication, a- t temperatures well below those prevailing during explosive silicidation. [J218]

"Dc--13.4 ghz frequency divider with --20 dbm input power sensitivity in 0.18 μm CMOS"

To operate a frequency divider with small input clock power, the self-oscillating frequency of the divider is tuned according to the input clock frequency. The proposed frequency divider is implemented in a 0.18 m CMOS technology and can operate from DC to 13.4 GHz with input clock power less than 20 dBm while consuming 7.2 10.8 mW from a 1.8 V supply. [J219]

"Stitching periodic submicron fringes by utilizing step-and-align interference lithography"

The authors develop a step-and-align interference lithography system to fabricate large-area periodic submicron structures by stitching the unit exposure area step-by-step. A metal mask with a square transparent window in the center is used to intercept the quasi-flat-top region of the expanded Gaussian beam, and thus it serves as a beamshaper to approximate the ideal unit beam that has uniform intensity and spatial coherence. Two-dimensional precision dual-actuator motion stages could provide travel distance for full wafer exposure with 2nmhigh precision positioning capability for stitching the submicron patterns. The gratings with period of 700nmare successfully stitched along two directions on 100mmdiameter wafers. [J220]

"Molecular beam epitaxy-grown Bi 4 Te 3 nanowires"

With Au nanoparticles as the catalyst, the formation of Bi4Te3nanowires was achieved at an optimized substrate temperature of around 330 °C. We found two growth mechanisms for the nanowires: a self-assembled growth mode through islands as the seed and a vapor-solid-solid growth mode through the assistance of Au catalyst nanoparticles, the decisive factor for which was identified as the density of the Au nanoparticles. [J221]

"Demonstration on GaN-based light-emitting diodes grown on 3C-SiC/Si(111)"

GaN-based light-emitting diodes (LEDs) grown on template of 3C-SiC/Si(111) were demonstrated. The structural properties have been investigated systematically by means of atomic force microscopy, x-ray diffraction, and transmission electron microscopy. It is found that the intermediate layer (IL) of 3C-SiC leads to not only a significant improvement in the crystalline quality of GaN, but also better interfaces between the buffer layer and the initial layers of strained-layer superlattice. The device properties were also evaluated using the measurements of current-voltage, electroluminescence, and light output power-current. Compared to conventional LEDs that do not contain 3C-SiC IL, the device with IL exhibits enhanced output power by more than 200% at an injection current of 20 mA, and the operating voltage is slightly increased from 3.7 to 3.9 V. These results indicate that using 3C-SiC as IL is one of the promising approaches to improve the performance of LEDs on silicon. [J222]

"Copolymer solution-based "smart window""

The authors report the design of a prototype smart window based on the phenomenon of the thermally induced aggregation of triblock copolymer poly (ethylene oxide)-poly (propylene oxide)-poly (ethylene oxide) (EPE). Fluorescein isothiocyanate was used to label EPE and study aggregation phenomenon at different temperatures. The cloud point could be tuned by mixing EPE with sodium dodecyl sulfate (SDS) and varying the concentration of the latter. The light transmittance at different temperatures was studied as a function of SDS concentration. [J223]

"Lineshape analysis of Raman scattering from LO and SO phonons in III-V nanowires"

Micro-Raman spectroscopy is employed to study the phonon confinement in Au- and Mn-catalyzed GaAs and InAs nanowires. The phonon confinement model is used to fit the LO phonon peaks, which also takes into account the contribution to the asymmetry of the line shape due to the presence of surface optical (SO) phonons and structural defects. This also allows us to determine the correlation lengths in these wires, that is the average distance between defects and the defect density in these nanowires. Influence of these defects on the SO phonon is also investigated. A good agreement between the experimental results and the calculations for the SO phonon mode by using the dielectric continuum model is also obtained. [J224]

"Spectral shapes of surface-enhanced resonance Raman scattering sensitive to the refractive index of media around single Ag nanoaggregates"

We found large spectral changes in surface-enhanced resonance Raman scattering (SERRS) with increasing refractive index of media around single Ag nanoaggregates. We analyzed relationship between the spectral changes in SERRS and those in plasma (plasmon) resonance based on the twofold electromagnetic (EM) enhancement theory. The analysis revealed that the changes in SERRS spectra are induced by changes in spectral shapes of twofold EM enhancement factors, which arise from coupling of plasma resonance with both incident and Raman scattering light. [J225]

"SU-8-based immunoisolative microcontainer with nanoslots defined by nanoimprint lithography"

Cells can secrete biotherapeutic molecules that can replace or restore host function. The transplantation of such cells is a promising therapeutic modality for the treatment of several diseases including type 1 diabetes mellitus. These cellular grafts are encapsulated in semipermeable and immunoisolative membranes to protect them from the host immune system, while allowing the transport of nutrients and small molecules that are required for cell survival and function. The authors report on SU-8-based biocompatible immunoisolative cuboid microcontainers for cell transplantation. Each microcontainer comprises a 300Ч300Ч250or a 1100Ч1100Ч250mcm3SU-8 hollowed cuboid base that houses the cells and an optically transparent SU-8-based nanoporous lid that closes the device. The hollowed cuboid base was formed by conventional optical lithography to have 8nl(200Ч200Ч200mcm3)encapsulation volume for cellular payload. The lid comprises a thick SU-8 slab with an array of cylindrical wells, whose bottom surface is sealed with a thin nanoporous SU-8 membrane. The nanoporous membrane was created from a 100nmgrating (width and spacing) initial silicon mold subjected to a repeated cycle of oxidation and wet etching to achieve a 20nmwide and 200nmpitch nano silicon grating. Nanoimprinting and oblique-angle metal deposition, followed by inductively coupled plasma etching were utilized

to create 15nmwide and 350-450nmdeep nanoslots in the thin SU-8 membrane. Isolated mouse islets were encapsulated in the hollowed cuboid base and the nanoporous l- id was assembled on top. The penetration of large and small molecules into the microcontainer was observed with fluorescence. [J226]

"Thermal stability of GeSbTe thin films deposited by layer-by-layer metalorganic chemical vapor deposition"

The thermal stability of the GeSbTe (GST) films deposited by layer-by-layer metalorganic chemical vapor deposition on the planar TiAlN/Siand on trenches 120nmin diameter and 500nmdeep (with aspect ratio of 4:1) was investigated under various annealing temperatures and durations in a nitrogen ambient atmosphere. The inhomogeneous distribution of the Ge and Sb elements in the as-grown GST layer was improved by a thermal treatment at 500°Cfor 60minin nitrogen ambient. The GST films annealed above 500°Cfor 30 and 60minwere delaminated from the TiAlN electrode. Samples annealed at 700°Cfor 1min, above the melting temperature of the GST, show a decreased thickness, indicating that the GST films were thermally unstable. The as-grown films on trenches did not show a complete fill of the structure, whereas the trenches were more fully filled after a thermal treatment at 500°Cfor 60min. [J227]

"From radar to nodar"

Photonics and nanotechnologies are emerging revolutionary technologies that will provide a revolution in the sectors of sensors and radar systems. SELEX Sistemi Integrati intends to face this evolution as a leader by pro-actively supporting and developing its state-of-the-art. One century after the first RADAR Г,ВїdeaГ,Вї we registered the Nanotechnology Optical Detection And Ranging (NODAR) trademark. Such NODAR, by including both photonic and nanotechnologies, aims to implement multi-functional, multi-role, multi-domain sensors, as well as adaptive, flexible, knowledge-based sensors. NODAR requires pro-active studies and developments on: nanotechnology vacuum tube amplifiers (TX reverse nano triode): wide bandwidth Tx-Rx optical beam-forming network by means of optical modulator, combiner, analogue optical receive and programmable true time delay; broadband photonic analogue to digital converters; thermal management and interconnection by means of carbon nanotubes; and nanotechnology infrared and chemical state-of-the-art sensors. [J228]

"Easy mask-mold fabrication for combined nanoimprint and photolithography"

Hybrid transparent working stamps with both a surface relief and absorbing mask pattern were fabricated by replicating nanostructures in an Ormostamp film on prepatterned glass substrates. By using a combined nanoimprint and photolithography process, self-aligned mixed patterns of nano- and microstructures can be generated within one single resist layer. In this article the authors present a simple process based on the organic-inorganic hybrid polymer Ormostamp by replication on prepatterned Borofloat substrates. Using these working stamps, grating arrays with 35 nm half pitch were replicated in thermoplastic UV-curable resist. The method is easy to employ for generating mesas with nanostructures on top or the backfilling with microstructures in thermal nanoimprint lithography applications. [J229]

"Thermal imprinting on quartz fiber using glasslike carbon mold"

The authors are developing an on-fiber device that uses a quartz fiber as a substrate material and a large-area display and a wearable health monitor by woven fibers with embedded electrical circuit. The electrical circuit will be formed by inserting some electroconductive material into the concave pattern by inkjet and electroless-plating after thermally imprinting on the surface of the quartz fiber. To imprint the quartz fiber, a mold should be able to withstand the high temperature of 1400°C. Therefore, a mold for quartz imprinting on quartz fiber was fabricated with a glasslike carbon substrate polished by chemical-mechanical-polishing. Mold patterns with high accuracies were processed by applying microelectromechanical system fabrication techniques such as photolithography and reactive ion etching. Precise patterns with 5mcmminimum linewidths were transferred on the front surface of a 200mcmsquare quartz fiber by thermal nanoimprint technology. The width of the imprinted quartz fibers grew from 200to296mcmby the loading force, but part of the loading force was also used up in deforming the quartz fibers. Filling rates, defined as the ratio of the height of imprinted patterns to the depth of mold patterns, were calculated and then the relationship between the filling rate and the aspect ratio of mold patterns was investigated. The molding accuracy was found to be independent of the size of the mold patterns, but it did exhibit its dependency on the aspect ratio of the mold patterns. The expected overlay accuracy, which is important for making circuitry in the future, was approximately 5mcmjudging from the imprinted patterns on the quartz fiber. [J230]

"Thermal roller imprint on surface of Teflon perfluoroalkoxy inlet tube"

The authors succeeded in transferring patterns from a plate mold onto a cylindrical surface of a plastic tube by

thermal imprinting. A roller imprint technology was selected as a pattern transfer method. A cylindrical molding material was rolled on the surface of a plate mold under an optimized contact force and heating temperature. A Teflon perfluoroalkoxy (PFA) inlet tube with an outer diameter of 1/16in.was selected as a cylindrical molding material. This tube is often used in connecting the microfluid devices in the studies of high performance liquid chromatography. A plate mold was fabricated by employing microelectromechanical systems and Ni electroforming technologies. The minimum linewidth and depth of an electroformed-Ni mold were 5 and 2mcm, respectively. Several patterns were designed to mimic microcoil and comb actuator. A Teflon-PFA inlet tube was sandwiched between an electroformed-Ni plate mold set at the bottom loading stage and a buffer material sheet mounted at the upper loading stage of an imprinting system. After applying a right amount of heat to the electroformed-Ni mold, it was moved horizontally, resulting in the rolling of the tube against the patterned surface of the mold. Using this method, three-dimensional roller imprinting was executed. A relationship among the press depth, contact force, rotation speed of a Teflon-PFA inlet tube, and the imprinted depth was investigated. As a result, it was shown that optimization of the press depth was necessary in order to avoid any slippage or stalking, impeding the rotation of the cylindrical tube. [J231]

"Self-rectifying effect in gold nanocrystal-embedded zirconium oxide resistive memory"

The ZrO2films with Au nanocrystals embedded (ZrO2:nc-Au)are fabricated by e-beam evaporation, and the self-rectifying effect in the Au/ZrO2:nc-Au/n+Si sandwich structure is investigated. Self-rectifying resistive switching characteristics are obtained when the resistive memory is switched to low-resistance state (LRS). It is found that the Schottky contact at the Au/ZrO2interface limits charge injection under reverse bias, while under forward bias the current is limited by space charge, resulting in a rectification of 7Ч102under ±0.5 V at LRS, which enables the resistive memory to alleviate the cross-talk effect without additional switching elements in crossbar structure arrays. This self-rectifying resistive switching is believed to occur at a localized region and explained by a proposed model. [J232]

"Size Effect of Barium Titanate and Computer-Aided Design of Multilayered Ceramic Capacitors"

The size effect of BaTiO3(BTO) is the most important issue to design multilayer ceramic capacitors (MLCCs) with high capacitance. In the size effect of BTO particles, the size dependence of dielectric permittivity related with the complex structure in BTO nano-particles. The grain size dependence of dielectric permittivity in BTO ceramics was due to the domain wall contribution. The core-shell structure played an important role in the size effect of dielectric layers in X7R-MLCCs. Computer simulation technique was developed to predict the limit of capacitance density of MLCCs produced by the current technology. Dielectric properties of MLCCs with different particle size of BTO were measured, and the data were analyzed using B-SPLINE fitting to predict dielectric permittivity at arbitrary temperatures and AC-fields. The dielectric properties of barium titanate grains smaller than 100 nm were predicted using least squares fitting of the B-SPLINE coefficients. It was found from the simulation that the use of barium titanate grains smaller than 80 nm did not give an advantage to increase the capacitance density as well as temperature stability of the MLCCs. The maximum capacitance was predicted for the 1608 (mm) chip size. [J233]

"The Design, Fabrication and Test Results of a 1.6 THz Superconducting Hot Electron Bolometer Mixer on SOI"

Interest in THz technology is growing, with projects such as the Atacama large millimeter array (ALMA) astronomical observatory, biohazard remote detection, high frequency radar and other detection systems. This paper presents the design, fabrication and test results of a 1.6 THz superconducting phonon-cooled NbN hot electron bolometer. Elements of the mixer design, including simulation results and S-parameters, are presented. A novel fabrication process, the suspended sidewall nano patterned stencil (SSNaPS) procedure, along with unique thin silicon backside processing, is used to create these THz mixers. For the phonon-cooled mixer, a receiver noise temperature of 3474 K and a mixer noise temperature of 613 K were obtained. DC characterization and RF test results are discussed. [J234]

"Focused Ion Beam NanoSQUIDs as Novel NEMS Resonator Readouts"

Nano electromechanical systems (NEMS) represent an important new class of device with wide ranging applications. In this paper we report proposals and calculations for novel methods for excitation and readout of cantilever-style NEMS resonators which are applicable over a wide temperature range. We suggest a Lorentz force-based excitation method and discuss an ultrasensitive readout provided by a nanoSQUID, where the cantilever vibration modulates the inductance of the nanoSQUID loop, allowing potentially sub-picometer amplitude sensitivity to be achieved. [J235]

"Fundamentals of Nanotechnology (Hornyak, G.I., et al.) [JBook reviews]"

This text provides an account of the state-of-the-art in nanotechnology that is appealing and accessible to readers from a variety of disciplines. The book begins with an introduction of how to start, develop, and exit a nanotechnology business. This approach exposes scientists and engineers to some of the business aspects of nanotechnology early on. The book covers a wide range of various aspects of the field, including: nanomanufacturing; electromagnetic nanoengineering, including nanoelectronics, nano-optics, and nanomagnetism; mechanical nanoengineering; chemical nanoengineering; and the utilization of nanotechnology in biological and environmental applications. It includes an excellent compilation of references on the mechanism, fabrication, and characterization at the nanoscale. The book is recommended for an upper division college seminar course. It can also serve as a reference book for scientists and engineers, policy makers, and venture capitalists who would like to be introduced broadly to nanotechnology. [J236]

"A High Dynamic Range CMOS Image Sensor for Scientific Imaging Applications"

This paper presents a high dynamic range CMOS image sensor that utilizes a combined linear-logarithmic readout scheme with built-in linear-logarithmic switching point detection for scientific imaging applications. The proposed readout architecture adjusts each individual pixel to operate in either linear or logarithmic readout mode according to the input illumination level. This realizes direct high-throughput image reconstruction enabling a hybrid combination of linear and logarithmic pixel outputs in the same image frame without introducing complicated post-signal processing. A novel feature of fine-tuning the overall dynamic range and contrast of the output image is also achieved using this readout method. An image sensor chip consisting of a 16times16 7-T pixel array with n-well/p-sub photodiodes and the proposed readout architecture has been implemented in 0.5 mum CMOS technology. The sensor chip has been evaluated through both electrical and optical characterizations, demonstrating an overall dynamic range of 121 dB. As a proof of concept, scientific imaging results on clusters of nano particles (CoFe2O4) and optical fiber sensor are presented and discussed. [J237]

"Quantitative study of interior nanostructure in hollow zinc oxide particles on the basis of nondestructive x-ray nanotomography"

The complicated three-dimensional interior structures of the polycrystalline hollow zinc oxide microspheres were clearly obtained by the nondestructive nanocomputed tomography (nano-CT) technique. The parameters such as diameter, volume, porosity, and surface area were calculated by the quantitative analysis of reconstructed data. Especially, three single selected particles with different typical structures were separated and compared. With these results, the distinction of the particles can be clearly understood in nanoscale. This study reveals that nano-CT is an effective and competent tool for investigating the three-dimensional interior structures of nanomaterials in the natural environment. [J238]

"Characterization of surface damage in AlSi alloys"

Plastic deformation and damage accumulation at the contact surface are two important aspects of sliding wear of metal-matrix composite (MMC) materials such as AlSi alloys. The particular topography of the surfaces of the AlSi alloys has triggered the idea that the silicon particles form a load bearing surface over which the countersurfaces are sliding. Therefore, the wear resistance of AlSi surface is thought to originate from the high hardness of the silicon surface formed by the primary Si particles (inclusions). On the other hand, the mechanical strength of the reinforcement (Si)/matrix(Al) interface in a MMC is the primary factor determining the strength on the load bearing Si formation. In this work, the authors developed a novel method to characterize the interface strength of a MMC, combining a nano-/microindentation experiment and a finite element/atomistic analysis. The nano-/microindentation experiment was carried out by indenting individual reinforcement particles on a free surface with a nano-/microindenter. The dependence of indentation response on the interface properties was systematically studied, and the interface strength was extracted from the threshold stress for the sink in of the Si particles. With this method, the shear strength of an Al/Siinterface was measured approximately 330MPa, which compares well with the lower bound of an atomistic simulation with a modified embedded atom method potential [A. Noreyan etal, Acta Mater. 56, 3461 (2008)]. [J239]

"Transmission electron microscopy study of adsorption of colloidal gold nanoparticles on lepidocrocite and kaolinite"

Colloidal gold nanoparticles are of extremely strong adsorbability. The adsorption of colloidal gold nanoparticles prepared by the reduction of HAuCl4with trisodium citric acid in solutions of weak acidity was studied using high resolution transmission electron microscopy. The results showed that the adsorption of colloidal gold nanoparticles on the lepidocrocite and kaolinite is essentially the connection of lattice planes between them. The

extremely strong adsorbability of colloidal gold nanoparticles originated from the atoms of lattice planes on the particle surface, which have less coordination numbers and more dangling bonds. This finding may lead to the development of an adsorption theory for gold nanoparticles and should be useful in improving physical, chemical and biomedical technologies related to colloidal gold nanoparticles. [J240]

"High-Power Single-Mode 1.3- m InGaAsP-InGaAsP Multiple-Quantum-Well Laser Diodes With Wide Apertures"

A wide-aperture ridge waveguide structure was applied to 1.3-mum InGaAsP-InGaAsP multiple-quantum-well laser diodes (LDs) to increase their maximum kink-free output power under single-lateral-mode operations. As a result, a kink-free output power up to 140 mW and an external efficiency of 0.3 W/A were achieved from a single facet of the LD with a 7-mum-wide ridge top and a 1.5-mm-long uncoated cavity. [J241]

"Accurate analysis of carbon nanotube interconnects using transmission line model"

A new technique for analysing the time-domain response of carbon nanotube (CNT) interconnects, based on transmission line modelling, that takes the effects of both contact and fundamental (quantum) resistances into account is introduced. A new sixth-order linear parametric expression for the transfer function of these lines has been presented for the first time. For verification purposes, the step response of a driver-CNT bundle-load configuration for a 32 nm technology node, using the new technique and HSPICE simulation have been compared, with which the obtained results show an excellent match. Also the effect of contact resistance on the step response, especially the propagation delay, has been studied. The obtained results show that for the length of a CNT bundle equal to 50 mum with the diameter of each individual CNT 1 nm, the propagation delay changes from 0.138 to 5.58 ns for the contact resistance values from 1 to 50 k Omega, i.e. a variation range of 39.43 times the minimum value. The related delay variations for the length values 200 mum, 500 mum and 1000 mum, are 31.37, 22.61 and 15.42 times the minimum value, respectively. [J242]

"Impact of Energy Quantization on the Performance of Current-Biased SET Circuits"

The current-biased single electron transistor (SET) (CBS) is an integral part of almost all hybrid CMOS SET circuits. In this paper, for the first time, the effects of energy quantization on the performance of CBS-based circuits are studied through analytical modeling and Monte Carlo simulations. It is demonstrated that energy quantization has no impact on the gain of the CBS characteristics, although it changes the output voltage levels and oscillation periodicity. The effects of energy quantization are further studied for two circuits: negative differential resistance (NDR) and neuron cell, which use the CBS. A new model for the conductance of NDR characteristics is also formulated that includes the energy quantization term. [J243]

"Modeling, Analysis, and Design of Graphene Nano-Ribbon Interconnects"

Graphene nanoribbons (GNRs) are considered as a prospective interconnect material. A comprehensive conductance and delay analysis of GNR interconnects is presented in this paper. Using a simple tight-binding model and the linear response Landauer formula, the conductance model of GNR is derived. Several GNR structures are examined, and the conductance among them and other interconnect materials [e.g., copper (Cu), tungsten (W), and carbon nanotubes (CNTs)] is compared. The impact of different model parameters (i.e., bandgap, mean free path, Fermi level, and edge specularity) on the conductance is discussed. Both global and local GNR interconnect delays are analyzed using an RLC equivalent circuit model. Intercalation doping for multilayer GNRs is proposed, and it is shown that in order to match (or better) the performance of Cu or CNT bundles at either the global or local level, multiple zigzag-edged GNR layers along with proper intercalation doping must be used and near-specular nanoribbon edge should be achieved. However, intercalation-doped multilayer zigzag GNRs can have better performance than that of W, implying possible application as local interconnects in some cases. Thus, this paper identifies the on-chip interconnect domains where GNRs can be employed and provides valuable insights into the process technology development for GNR interconnects. [J244]

"Formation of multiple conductive filaments in the Cu /ZrO 2 :Cu /Pt device"

We report the direct electrical measurement of multiple resistance steps in the ZrO2-based solid electrolyte nonvolatile memory device using the refined dc I-Vmethod with a very small voltage increasing rate. The results demonstrate that multiple conductive filaments are formed successively between the bottom and top metal electrodes through the insulating layer while increasing the bias voltage, which are consistent with the electrical field simulation results based on the solid electrolyte theory. The inverse relationship between resistance steps and the filament formation sequence are obtained, which helps understand the switching mechanism of the multiple conductive filaments. [J245]

"Thermal Properties of 12-Fold Quasi-Photonic Crystal Microcavity Laser With Size-Controlled Nano-Post for Electrical Driving"

In this report, we investigate the fabrication process of 12-fold quasi-photonic crystal microcavity with size-controlled nano-post beneath for electrically-driven structure by fine-tuning the wet-etching time. By finite-element method, we simulate and analyze the heat transfer behaviors of microcavities with different nano-post sizes and shapes. From the real devices, we obtain whispering-gallery (WG) single-mode lasing action with high measured quality factor of 8 250 and low threshold of 0.6 mW when the nano-post size is as large as 830 nm in diameter. By varying the substrate temperature, WG single-mode lasing action is still obtained when the substrate temperature is as high as 70degC. Besides, the lasing wavelength red-shift rate is also improved compared with the microcavity without nano-post beneath. By varying the pump condition, lasing action is still observed at room temperature when the pump duty cycle increases to 16.0%. Thus, for electrically-driven photonic crystal microcavity lasers, this nano-post can serve as current injection pathway and heat sink at the same time. [J246]

"Fabrication of nanometer-spaced superconducting Pb electrodes"

We report the fabrication of superconducting Pb electrodes with nanometer-sized separation by using the electromigration technique. Below the superconducting transition temperature, the electrodes show current-voltage characteristics consistent with the tunneling between two superconducting electrodes, which can be well understood within conventional theory of superconductivity. The electrodes can be reversibly switched between the normal and superconducting states by the application of an external magnetic field. These electrodes are suited for electron-transport studies of chemically synthesized nanostructures and the utility is demonstrated by making single-molecule transistors incorporating individual Co-porphyrin molecules. [J247]

"Laser-induced self-assembly of iron oxide nanostructures with controllable dimensionality"

The nanosecond pulsed laser ablation of fine iron powder submerged under different liquid media (water, methanol, ethanol, and isopropanol) is used to rapidly produce a variety of iron oxide nanostructures from nanoparticles to nanowires and nanosheets. The dimensionality of the nanostructures is shown to be a consequence of two controllable mechanisms. The rapid oxidation, collisional quenching, and coalescence of the ablation products are suggested as the dominant mechanisms for the formation of zero-dimensional nanostructures such as hematite (alpha -Fe2O3)nanoparticles in water, or iron oxyhydroxide nanoparticles under alcohols. By employing different laser wavelengths (248 and 532 nm) it is demonstrated that the growth of extended iron oxyhydroxide nanostructures (one-dimensional nanowires and two-dimensional nanosheets) under methanol is possible and is a consequence of a second self-assembly mechanism driven by interaction between the UV laser pulses and the ablation products. [J248]

"Multiplication Noise Characterization of InAlAs-APD With Heterojunction"

The excess noise and ionization coefficient ratio of InAlAs avalanche photodiodes (APDs) with heterojunctions has been measured. To obtain these values accurately, we used a differential amplifier and determined the optical current at which the avalanche multiplication equals 1. These made it possible to conduct measurements on excess noise including that in the low multiplication region. Measured ionization coefficient ratios at M=10 were 0.18 and 0.17 with multiplication layer widths of 0.2 and 0.7 ??m, respectively. Excess noise was reduced with an increase in the optical input power. This tendency appeared more prominently in APDs with a thin multiplication layer. [J249]

"Low temperature magnetocaloric effect in polycrystalline BiFeO 3 ceramics"

We report on the structural, thermal, and magnetic properties of polycrystalline BiFeO3synthesized by sol-gel route. Powder x-ray diffraction data of the BiFeO3sample was refined with rhombohedral structure with space group R3c. Magnetization and coercive field measurements showed weak ferromagnetic nature below 10 K. We also investigated the low temperature magnetocaloric effect in polycrystalline BiFeO3ceramics. The anomalies observed in the magnetic entropy change of the BiFeO3ceramics were close to that of low temperature phase transitions. The combined relative errors in the magnetic entropy change are found to vary from 4% to 15% with increase in temperature. [J250]

"Development of a Micromechanical Grating Optical Modulator for Optical Network"

In this paper, we present the design, fabrication, and characterization of a new micromechanical grating optical modulator. By applying a dc driving voltage to the electrostatic comb-drive actuator, the grating beams can be reconfigured. Experimental tests reveal that at a voltage of 45 V, the grating period can be altered from the initial

10 to 20 mum, and correspondingly, the plusmnfirst-order diffraction angle is changed from 3.86deg to 1.94deg for a normally incident laser beam (wavelength, 632.8 nm). While the measured modulation of optical intensity can be as large as 30.6 dB for +first order and -19.1 dB for +second order. The adoption of silicon-on-glass process for fabricating this grating optical modulator is simple, high yield, and with a very smooth optical surface. The modulator has a first-level resonant frequency of 21.539 kHz, enabling a fast-enough manipulation. When operated in a digital mode, the proposed grating optical modulator can be used as an optical switch and an analog mode for a variable optical attenuator. Both show potential applications for the future optical network. [J251]

"Nanopackaging research at Georgia Tech"

The vision of GT-PRC's 3D systems is to go beyond 3D ICs to miniaturize the entire electronic or bioelectronic system components to nanoscale, such as passive components, system interconnections, thermal structures, and power supplies. Recent advances in the synthesis of nanomaterials with outstanding properties combined with novel processing technologies can lead to highly miniaturized, highly functional, and lowcost components and systems (Table 2). The nano to microscale wiring on system packages, off-chip nanointerconnections, and functional nanocomponents for RF, digital, and biofunctions will eventually migrate systems to nanoscale. Nanopackaging, therefore, should transform the handheld devices of today to become megafunctional convergent systems with computing, communications, and sensor capabilities. [J252]

"Near-Field Scanning Nanophotonic Microscopy-Breaking the Diffraction Limit Using Integrated Nano Light-Emitting Probe Tip"

We introduce a novel scanning ldquonanophotonicrdquo microscope through monolithic integration of a nanoscale LED (Nano-LED) on a silicon cantilever. We review two recent trends of incorporating miniature light sources on the scanning probes for near-field scanning optical microscopy: one is to attach fluorephores at the tip to define a small light source, while the other is to integrate an LED and a nanometer aperture into scanning probes, based on silicon microfabrication techniques. The creation of Nano-LED combines the advantages of previous two approaches: no external sources are required and the reduction of the light source size directly leads to resolution improvement. Two types of Nano-LEDs have been successfully demonstrated utilizing nanofabrication and microelectromechanical systems technologies: 1) formation of thin silicon dioxide light-emitting layer between heavily doped p + and n+ silicon layers created by a focused ion beam and 2) electrostatic trapping and excitation of CdSe/ZnS core-shell nanoparticles in a nanogap. We employed these probes into a standard near-field scanning and excitation setup. The probe successfully measured optical as well as topographic images of chromium test patterns with imaging resolutions of 400 and 50 nm, respectively. In addition, the directional resolution dependence of the acquired images suggests the size and shape of the light source. To our knowledge, these results are probably the first successful near-field images directly measured by such tip-embedded light sources. With the potential emission capability from near UV to IR and additional mass producibility, the nanophotonic microscope presents exciting opportunities in near-field optics, integrated circuit technology, nanomanufacturing and molecular imaging, and sensing in biomedicine. [J253]

"Self-organization of polymer nanoneedles into large-area ordered flowerlike arrays"

Combination of top-down and bottom-up process is crucial for fabricating ordered complex micronanostructures. Here we report a simple, rapid, and versatile approach to demonstrate this useful concept, which involves the joint use of multibeam interference patterning and capillary force self-organization. Regular hydrophobic arrays of four-peddle nanoflowers consisting of bent needles with 300 nm tip diameters are readily produced. A "domino model" based on the balance of the capillary and support forces were proposed to interpret realization of large-area homogeneity of the array. The technology, promising for preparing more complex and functional structures, may find broad utilization in nano and biological researches. [J254]

"Effect of strain on quantum efficiency of InAlN-based solar-blind photodiodes"

A series of InxAl1-xN-based Schottky solar-blind photodiodes are fabricated on the InxAl1-xNepilayers with high and very close crystal qualities. The quantum efficiency varies from 14.5% to 68.5%. The microstructure and strain state of epilayers are investigated in detail. It is found that the quantum efficiency of photodiode depends on the strain state in InxAl1-xNfilms. This indicates that adjusting the strain state in InxAl1-xNfilm is one of the promising approaches to optimize the performance of InAlN-based solar-blind photodiode. [J255]

"Controlled etching and regrowth of tunnel oxide for antenna-coupled metal-oxide-metal diodes"

The authors have designed a new procedure for fabrication of infrared (IR) sensors. These sensors consist of a dipole antenna coupled with a metal-oxide-metal (MOM) (Al-AlOx-Pt)diode. The surface of electron beam

evaporated Al, serving as one of the electrodes, is cleaned using an Ar plasma, followed by in situ controlled growth of the tunneling oxide, AlOx. The antenna, its leads, and the overlap of the Al and Pt electrodes that defines the MOM overlap area are all defined using electron beam lithography. The MOM overlap area of these devices is as small as 50Ч80nm2. Features of our process include the use of dissimilar metals for the formation of the MOM diode, small MOM diode size, and controlled etching and regrowth of the tunneling oxide. A CO2laser at 10.6mcmwas used for the IR characterization of these sensors. Current-voltage and IR measurements are presented. The normalized detectivity (D*)for these devices was found to be 2.13Ч106cm Hz1/2 W-1. [J256]

"Passivity-Based Stabilization of a 1-DOF Electrostatic MEMS Model With a Parasitic Capacitance"

Feedback control of electrostatic microelectromechanical systems (MEMS) is significantly complicated by the presence of parasitics. This paper considers the stabilization of a one-degree-of-freedom (1-DOF) piston actuator under the influence of a capacitively coupled parasitic electrode. Previous work by the authors has shown that, in the absence of parasitics, passivity-based control may be used to make any feasible equilibrium point of this system globally asymptotically stable. However parasitics may destabilize the nominal closed-loop system by inducing multiple equilibrium points, causing a saddle-node bifurcation called chargepull-in. This note shows how the nominal passivity-based control formulation may be modified to eliminate the multiple equilibria and prevent charge pull-in. As in previous work, we consider both static and dynamic output feedback controllers, with the dynamic controller providing additional control over transient performance. [J257]

"Conductive Inkjet-Printed Antennas on Flexible Low-Cost Paper-Based Substrates for RFID and WSN Applications"

In this paper, a review of the authors' work on inkjet-printed flexible antennas, fabricated on paper substrates, is given. This is presented as a system-level solution for ultra-low-cost mass production of UHF radio-frequency identification (RFID) tags and wireless sensor nodes (WSN), in an approach that could be easily extended to other microwave and wireless applications. First, we discuss the benefits of using paper as a substrate for high-frequency applications, reporting its very good electrical/dielectric performance up to at least 1 GHz. The RF characteristics of the paper-based substrate are studied by using a microstrip-ring resonator, in order to characterize the dielectric properties (dielectric constant and loss tangent). We then give details about the inkjet-printing technology, including the characterization of the conductive ink, which consists of nano-silver particles. We highlight the importance of this technology as a fast and simple fabrication technique, especially on flexible organic (e.g., LCP) or paper-based substrates. A compact inkjet-printed UHF ldquopassive RFIDrdquo antenna, using the classic T-match approach and designed to match the IC's complex impedance, is presented as a demonstration prototype for this technology. In addition, we briefly touch upon the state-of-the-art area of fully-integrated wireless sensor modules on paper. We show the first-ever two-dimensional sensor integration with an RFID tag module on paper, as well as the possibility of a three-dimensional multilayer paper-based RF/microwave structure. [J258]

"GaN-Based Light-Emitting Diode Prepared on Nano-Inverted Pyramid GaN Template"

Using self-aligned SiO2nano-spheres as an etching mask, the authors demonstrated the formation of a GaN-based nano-inverted pyramid (NIP) structure. It was found that crystal quality of the GaN epilayer prepared on an NIP/GaN template was significantly better than that prepared with conventional low-temperature GaN nucleation layer. With the NIP structure, it was found that 20-mA light-emitting-diode (LED) output power can be enhanced by 32%, as compared with the conventional LED. [J259]

"Enhanced photon emission and absorption of single quantum dot in resonance with two modes in photonic crystal nanocavity"

We demonstrate simultaneous enhancement of photon emission and absorption of a single InGaAs self-assembled quantum dot (QD) in resonance with two modes in a photonic crystal nanocavity. The QD, whose ground and excited states are resonant, respectively, with the first and second lowest order cavity modes, is excited by cavity resonant excitation at the wavelength of the second order cavity mode and shows 180 times greater photon emission from the ground state than a bare QD. This large enhancement is attributed to a combination of Purcell effect, efficient photon extraction, and cavity resonant absorption enhancement. [J260]

"Mechanism analysis of improved corona-resistant characteristic in polyimide/Ti O 2 nanohybrid films"

Polyimide/TiO2nanohybrid films with good corona resistance were prepared by using in situ dispersive

polymerization. Effects of the concentration of nano-TiO2fillers and the corona aging time on the dielectric properties of the films were explored. Results showed that the corona resistance of the hybrid films could be improved with increasing the concentration of TiO2fillers, and the corona resistance was dependent on the dielectric permittivity of the hybrid films. The mechanism of the corona resistance was also discussed by analyzing the change in electric field and the electron action of TiO2fillers based on the Fermi-Dirac statistic. [J261]

"Microwave-excited atmospheric-pressure plasma jets using a microstrip line"

We report a 2.45GHzmicrowave-excited atmospheric-pressure plasma jet (MW-APPJ) device using a microstrip line for materials processing. A three-dimensional simulation based on the finite difference time domain method revealed that the configuration of the MW-APPJ device results in a strong concentration of electric fields at the gas nozzle. Argon plasmas were generated at the nozzle and were blown into ambient air with the maximum length of 5mmat a microwave power of 40W. The rotational temperatures of molecular nitrogen in the downstream of the plasma jets, measured by optical emission spectroscopy, were 1720to900Kfor gas flow rates from 0.5to3.5l/min, indicating that the jets were nonthermal plasmas. This MW-APPJ device will provide a large-area APPJ for materials processing depending on the configuration of the nozzle array and microstrip lines. [J262]

"Direct evidence of Al diffusion into tris-(8-hydroquinoline) aluminum layer: medium energy ion scattering analysis"

The diffusion of Al into tris-(8-hydroquinoline) aluminum (Alq3)was studied using in situ medium energy ion scattering (MEIS) spectroscopy. Al was thermally deposited on an Alq3thin film in a stepwise manner, with MEIS performed after each deposition step. At the initial stage of interface formation, Al diffuses deep into the Alq3layer and reaches the bottom of the Alq3layer of thickness 20 nm. Some Al is stacked at the surface of Alq3and starts to form an Al layer. The deep diffusion of Al is diminished when sufficient Al aggregates at the surface. After this stage, Al is stacked only at the surface, but does not diffuse into the Alq3film. [J263]

"Violet-light spontaneous and stimulated emission from ultrathin In-rich InGaN/GaN multiple quantum wells grown by metalorganic chemical vapor deposition"

We investigated the spontaneous and stimulated emission properties of violet-light-emitting ultrathin In-rich InGaN/GaN multiple quantum wells (MQWs) with indium content of 60%-70%. The Stokes shift was smaller than that of In-poor InGaN MQWs, and the emission peak position at 3.196 eV was kept constant with increasing pumping power, indicating negligible quantum confined Stark effect in ultrathin In-rich InGaN MQWs despite of high indium content. Optically pumped stimulated emission performed at room temperature was observed at 3.21 eV, the high-energy side of spontaneous emission, when the pumping power density exceeds 31kW/cm2. [J264]

"Micromechanical observation of the kinetics of biomolecular interactions"

Resonant microcantilevers have recently enabled the label-free detection of biomolecules. Here, we observed the kinetics of biomolecular interactions such as antigen-antibody interactions and/or DNA hybridization based on a resonant frequency shift, obeying Langmuir kinetics, measured in a buffer solution. It is shown that the kinetics of DNA adsorptions on the surface is governed by intermolecular interactions between adsorbed DNA molecules. It is also shown that the kinetics of DNA hybridization is determined by the intermolecular interaction. It is implied that resonant microcantilever in buffer solution may allow for gaining insights into the kinetics of various molecular interactions. [J265]

"Current percolation in ultrathin channel nanocrystalline silicon transistors"

The ultrathin channel nanocrystalline silicon transistor shows greatly improved switching performance and has demonstrated its candidacy for low power applications. In this work, by careful observation of the current-voltage and threshold voltage characteristics, we find that current percolation occurs when the channel is thinner than 3.0nmdue to strong quantum confinement induced large potential variations over the channel. We show that the device channel width must be at least 0.3mcmto avoid percolative "pinch off" for 0.5mcmchannel length devices. Theoretical analysis performed on the devices agrees well with the experimental data and provides important guidelines to model and optimize the devices for circuit design. [J266]

"High field-effect mobility amorphous InGaZnO transistors with aluminum electrodes"

We report on the device characteristics of amorphous indium gallium zinc oxide thin-film transistors (TFTs) with

aluminum (Al) electrodes. The TFTs exhibited a high performance with a field-effect mobility of 11.39cm2/V s, a subthreshold swing of 181 mV/ decade, and an on-off ratio of 107. Further improvement in device performance was achieved by doping the source/drain contact regions, resulting in an enhanced mobility of 16.6cm2/V sat an operating voltage as low as 5 V. [J267]

"Asymmetric transport in asymmetric T-shaped graphene nanoribbons"

We propose an asymmetric T-shaped graphene nanoribbon (TGNR) that shows peculiar transport properties. In the vicinity of the Fermi level, the electron transmissions from the vertical graphene nanoribbon (GNR) to the two ends of the horizontal GNR are highly asymmetric. The electrons mostly transmit to one horizontal arm while are blocked by the other one. It is originated from the local asymmetric couplings between the intersection of the junction and the two horizontal arms. The asymmetric transport is very robust, even the T-shaped junction has a large size. Thus the asymmetric TGNR can be served as important components of nanocircuits. [J268]

"Gas sensing properties of defect-controlled ZnO-nanowire gas sensor"

The effect of oxygen-vacancy-related defects on gas-sensing properties of ZnO-nanowire gas sensors was investigated. Gas sensors were fabricated by growing ZnO nanowires bridging the gap between two prepatterned Au catalysts. The sensor displayed fast response and recovery behavior with a maximum sensitivity to NO2gas at 225 °C. Gas sensitivity was found to be linearly proportional to the photoluminescence intensity of oxygen-vacancy-related defects in both as-fabricated and defect-controlled gas sensors by postannealing in Ar and H2atmosphere. This result agrees well with previous theoretical prediction that oxygen vacancies play a role of preferential adsorption sites for NO2molecules. [J269]

"Light-induced hysteresis characteristics of copper phthalocyanine organic thin-film transistors"

Applying a bidirectional sweeping gate voltage, the white-light illuminated copper phthalocyanine thin-film transistors (CuPc-TFTs) show obvious hysteresis effect and the hysteresis window is 32 V. This effect is dominated by the additional carriers generated by photoirradiation. Although small hysteresis exists in CuPc-TFTs without illumination, light makes the hysteresis more obvious. Thus, CuPc-TFTs are promising to realize light detection and/or light memory in a single organic device for future low-cost, ultrahigh-density organic photoelectric integration. [J270]

"An extremely high dielectric constant in bismuth-based pyrochlore multilayer film capacitors combined with percolative structure"

The percolative film capacitor structure of Pt/Bi2Mg2/3Nb4/3O7[BMN(Ar) films deposited at pure argon atmosphere]/Pt was addressed for achievement of a high dielectric constant in the films deposited at room temperature by radio frequency magnetron sputtering. The deterioration of the leakage current characteristics in the percolative capacitor was mitigated using the multilayer films of BMN(O)/BMN(Ar)/BMN(O), where ultrathin BMN(O) films were deposited at a mixed atmosphere of argon and oxygen. An extremely high dielectric constant of 120 and a low leakage current density of 6Ч10-6A/cm2at 3 V were observed in percolative BMN multilayer films as-deposited at room temperature. [J271]

"Growth behaviors of ultrathin ZnSe nanowires by Au-catalyzed molecular-beam epitaxy"

Ultrathin ZnSe nanowires grown by Au-catalyzed molecular-beam epitaxy show an interesting growth behavior of diameter dependence of growth rates. The smaller the nanowire diameter, the faster is its growth rate. This growth behavior is totally different from that of the nanowires with diameters greater than 60nmand cannot be interpreted by the classical theories of the vapor-liquid-solid mechanism. For the Au-catalyzed nanowire growth at low temperatures, we found that the surface and interface incorporation and diffusion of the source atoms at the nanowire tips controlled the growth of ultrathin ZnSe nanowires. [J272]

"Electrical properties of pulsed UV laser irradiated amorphous carbon"

Amorphous carbon films containing no hydrogen were irradiated with a pulsed UV laser in vacuum. Raman spectroscopy indicates an increase in the quantity of sp2clustering with the highest laser energy density and a commensurate reduction in resistivity. The reduction of resistivity is explained to be associated with thermally induced graphitization of amorphous carbon films. The high field transport is consistent with a Poole-Frenkel type transport mechanism via neutral trapping centers related to sp2sites which are activated under high fields. Decreasing the resistivity is an important feature for use of carbon as an electronic material. [J273]

"Lasing from dye-doped photonic crystals with graded layers in dichromate gelatin emulsions"

We report on optically pumped lasing from dye-doped, graded-spacing layer structures of dichromate gelatin emulsions fabricated using two-beam holographic interference. The graded layers exhibited deep and wide photonic band gaps. Multimode lasing with both a low threshold and a high quality factor was observed at the band edge of the photonic band gap. We modeled the emissions from the dye-doped graded layer system using a finite difference time domain technique and achieved good agreement with experimental results. [J274]

"Surface nematic bistability at nanoimprinted topography"

The azimuthal nematic bistability was realized by frustration between two azimuthally orthogonal anchoring axes induced by a nanoimprinted groove pattern and mechanical rubbing. The nematic bistability can be explained by the revised Berreman model of groove-induced surface anchoring, recently introduced by Fukuda etal [Phys. Rev. Lett. 98, 187803 (2007)]. The azimuthal bistability can be tuned in arbitrary direction by changing the groove pitch and rubbing conditions. This simple combinatorial scheme may be considered as a practical candidate for bistable displays with tailored bistable directions required in various liquid crystal device modes. [J275]

"Controllable fabrication and electromechanical characterization of single crystalline Sb-doped ZnO nanobelts"

We report the fabrication of the high-quality Sb-doped ZnO nanobelts by using a simple chemical vapor deposition method. The nanobelts consist of single-crystalline wurtzite ZnO crystal and grow along [0112]direction. An electromechanical system is constructed to explore the transverse electrical properties of a single nanobelt under the different applied loading forces. The I-Vresults indicate that a little barrier exists in between the nanobelt and the atomic force microscopy tip. An almost linear relationship between the force and the resistance was found at small deformation regions, which demonstrates that the nanobelts have potential applications as force/pressure sensor for measuring the nano-Newton forces. [J276]

"Formation mechanism of nanotrenches induced by mobile catalytic nanoparticles"

110 oriented nanotrenches were generated by thermally annealing an ultrathin Au layer deposited on ZnSe surfaces of different orientations. Results from a number of structural and chemical analyses indicate that they were induced by the migration of Au-alloy droplets through a catalytic reaction with ZnSe. Highly aligned nanotrenches can be achieved on (100)-oriented substrates, which can potentially serve as templates for the fabrication of one-dimensional nanostructures of various materials. [J277]

"Resistive switching memory effect of Zr O 2 films with Zr + implanted"

The Au/Cr/Zr+-implanted-ZrO2/n+-Sisandwiched structure exhibits reversible bipolar resistive switching behavior under dc sweeping voltage. The resistance ratio (Rratio)of high resistive state and low resistive state is as large as five orders of magnitude with 0.5Vreadout bias. Zr+-implanted-ZrO2films exhibit good retention characteristics and high device yield. The impact of implanted Zr+ions on resistive switching performances is investigated. Resistive switching of the fabricated structures is explained by trap-controlled space charge limited current conduction. [J278]

"Magnetically responsive elastic microspheres"

We report the design, fabrication, and characterization of magnetically responsive elastic microspheres consisting of polydimethylsioxane (PDMS) and magnetic nano-/microparticles. The microspheres can have either core-shell or solid structure, fabricated by using a microfluidic technique. The mechanical characteristics are determined with a modified electronic balance, and the results show that the microspheres exhibit magnetostrictive effect. Such microspheres can in addition behave as a smart material controllable through an external magnetic field. Owing to the transparency, biocompatibility and nontoxicity of PDMS, the magnetically responsive elastic microspheres may have potential applications in drug delivery, biosensing, bioseparation, and medical diagnosis. [J279]

"Branched Sn O 2 nanowires on metallic nanowire backbones for ethanol sensors application"

We report the synthesis of hierarchically branched semiconducting SnO2nanowire on metallic Sb-doped SnO2nanowires by the sequential seeding of multiple nanowire generations with Au nanoparticles as catalysts. Such semiconducting nanowire/metallic backbone complex structures increase the potential functionality of SnO2nanowires. Branched SnO2nanowire films are used as sensing materials for high-performance ethanol

sensor fabrication. The nanowire sensors show sub-ppm sensitivity and fast response and recovery times at 300°C. A linear equation relationship between sensitivity and the ethanol vapor concentration was observed. [J280]

"Near-field scanning optical microscopy with monolithic silicon light emitting diode on probe tip"

We describe optical and topographic imaging using a light emitting diode monolithically integrated on a silicon probe tip for near-field scanning optical microscopy (NSOM). The light emission resulted from a silicon dioxide layer buried between a phosphorus-doped N+silicon layer and a gallium-doped P+silicon region locally created at the tip by a focused ion beam. The tip was employed in a standard NSOM excitation setup. The probe successfully measured optical as well as topographic images of a chromium test pattern with imaging resolutions of 400 and 50nm, respectively. The directional resolution dependence of the acquired images directly corresponds to the shape, size, and polarity of the light source on the probe tip. To our knowledge, this report is the first successful near-field imaging result directly measured by such tip-embedded light sources. [J281]

"Asymmetric electrical bistable behavior of an eicosanoic acid/zirconium oxide bilayer system with rectifying effect"

The electrical switching characteristics of eicosanoic acid (EA)/zirconium oxide (ZrO2)bilayer thin films are investigated in this letter. The devices have a sandwich structure of aluminum (Al)/EA/ZrO2/gold(Au) and exhibit asymmetric electrical bistable behavior with a rectifying effect through resistive switching. Reversible and reproducible bistable switching properties were observed by applying certain voltages. The asymmetry and rectifying bistable behavior is proposed to result from the Schottky barrier that is present by reason of the ZrO2layer. The rectifying effect can significantly improve misreading in matrix crossbar memory based on bistable two-terminal devices, paving a way for a practical crossbar molecular memory. [J282]

"Influence of pulse width on electroluminescence and junction temperature of AlInGaN deep ultraviolet light-emitting diodes"

The behavior of electroluminescence (EL) and junction temperature of AlInGaN deep ultraviolet light-emitting diodes under pulse-width modulation is investigated. The redshift of both emissions from quantum-well (P1) and localized (P2) states in the EL spectra and the increase of intensity ratio of P1 to P2 are observed with the increase of duty cycle. The photoluminescence of p-GaNcontact layer is adopted to measure the junction temperature, which shows a linear relation with the duty cycle. Meanwhile, the duty cycle coefficient of junction temperature increases with the increase of injection current. The EL behaviors are explained by the thermal effect induced by pulse current at high duty cycle. [J283]

"Band alignment between amorphous Ge 2 Sb 2 Te 5 and prevalent complementary-metal-oxide-semiconductor materials"

Band alignment of amorphous Ge2Sb2Te5and various substrates was obtained using high-resolution x-ray photoelectron spectroscopy. The valence band offset of Ge2Sb2Te5on various complementary-metal-oxide-semiconductor (CMOS) materials, i.e., Si, SiO2, HfO2, Si3N4and NiSi, were investigated with the aid of the core level, valence band, and energy loss spectra. Energy band lineups of Ge2Sb2Te5on these materials were thus determined which can be used as for phase change memory device engineering and integration with CMOS technology. [J284]

"Viewing-angle controllable liquid crystal display using a fringe- and vertical-field driven hybrid aligned nematic liquid crystal"

Viewing-angle controllable liquid crystal display (LCD) without using an additional panel or pixel division is proposed. In the device, hybrid aligned nematic liquid crystal using a liquid crystal with negative dielectric anisotropy is used. The device shows narrow viewing angle when it is driven only by fringe-electric field, however, it exhibits wide viewing angle if driven by vertical- as well as fringe-electric field. With the approach, the viewing angle of the LCD can be controlled from 120° to 20° in horizontal direction. [J285]

"Single-electron-based flexible multivalued logic gates"

Single-electron transistor (SET)-based multivalued (MV) not-AND (NAND) and not-OR (NOR) logic cells were implemented on a silicon-on-insulator chip. Depending on the ways of connecting two SETs with a field-effect transistor, the voltage transfer characteristics show typical NAND or NOR gate functions for various input voltages, which are binary, MV, and binary-MV mixed. Moreover, the switching functionality of our NAND (NOR)

can convert to OR (AND) operation by simply adjusting their initial input voltages. These flexible two-input logic gates are expected to provide four basic arithmetic cells for the SET MV logic gate family. [J286]

"Recognition of biomolecular interactions by plasmon resonance shifts in single- and multicomponent magnetic nanoparticles"

Composite biomarkers open prospects to combine the targeting advantages of magnetic nanoparticles with direct plasmon-based optical detection of biomolecular interactions. Although nanoparticles from ferromagnetic 3d-transition metals could be suitable for such a task, they are shown to be rather large, thus tending to agglomerate in aqueous suspensions. A superior alternative uses composite nanoparticles consisting of a superparamagnetic core and a noble metal shell. Systematic Mie-theory based calculations of their plasmon peak shifts and sensitivity against biomolecular binding events on their surfaces are presented for this hybrid particle class. [J287]

"Suppression of the subband parasitic peak by 1 nm i-Al N interlayer in AlGaN deep ultraviolet light-emitting diodes"

The origin and suppression of the subband parasitic peak in AlGaN deep ultraviolet light-emitting diodes have been studied. The parasitic peak is clarified to come from a p-AlGaNcladding layer and to be related to Mg dopants. By using 1nmi-AlNas an interlayer between the active region and the p-AlGaNcladding layer, this peak is suppressed efficiently. The devices with such an interlayer show improved output power by a factor of 4 at injection current density of 20A/cm2, except that the series resistance and turn-on voltage are slightly increased. [J288]

"High-temperature quenching of electrical resistance in graphene interconnects"

The authors reported on the experimental investigation of the high-temperature electrical resistance of graphene. The test structures were fabricated by using the focused ion beam from the single and bilayer graphene produced by mechanical exfoliation. It was found that as temperature increases from 300to500K, the resistance of the single, and bilayer graphene interconnects drops down by 30% and 70%, respectively. The quenching and temperature dependence of the resistance were explained by the thermal generation of the electron-hole pairs and carrier scattering by acoustic phonons. The obtained results are important for the proposed graphene interconnect applications in integrated circuits. [J289]

"Measurement and noise performance of nano-superconducting-quantum-interference devices fabricated by focused ion beam"

Science and industry demand ever more sensitive measurements on ever smaller systems, as exemplified by spintronics, nanoelectromechanical system, and spin-based quantum information processing, where single electronic spin detection poses a grand challenge. Superconducting quantum interference devices (SQUIDs) have yet to be effectively applied to nanoscale measurements. Here, we show that a simple bilayer deposition route, combining photolithography with focused ion beam patterning, produces high performance nanoscale SQUIDs. We present results of noise measurements on these nanoSQUIDs which correspond to a magnetic flux sensitivity of around 0.2mu Phi 0/Hz1/2. This represents one of the lowest noise values achieved for a SQUID device operating above 1K. [J290]

"AlInN-based ultraviolet photodiode grown by metal organic chemical vapor deposition"

AlInN, one of the III-nitride semiconductors, is expected to find its application as transistors, sensors, light emitters of electronic, and optoelectronic devices. When the lattice alignment of AlInN is made similar to GaN, a great deal of crack-free AlInN film growth is possible on GaN layers. We have successfully grown AlInN and AlGaN films by metal organic chemical vapor deposition. The structural analysis for the metal organic chemical vapor deposition grown films show that they have the same structure and were used to produce AlInN and AlGaN-based ultraviolet (UV) photodiodes. This paper describes the growth and fabrication of AlGaN and AlInN-based UV photodiodes and analyzes their device performance. For an AlInN, the peak responsivity at zero bias was measured to be 140mA/Wat 230nm, corresponding to an external quantum efficiency of 74%. AlInN was found to be more suitable than AlGaN for UV photodiodes with a cutoff wavelength in the UV-C range. [J291]

"On the effect of the electrical contact resistance in nanodevices"

We have investigated the effect of the electric contact resistance in nano devices by manufacturing dedicated chips with four-point contacted platinum nanowires and individual, suspended, and four-point contacted carbon nanotubes. For both cases, we measured the intrinsic electrical resistance and the electrical contact resistance.

Our results indicate that the electrical contact resistance of the platinum nanowires and the carbon nanotubes can be one to three orders of magnitude higher than the intrinsic electrical resistance of the sample itself. Subsequently, we tested the platinum nanowires as pressure sensors to quantify the impact of the electrical contact resistance on the performance of micro- and nanodevices. [J292]

"Contact photolithographic micropatterning for bistable nematic liquid crystal displays"

Orthogonal alignment patterns of 2Ч2mcm2size that induce nematic bistability were fabricated over 4Ч4cm2by a double exposure process employing a rewritable photoalignment material. Bistable liquid crystal cells with patterned surfaces were fabricated, and reproducible switching between the bistable states driven by orthogonal in-plane electric fields at 8.2 and 3.9V/mcmwas confirmed. [J293]

"Effect of sulfurization conditions on structural and electrical properties of copper sulfide films"

We examined the structural and electrical properties of copper sulfide films as a function of the sulfurization time of 70-nm-thick Cu films. Copper sulfide films with various phases such as mixed metallic Cu-chalcocite, chalcocite, roxbyite, and mixed roxbyite-covellite phases were formed with increasing sulfurization time. The Cu/Satomic percentage ratio of the films decreased with increasing sulfurization time, and films with various compositions such as Cu-rich and stoichiometric copper sulfide with underlying unreacted Cu as well as pure stoichiometric and S-rich copper sulfide were obtained. The surface morphology and the electrical resistivity of the films depended on the chemical phase and composition of the films. The resistivity decreased with increasing Cu deficiency in the films. Distinct switching of the resistance from high to low-state, and vice versa, with the reversal of the bias polarity of the film was observed only for the mixed metallic Cu-chalcocite phased film with underlying Cu. However, the chalcocite film with underlying Cu exhibited a semiconducting behavior. This indicated that excess Cu within the chalcocite film is required for the observation of the switching behavior of the resistance. [J294]

"Characterization of embedded MgO/ferromagnet contacts for spin injection in silicon"

In this work we present the structural and electrical characterization of sputter-deposited CoFe(B)/MgO/Si metal-insulator-semiconductor tunneling junctions for injection and detection of spin polarized current in silicon. The multilayers have been deposited in 700 nm deep trenches, patterned in thick SiO2dielectric, on n- and p-doped wafers. The films inside the trenches are continuous with a correlated and low roughness. The MgO barrier grows amorphous without indication of pinholes. The dc and ac transport properties of the junctions were studied as a function of temperature and frequency. A relatively high interface trap density at the MgO/Si-interface is extracted from admittance spectra measurements. Transport is dominated by majority carriers in the case of n-doped and by minority carriers for the p-doped wafers. This leads to distinct rectification characteristics for the two wafer types, which would significantly influence the spin injection efficiency of the tunneling junctions. [J295]

"Analysis of temperature-dependent barrier heights in erbium-silicided Schottky diodes"

We manufactured erbium-silicided Schottky diodes on n-type and p-type silicon substrates to determine the Schottky barrier heights for electrons and holes, respectively. The effective barrier heights were extracted from the current-voltage-temperature characteristics of the Schottky diodes in reverse-bias condition. The barrier heights were obtained as a function of temperature, decreasing with the decrease of temperature. Low effective barrier heights at low temperature may be due to the trap-assisted current at the erbium silicide/silicon Schottky junction. The temperature-independent barrier heights for electrons and holes were evaluated to be 0.39 and 0.69eV, respectively, at high temperature by fitting the effective barrier heights as a function of temperature. In this case, the carrier conduction mechanism can be explained by the pure thermionic emission model. [J296]

"Investigation of negative coercivity in one layer formation of soft and hard magnetic materials"

A single layer consists of CoFe soft and LaCoFeO hard magnetic materials was deposited using the cosputtering method. Microstructure analysis of the layer demonstrated that CoFe particles were surrounded by a LaCoFeO shell and the ratio of the thicknesses was dependent on the amount of La and on the O2/(Ar+O2)gas flow ratio used during sputtering. When the O2/(Ar+O2)gas flow ratio was increased from 7% to 13%, coercivity (Hc)along the hard axis decreased from 11.3Oeat 7% to -9.1Oeat 11%. At a gas flow ratio of 13%, the coercivity increased to 11.7Oe. The results of the present study show that negative coercivity Hc 0is caused by interactions between two single domains of soft and hard magnetic materials. This interaction was modeled and described in detail using an extension of Heisenberg's model to the case of two domains. The results of the present study, demonstrating the conditions required to obtain negative Hc, can be applied to other pairs of soft-hard magnetic materials. [J297]

"Oxidation processes of surface hydrogenated silicon nanocrystallites prepared by pulsed laser ablation and their effects on the photoluminescence wavelength"

Natural oxidation processes of surface hydrogenated silicon nanocrystallites prepared by pulsed laser ablation under various hydrogen gas pressures are discussed by measuring the vibrational frequency of Si-Hnunits on the surface and intensity of Si-O-Sistretching vibration. The surfaces of nanocrystallites are predominantly composed of Si-Hbonds and oxidation starts from backbonds of these bonds. The deposited nanocrystal films have a porous secondary structure which depends on the background gas pressure. The oxidation rate observed by infrared absorption measurements depended on this porous secondary structure. The oxidation process is discussed by the correlation between oxidation rate and porous structure of nanocrystal film. We found that Si-Obond density increases with covering the surface of the nanocrystallites during the diffusion of oxygen-related molecules through the void spaces in the porous structure. The surface oxidation of each nanocrystallite is not homogeneous; after the coverage of easy-to-oxidize sites, oxidation continues to gradually progress at the post-coverage stage. We point out that the oxidation process at coverage and post-coverage stages result in different photoluminescence (PL) wavelengths. Adsorption of the water molecule before oxidation also affects the PL wavelength. Defect PL centers which have light emission around 600 and 400 nm are generated during the coverage and post-coverage oxidation processes, respectively. [J298]

"Effect of capacitive to inductive coupling transition in multiple linear U-type antenna on silicon thin film deposition from pure Si H 4 discharges"

Using a large area internal-type inductively coupled plasma (ICP) source called "multiple U-type ICP source" having the size of 1020Ч830mm2, the electrical properties of the antennas and the dissociation characteristics were investigated as a function of rf power using pure SiH4and their influence on the deposited silicon films was studied. With increasing rf power, the plasma mode has changed from capacitively coupled plasma (Emode) to inductively coupled plasma (Hmode), and the change of plasma mode increased the ratios of HFulcher*/SiH*and Si*/SiH*by changing the electron energy distribution function. In addition, the increase in HFulcher*/SiH*changed the microstructure of a silicon thin film deposited on glass substrates from amorphous to microcrystalline. At the high rf power regime of 4000W, a silicon films having the crystalline volume fraction of 53% with optical band gap (Tauc') of about 2.1eVand dark conductivity of 2.4Ч10-5Omega -1cm-1could be obtained at 20mTorrof SiH4[70SCCM(SCCM denotes cubic centimeter per minute at STP)]. [J299]

"Influence of the microstructure on steel hardening in pulsed plasma nitriding"

The plasma technologies are widely used in metal surface engineering processes. Basically, these treatments improve the mechanical, tribological, and chemical properties of the material such as wear resistance, hardness, fatigue resistance, friction, and corrosion resistance. In this work, a comprehensive study of the influence of the microstructure on hardness of AISI P20 steel treated at different temperatures and times by pulsed plasma nitriding is reported. The processes were done by using a pulsed plasma industrial system. The samples were characterized by nano-indentation (hardness), x-ray diffraction (XRD), scanning electron microscopy (SEM), and x-ray dispersion spectroscopy (EDS). At lower treatment temperatures (360 °C), a high density of small lamellar precipitates, constituted by more epsilon -Fe2-3Nphase than gamma '-Fe4Nphase, is formed. At intermediate treatment temperatures (480 °C), big lamellar precipitates, constituted by more gamma '-Fe4Nphase than epsilon -Fe2-3Nphase, are formed at grain boundary. At higher treatment temperatures (520 °C), the nitrided layer does not contain lamellar precipitates and it is only constituted by alpha -Fephase saturated in nitrogen. Hardness depends on size, shape, and distribution of precipitates and crystalline phases (microstructure). The higher hardness values are obtained when more and smaller lamellar precipitates are presented and constituted by more epsilon -Fe2-3Nphase. [J300]

"Fabrication and properties of Cu-Ni mixed-metal periodical array for midinfrared filtering and hydrophobic application"

Cu was grown successfully on Ni film as a conductive layer that demonstrated a stronger Cu (111) preferred crystallographic orientation. Furthermore, we studied the scale effect of various periods of patterned Ni lines separated by variable widths of SiO2. When Cu was electroplated onto this patterned Ni, it preferentially deposited on the Ni edges adjacent to the SiO2stripes, resulting in a Cu-Ni-Cu-SiO2, Cu-SiO2-Cu, or Cu-Cu structure, depending on the dimensions of the starting Ni pattern and the deposition time. There are two reflective dips at 2.2 and 8mcmwavelengths using Fourier transform infrared spectroscopy, which revealed a trend of narrower bandwidth in reflective spectra and a redshift effect with increasing deposition time. Interestingly, a hydrophobic surface was also observed due to its particular surface-roughness structures that could be controlled by the deposition time and altered the contact angle from 72° to 110° without coating any extra low free-energy materials. [J301]

"Fabrication of concave gratings by curved surface UV-nanoimprint lithography"

The authors report a new method for fabricating submicron gratings on curved substrates by combining thermoforming and nanoimprint technologies. A preshaping film was used to provide uniform pressure distribution throughout the whole concave substrate with the diameter of 60mmand the radius of curvature of 92.5mm. The concave glass could be resin coated uniformly by a conventional spin coater through the support of a soft holder. Either the preshaping film or the soft holder could be a buffer layer to prevent the curved glass from crumbling, which may result from high gas pressure during the imprint process. As for demonstration, a Rowland circle type concave grating with a period of 1.2mcmwas made, and the measured first order reflectance was about 20% at various wavelengths. [J302]

"Interfacial and electrical properties of Zr x Ti 1-x O 4 (x=0.66) films deposited by liquid-delivery metal organic chemical vapor deposition to be used as high-k gate dielectric"

ZrxTi1-xO4(x=0.66)films were deposited on p-type Si (100) substrate using liquid-delivery metal organic chemical vapor deposition using Zr(O-C3H7)2{(C11H19O2)2}and Ti(O-C3H7)2{(C11H19O2)2}precursors. Postdeposition rapid thermal annealing was performed in N2ambient to improve the electrical characteristics of the films. The postdeposition annealed samples show excellent electrical characteristics, such as low values of effective oxide charge density, flatband voltage, hysteresis, oxide trap charge density, and interface state density. No metal silicides were found in the films. A minimum leakage current density of the order of 10-5A/cm2at a bias voltage of -1Vhas been obtained even after annealing at 800°C. [J303]

"Characterization of photoconductive CdS thin films prepared on glass substrates for photoconductive-sensor applications"

Cadmium sulfide (CdS) thin films with n-type semiconductor characteristics were prepared at room temperature on glass substrates by radio-frequency magnetron sputtering for photoconductive-sensor applications. Films deposited at room temperature exhibit polycrystalline phases and show smooth surface morphologies. The deposition rate of the films decreases with increasing working pressure. The dark- and photoresistances in 400-nm-thick CdS films deposited at 6.7Ч10-1Paand 80Wwere approximately 1Ч105and 3Ч104Omega /sq, respectively. Lowering both the dark- and photoresistances lowers the sensitivity (Rdark/Rphoto)of the resistance. [J304]

"X-ray excited optical luminescence detection by scanning near-field optical microscope: A new tool for nanoscience"

Investigations of complex nanostructured materials used in modern technologies require special experimental techniques able to provide information on the structure and electronic properties of materials with a spatial resolution down to the nanometer scale. We tried to address these needs through the combination of x-ray absorption spectroscopy (XAS) using synchrotron radiation microbeams with scanning near-field optical microscopy (SNOM) detection of the x-ray excited optical luminescence (XEOL) signal. This new instrumentation offers the possibility to carry out a selective structural analysis of the sample surface with the subwavelength spatial resolution determined by the SNOM probe aperture. In addition, the apex of the optical fiber plays the role of a topographic probe, and chemical and topographic mappings can be simultaneously recorded. Our working XAS-SNOM prototype is based on a quartz tuning-fork head mounted on a high stability nanopositioning system; a coated optical fiber tip, operating as a probe in shear-force mode; a detection system coupled with the microscope head control system; and a dedicated software/hardware setup for synchronization of the XEOL signal detection with the synchrotron beamline acquisition system. We illustrate the possibility to obtain an element-specific contrast and to perform nano-XAS experiments by detecting the Zn Kand W L3absorption edges in luminescent ZnO and mixed ZnWO4-ZnOnanostructured thin films. [J305]

"Tunable double dots and Kondo enhanced Andreev transport in InAs nanowires"

The effect of Kondo correlations on the subgap structure of a quantum dot contacted by superconducting leads is investigated experimentally in indium-arsenide nanowires. When the zero-bias Kondo effect is suppressed by the superconducting pairing of the electrons a profound enhancement of the first-order Andreev reflection is observed. Devices with local gate control allow individual tuning of multiple quantum dots along the wire, a double dot with tunable interdot coupling is demonstrated. [J306]

"Structural and electrical properties of Bi 1.5 Mg 1.0 Nb 1.5 O 7 thin films deposited on Pt /TiO 2 /SiO 2 /Si substrates by rf-magnetron sputtering"

Bi1.5Mg1.0Nb1.5O7thin films were deposited at various temperatures by rf-magnetron sputtering on Pt/TiO2/SiO2/Sisubstrates. The structural and electrical properties were investigated as a function of deposition temperature. The films deposited below 400 °Cshow an amorphous state and a dielectric constant of approximately 31-51. On the other hand, films deposited at 500 °Cexhibit well-developed crystallinity and a high dielectric constant of approximately 104. However, for crystallized films deposited at 500 °C, the leakage current density is higher than that of the films deposited below 300 °C. [J307]

"Patterning chalcogenide glass by direct resist-free thermal nanoimprint"

In this article, patterning As2S3chalcogenide glass is investigated from a nanoimprint perspective. Thermal nanoimprint was used to successfully pattern As2S3microstructures. Due to the high melt viscosity of As2S3, patterns of a few microns and submicrons can be well formed, while larger patterns cannot be faithfully replicated due to limited melt flow when a thin initial film is used. Accelerated crystallite formation after nanoimprint was observed and a method to suppress crystallites was explored. In patterned As2S3microstructures, optical birefringence was observed near the pattern edges, which potentially has a significant impact on the optical properties of patterned microstructures. It was also observed that significant surfactant wear occurs after just a few nanoimprints. A new surfactant with better temperature stability was proposed and its durability was compared to commonly used nanoimprint surfactant such as heptadecafluoro-1,1,2,2-tetrahydrodecyl trichlorosilane. [J308]

"Fabrication of single-crystalline Li Ta O 3 film on silicon substrate using thin film transfer technology"

High-quality LiTaO3thin films on silicon substrates are important for the application of silicon-based optoelectronic integration technology. In this article, single-crystalline LiTaO3thin films were achieved by wafer-bonding and layer-transfer technology. Cross-sectional transmission electronic microscopy (TEM) and x-ray diffraction results indicate that the LiTaO3thin films are single crystalline and have good structural quality. After hydrogen implantation and annealing, the surfaces of LiTaO3samples were investigated in detail using optical microscopy and TEM. Results show that dose and implantation energy of hydrogen can both have effect on the cleavage of a thin surface section from a LiTaO3wafer. [J309]

"Effect of substrate temperature on structural and electrical properties of liquid-delivery metal organic chemical vapor deposited indium oxide thin films on silicon"

Indium oxide conducting films were deposited on p-type Si (100) substrates at various temperatures by a liquid-delivery metal organic chemical vapor deposition technique using indium (III) tris(2,2,6,6-tetramethyl-3,5-heptanedionato) (dpm)3precursors. The structural, morphological, and chemical bonding features of these films were studied by x-ray diffraction, scanning electron microscopy, and x-ray photoelectron spectroscopy. The effect of substrate temperature on the electrical and structural properties has been investigated to obtain a high mobility and highly conducting In2O3film. All deposited films within the temperature range of 200-400°Chave a [111] preferred orientation and exhibit an increase of grain size from 21to33nmwith increasing deposition temperature. In this range of deposition temperature, there is no metallic indium phase in deposited films. It was observed that the electrical properties of the films are closely related to the microstructure of the films. Hall mobility and electrical resistivity values of the films are comparable to most of the presently investigated transparent conducting oxide films. [J310]

"In situ field emission characterization of multiwalled carbon nanotubes"

The field emission (FE) properties of carbon nanotubes (CNTs) are measured using nanomanipulators fitted within a scanning electron microscope. We initially investigate a group of randomly arranged CNT at the apex of a carbon fiber. Second, we use a CNT polymer composite as a substrate and physically crack it to expose CNTs. We have developed a means of selectively picking up, moving, welding, and even "burning off" unwanted CNTs to leave a fully isolated CNT for FE testing. Using the nanomanipulators, we are able to achieve anode to CNT distances down to 1mcmat a minimum step size of 40nm. We show that the location of the anode plays an important role in understanding the emission process of CNTs, which ties in with previously reported work. Finally, we create a bespoke gate electrode by focussed ion beam milling of a tungsten probe and use this in investigating three terminal FE measurements of a single CNT. [J311]

"A fast sonochemical approach for the synthesis of solution processable ZnO rods"

A solution based sonochemical synthesis method for ZnO rods is presented with a resulting growth rate in excess of 15 times faster than previously reported. Such material is solution processable and could be exploited

in the fabrication of transparent conductors and/or large area electronics via inkjet printing methods or solution based self-assembly techniques. To understand the crystal structure and defects chemistry, the as-synthesized wurtzite crystal structures were compared and contrasted with rods grown by the more traditional and well characterized hydrothermal growth method. Fluorescence spectra were recorded and the emission characteristics correlated with the structural and conductive properties of the ZnO rods. In particular, the sonochemical crystals appear to have a higher degree of order with fewer defects. This study represents a first step toward the tailoring of the electronic properties of ZnO rods. In particular, we will concentrate on the influence that native defects have on electrical conduction and on photoluminescence. Furthermore, we show how the intensity of the ultrasonic power exploited in this synthesis has a direct influence on the crystal quality as revealed by a comparative study. An optimum value between 30% and 35% of the maximum amplitude of a 20 kHz ultrasonic probe was found to give the best conditions for the growth of crystals with fewer defects density, while at ca. 25% of the maximum amplitude we observed the higher intensities for the fluorescence spectra both in the ultraviolet and in the visible range. [J312]

"Electronic state modification in laser deposited amorphous carbon films by the inclusion of nitrogen"

In this study, we investigate the effect of the inclusion of nitrogen in amorphous carbon thin films deposited by pulsed laser deposition, which results in stress induced modifications to the band structure and the concomitant changes to the electronic transport properties. The microstructural changes due to nitrogen incorporation were examined using electron energy-loss spectroscopy and Raman scattering. The band structure was investigated using spectroscopic ellipsometry data in the range of 1.5-5 eV, which was fitted to the Tauc Lorentz model parametrization and optical transmittance measurements. The dielectric constant evaluated using optical techniques was compared to that obtained with electrical measurements, assuming a Poole-Frenkel type conduction process based on the best fits to data. The electrical conduction mechanism is discussed for both low and high electric fields, in the context of the shape of the band density of states. By relating a wide range of measurement techniques, a detailed relationship between the microstructure, and the optical and the electrical structures of a-CNxfilms is obtained. From these measurements, it was found that, primarily, the change in density of the film, with increasing nitrogen pressure, affects the band structure of the amorphous carbon nitride. This is due to the fact that the density affects the stress in the film, which also impacts the localized states in the band gap. These results are supported by density of states measurements using scanning tunneling spectroscopy. [J313]

"Hydrogenation and thermal stability of nano- and microcrystalline diamond films studied by vibrational electron spectroscopy"

The influence of high temperature annealing of hydrogenated diamond films with average grain size of 300and 5nmon surface degradation by graphitization is reported. Ex situ microwave plasma hydrogenation was applied to obtain fully hydrogenated diamond surfaces. Hydrogen bonding and near surface phase composition of both films were studied by high resolution electron energy loss spectroscopy (HR-EELS) and electronic EELS. C-H vibrational modes, phonon losses, and their overtones were measured by HR-EELS and bulk and surface plasmons by EELS. In situ vacuum annealing at 1000 °Cresults in hydrogen desorption and reconstruction of both kinds of surfaces, detected by vanishing of C-H peaks and appearance of sp2hybridized carbon features. Our results suggest that graphitization induced by hydrogen desorption occurs to a larger extent on the surface of 5nmgrain size films. Subsequent in situ atomic hydrogen exposure of both films' surfaces results in hydrogen adsorption and recovery of the diamond surface, as evidenced by C-H vibrational modes and optical phonon losses. In both cases the film surface does not recover to its previous state, while the degree of degradation is larger for the 5nmdiamond grain size, where a clear mixed carbon sp2/sp3near surface phase composition is evidenced from both HR-EEL and EEL spectra. [J314]

"Plasma etching of SiO 2 using remote-type pin-to-plate dielectric barrier discharge"

Atmospheric pressure plasma etching of SiO2was examined using a modified remote-type dielectric barrier discharge (DBD), called "pin-to-plate DBD." The effect of adding four gases CF4, C4F8, O2, and Ar to the base gas mixture containing N2(60 slm) (slm denotes standard liters per minute)/NF3(600 SCCM) (SCCM denotes cubic centimeter per minute at STP) on the SiO2etch characteristics was investigated. The results showed that the SiO2etch rate decreased continuously with increasing C4F8(200-800 SCCM) addition, whereas the SiO2etch rate increased with increasing CF4(1-10 slm) addition up to 7 slm CF4. This increase in the SiO2etch rate up to 7 slm CF4was attributed to the effective removal of Si in SiO2by F atoms through the removal of oxygen in SiO2by carbon in the CFXin the plasma. However, the decrease in SiO2etch rate with further increases in CF4flow rate above 7 slm was attributed to the formation of a thick C-F polymer layer on the SiO2surface. A SiO2etch rate of approximately 243 nm/min was obtained with a gas mixture of N2(60 slm)/NF3(600

SCCM)/CF4(7 slm), and an input voltage and operating frequency to the source of 10 kV and 30 kHz, respectively. The addition of 200 SCCM Ar to the above gas mixture increased the SiO2etch rate to approximately 263 nm/min. This is possibly due to the increased ionization and dissociation of reactive species through penning ionization of Ar. [J315]

"GaN-based microdisk light emitting diodes on (111)-oriented nanosilicon-on-insulator templates"

InGaN/GaN microdisk light emitting diodes (LEDs) on (111)-oriented nanosilicon-on-insulator (nano-SOI) substrates are demonstrated. The (111)-oriented thin SOI substrates are prepared by separation by implantation of oxygen (SIMOX) method. The InGaN/GaN LED structures are grown on these SIMOX templates by metal-organic chemical vapor deposition. The circular mesa patterns are created by standard LED processing steps including photolithography, inductively coupled plasma etching, and contact metallization. Due to the reflectivity changes at the bottom Si/SiO2interfaces beneath AlN buffer, an improved light extraction from these LEDs has been observed. The room-temperature electroluminescence (EL) spectrum of the microdisk LEDs on SOI shows multiple interference peaks due to the reflections at the Fabry-Perot boundaries and such effect resulted in an increased integrated EL intensity. For a comparative analysis of light extraction with respect to similar LED structures grown on bulk Si(111), a detailed reflectivity analysis has been carried out to verify the LED structures and to model the EL lineshapes. [J316]

"Optical antennas: A boost for infrared detection"

Optical antennas that operate at infrared wavelengths are studied for their potential application in enhancing the sensitivity of infrared detectors. Huge enhancement of infrared intensity can be achieved at the gap region of dipole and bowtie aperture antennas. The intensity enhancement is found to increase monotonically with a narrower gap size. The infrared radiation is also found to be concentrated above and below the antenna plane at the gap region, which allows for easy integration of the optical antennas with infrared detectors. The advantages of the infrared antennas, such as strong field enhancement and easy fabrication, may present a viable solution toward achieving highly sensitive and highly compact uncooled infrared detectors to impact numerous infrared technologies. [J317]

"Sub-50 nm resolution surface electron emission lithography using nano-Si ballistic electron emitter"

It is demonstrated that parallel electron beam lithography using a nano-Si planar ballistic electron emitter (PBE) provided the resolution below 30nmeven in a low accelerating voltage. This high resolving power is explained by the nature of ballistic electron transport in nanocrystalline silicon. The parallel EB lithography was performed on a 1:1 electron imaging system. The system was composed of the PBE as a patterned surface electron source, a target wafer parallel to the surface electron source, and vertical electromagnetic fields. The PBE projected a patterned electron image on the target. A replica of the pattern was transferred into a resist on the target wafer within less than 1s. The experimental exposure was performed over 10mm2area. The PBE was composed of a thin metal surface electrode, nanosilicon layer, and semiconductor substrate. The electrons injected from semiconductor substrate were accelerated via cascade tunneling through the nanosilicon layer and reached the outer surface as ballistic or quasiballistic electrons. As a result, the chromatic aberration limiting resolution is expected to be quite small. The 1:1 electron imaging system based on the PBE provides promising solution for high resolution and high throughput lithography with low cost system with the simple electron optics for the next generation device fabrication in the sub-30nmscale. [J318]

"Improving organic thin-film transistor performance by nanoimprint-induced chain ordering"

The chain configuration in conjugated polymer films has a significant impact on the electronic and optical properties of polymer semiconductors, which in turn dictate the device performances of polymer electronics. This article presents a new method to control chain orientation in polymer semiconductors by direct nanoimprint. Nanoimprint-induced chain orientation in conjugated polymer imparts strong optical birefringence in patterned microstructures. X-ray diffraction on patterned films exhibits higher level of chain ordering as nanoimprint temperature increases. Polarized absorption spectra show progressive redshift at higher nanoimprint temperature. The carrier mobility in thin-film transistors based on nanoimprinted grating equals to 12 times of that without patterning. Anisotropies of material properties and device performance are observed in all conjugated polymer structures and devices patterned by nanoimprint. It is expected that the unique ability to control chain orientation will enable nanoimprint to play an important role in tailoring the performance of polymer electronics and sensors. [J319]

"Light transmission through a metallic/dielectric nano-optic lens"

The authors analyze transmission of a normally incident plane wave through a Ag/dielectric layered concentric ring structure using finite-difference time-domain (FDTD) analysis. The authors study the dependency of the transmission efficiency on the refractive index in slit. The numerical analysis indicates that the focusing beyond diffraction limit is found even at the extended focal length comparable to the distance of 7lambda from exit plane using a circularly polarized coherent plane wave, lambda =405nm. Especially, compared to Ag-only structure, the Ag/LiNbO3structure exhibits over 2.85 orders of larger transmission power. Therefore, this Ag/dielectric layered lens has the potential for significantly the high resolution imaging and optical data storage. [J320]

"Visible luminescence mechanism in nano ZnO under weak confinement regime"

We describe the structure of luminescence spectrum in the visible region in nano-ZnO in colloidal and thin film forms under weak confinement regime by modeling the transition from excited state energy levels of excitons to their ground state. Measurements on nanocrystallites indicate the presence of luminescence due to excitonic emissions when excited with 255 nm. The relevant energy levels showing the transitions corresponding to the observed peaks in the emission spectrum of ZnO of particle size 18 nm are identified. [J321]

"Effect of annealing on the spectral and nonlinear optical characteristics of thin films of nano-ZnO"

The annealing effect on the spectral and nonlinear optical (NLO) characteristics of ZnO thin films deposited on quartz substrates by sol-gel process is investigated. As the annealing temperature increases from 300-1050 °C, there is a decrease in the band gap, which indicates the changes of the interface of ZnO. ZnO is reported to show two emission bands, an ultraviolet (UV) emission band and another in the green region. The intensity of the UV peak remains the same while the intensity of the visible peak increases with increase in annealing temperature. The role of oxygen in ZnO thin films during the annealing process is important to the change in optical properties. The mechanism of the luminescence suggests that UV luminescence of ZnO thin films is related to the transition from conduction band edge to valence band, and green luminescence is caused by the transition from deep donor level to valence band due to oxygen vacancies. The NLO response of these samples is studied using nanosecond laser pulses at off-resonance wavelengths. The nonlinear absorption coefficient increases from 2.9Ч10-6to 1.0Ч10-4m/Wwhen the annealing temperature is increased from 300 to 1050 °C, mainly due to the enhancement of interfacial state and exciton oscillator strength. The third order optical susceptibility chi (3)increases with increase in annealing temperature (T)within the range of our investigations. In the weak confinement regime, T2.4dependence of chi (3)is obtained for ZnO thin films. The role of annealing temperature on the optical limiting response is also studied. [J322]

"Resistance switching of Au-implanted-ZrO 2 film for nonvolatile memory application"

The resistive switching characteristics and switching mechanisms of the Au-implanted-ZrO2film are extensively investigated for nonvolatile memory applications. Reversible resistance-switching behavior from a high resistance to low resistance state can be traced by dc voltage and pulse voltage. After more than 200 dc switching cycles, the resistance ratio between the high and low resistance states is more than 180 times under 0.7 V readout bias. In the voltage pulse test, the "write" and "erase" speeds can be as fast as 50 and 100 ns, respectively. No data loss is observed for more than 106s. The formation and rupture of conducting filamentary paths related to the implanted Au ions are suggested to be responsible for the resistive switching phenomenon. The dependence of resistance on temperature indicates that the variable-range hopping conduction mechanism is dominated in the low-resistance state, while the current characteristics are governed by the trap-controlled space limited conduction mechanism in the high-resistance state. [J323]

"Molecular dynamics study of ripples in graphene nanoribbons on 6H-SiC (0001) : Temperature and size effects"

Using the classical molecular dynamics and the simulated annealing techniques, we show that monolayer graphene nanoribbons (GNRs) on 6H-SiC(0001)surface form atomic scale rippled structures. From the analysis of atomic configurations, two different types of rippled structures in GNRs can be identified, namely, the periodic rippled structure at room temperature or even at lower temperatures and random ripples at high temperatures. The dependence of microscopic roughness of the ripples on temperature and size are studied through analyzing the covalent bonding inhomogeneities in bond-length and bond-angle distributions. Our results provide atomic-level information about the rippled GNRs on SiC substrate, which is useful not only for understanding the structure and stability of monolayer GNRs but also for future applications of GNRs in nanoelectronics. [J324]

"Numerical and experimental investigation of wedge tip radius effect on wedge plasmons"

We report numerical analysis and experimental observation of strongly localized plasmons guided by triangular

metal wedges and pay special attention to the effect of smooth (nonzero radius) tips. Dispersion, dissipation, and field structure of such wedge plasmons are analyzed using the compact two-dimensional finite-difference time-domain algorithm. Experimental observation is conducted by the end-fire excitation and near-field scanning optical microscope detection of the predicted plasmons on 40°silver nanowedges with the wedge tip radii of 20, 85, and 125 nm that were fabricated by the focused-ion beam method. The effect of smoothing wedge tips is shown to be similar to that of increasing wedge angle. Increasing wedge angle or wedge tip radius results in increasing propagation distance at the same time as decreasing field localization (decreasing wave number). Quantitative differences between the theoretical and experimental propagation distances are suggested to be due to a contribution of scattered bulk and surface waves near the excitation region as well as the addition of losses due to surface roughness. The theoretical and measured propagation distances are several plasmon wavelengths and are useful for a range of nano-optical applications. [J325]

"Study of surface passivation of strained indium gallium arsenide by vacuum annealing and silane treatment"

A study of the surface passivation of strained InGaAs using vacuum annealing and silane (SiH4)passivation was reported for the first time. X-ray photoelectron spectroscopy reveals the elimination of As-O bond after vacuum annealing and SiH4surface passivation. Vacuum annealing eliminated poor quality native oxide on InGaAs surface, while a thin silicon interfacial layer was formed by SiH4treatment, therefore effectively preventing the InGaAs surface from exposure to an oxidizing ambient during high-kdielectric deposition. Transmission electron micrograph confirmed the existence of a thin oxidized silicon layer between high-kdielectric and InGaAs. By incorporating this surface technology during gate stack formation, TaN/HfAlO/InGaAs metal-oxide-semiconductor capacitors demonstrate superior C-Vcharacteristics with negligible frequency dispersion, small hysteresis, and interface state density as low as (3.5Ч1011)-(5.0Ч1011)cm-2 eV-1. [J326]

"Epitaxial lateral overgrowth of InP on Si from nano-openings: Theoretical and experimental indication for defect filtering throughout the grown layer"

We present a model for the filtration of dislocations inside the seed window in epitaxial lateral overgrowth (ELO). We found that, when the additive effects of image and gliding forces exceed the defect line tension force, filtering can occur even in the openings. The model is applied to ELO of InP on Si where the opening size and the thermal stress arising due to the mask and the grown material are taken into account and analyzed. Further, we have also designed the mask patterns in net structures, where the tilting angles of the openings in the nets are chosen in order to take advantage of the filtering in the openings more effectively, and to minimize new defects due to coalescence in the ELO. Photoluminescence intensities of ELO InP on Si and on InP are compared and found to be in qualitative agreement with the model. [J327]

"Capture of nonmagnetic particles and living cells using a microelectromagnetic system"

We develop a microelectromagnetic system to trap nonmagnetic materials such as micropolystyrene particles and yeast cells in particular areas. We fabricate gold films, the width of the central narrow part is 22mcm, and flow an electric current through the films. We then apply an external uniform dc magnetic field to weaken the local magnetic field at the narrow part so that a nonuniform magnetic field is produced. We demonstrate that the particles, which are dispersed in magnetic fluid, are successfully trapped at the narrow part of the film. We evaluate the driving force acting on a microparticle in the nonuniform magnetic field and carry out a Stokesian dynamics simulation of the motion of the particles. We show that yeast cells are also trapped at the narrow part of the film. Finally, we fabricate multichannel microelectromagnets so that yeast cells are trapped at multiple points in the microelectromagnetic system. The present system may be applied to cell transfection on a cell microarray and, therefore, eventually contribute to progress in the identification and determination technologies of different drug targets and the functions of genes and proteins. [J328]

"Tunable bandgap structures of two-dimensional boron nitride"

Electronic structures of two-dimensional (2D) hexagonal boron nitride (h-BN) with different planar strain distributions have been studied using the first principles methods. We found that the 2D h-BN without strain has a large direct bandgap and its bandgap structure strongly depends on the strength and direction of the strain. The bandgap width can be reduced significantly under both symmetrical and asymmetrical strain distributions. Moreover, the bandgap feature exhibits strong anisotropic behaviors. The bandgap remains direct under large symmetrical tensile strain or asymmetrical tensile strain perpendicular to B-N bonds. However, a small amount of symmetrical compressive strain larger than 1.5% or asymmetrical tensile strain parallel to B-N bonds larger than 1.2% turns the direct bandgap into indirect. Our results indicate that optical and electronic transport properties of 2D h-BN can be effectively tuned by applying different planar forces, offering a unique route for designing

nanoscale tunable ultrathin optoelectronic devices only one atomic layer thick. [J329]

"Nano Ferrites Microwave Complex Permeability and Permittivity Measurements by T/R Technique in Waveguide"

There is a huge demand to accurately determine the magnetoelectrical properties of particles in the nano-sized regime due to the modern IC technology revolution and biomedical applications. In this paper, we present a microwave waveguide measurement technique for measuring complex permeability and permittivity of expensive nano-sized magnetic powder materials. We used a vector network analyzer to provide a standard TRL calibration for free space inside waveguide measurements. In order to maintain the recommended insertion phase range, a very thin prepared sample was loaded inside the calibrated waveguide. The loaded material's magnetic and dielectric effects were also considered in the cutoff wavelength calculation of the propagation constant of the TE10wave from the geometrical dimensions of the waveguides. These provisions make the permeability and permittivity measurements more reliable than those found by commonly used techniques. We used six different compounds of nano-sized ferrite powders (Fe3O4, CuFe2O4, CuFe2O4Zn, F12NiO3Zn, BaFe12O19, and SrFe12O19), in which the average diameter of nano particles is less than 40 nm, for measurement purposes. We measured the complex permeability and permittivity from 3.95 to 5.85 GHz. The results show that the dielectric permittivity of these materials is quite different from that of solid-state materials. [J330]

"Enhanced Output Power of GaN-Based LEDs With Nano-Patterned Sapphire Substrates"

GaN-based light-emitting diodes (LEDs) with an emitting wavelength of 450 nm were grown on nano-patterned sapphire substrates (NPSS) fabricated by nanosphere lithography. The crystalline quality of the epitaxial film could be improved by using the NPSS technique. The output power of LED grown on NPSS was 1.3 and 1.11 times higher than those of LEDs grown on conventional and patterned sapphire substrates at the injection current of 20 mA, respectively. The enhancement in output power could be contributed to the efficiently scattering by NPSS. But some voids formed at the GaN/NPSS interface cause a thermal dissipation problem of NPSS LED operated at high injection current. [J331]

"Advances in Giant Magnetoresistance Biosensors With Magnetic Nanoparticle Tags: Review and Outlook"

We present a review of giant magnetoresistance (GMR) spin valve sensors designed for detection of magnetic nanoparticles as biomolecular labels (nanotags) in magneto-nano biodetection technology. We discuss the intricacy of magneto-nano biosensor design and show that as few as approximately 14 monodisperse 16-nm superparamagnetic nanoparticles can be detected by submicron spin valve sensors at room temperature without resorting to lock-in (narrow band) detection. GMR biosensors and biochips have been successfully applied to the detection of biological events in the form of both protein and DNA assays with great speed, sensitivity, selectivity, and economy. The limit of molecular detection is well below 10 pM in concentration, and the protein or DNA assay time can be under two hours. The technology is highly scalable to deep multiplex detection of biomarkers in a complex disease, and amenable to integration of microfluidics and CMOS electronics for portable applications. On-chip CMOS circuitry makes a sensor density of 0.1-1 million sensors per square centimeter feasible and affordable. The theoretical and experimental results thus far suggest that magneto-nano biochip-based GMR sensor arrays and nanotags hold great promise in biomedicine, particularly for point-of-care molecular diagnostics of cancer, infectious diseases, radiation injury, cardiac diseases, and other diseases. [J332]

"Ultra-Low-Powered Aqueous Shear Stress Sensors Based on Bulk EG-CNTs Integrated in Microfluidic Systems"

Novel aqueous shear stress sensors based on bulk carbon nanotubes (CNTs) were developed by utilizing microelectrical mechanical system (MEMS) compatible fabrication technology. The sensors were fabricated on glass substrates by batch assembling electronics-grade CNTs (EG-CNTs) as sensing elements between microelectrode pairs using dielectrophoretic technique. Then, the CNT sensors were permanently integrated in glass-polydimethylsiloxane (PDMS) microfluidic channels by using standard glass-PDMS bonding process. Upon exposure to deionized (DI) water flow in the microchannel, the characteristics of the CNT sensors were investigated at room temperature under constant current (CC) mode. The specific electrical responses of the CNT sensors at different currents have been measured. It was found that the electrical resistance of the CNT sensors increased noticeably in response to the introduction of fluid shear stress when low activation current (Lt1 mA) was used, and unexpectedly decreased when the current exceeded 5 mA. We have shown that the sensor could be activated using input currents as low as 100 muA to measure the flow shear stress. The experimental results showed that the output resistance change could be plotted as a linear function of the shear stress to the

one-third power. This result proved that the EG-CNT sensors can be operated as conventional thermal flow sensors but only require ultra-low activation power (~ 1 muW), which is ~ 1000 times lower than the conventional MEMS thermal flow sensors. [J333]

"Characterization of Distribution of Trap States in Silicon-on-Insulator Layers by Front-Gate Characteristics in n-Channel SOI MOSFETs"

We characterized the distribution of trap states in silicon-on-insulator (SOI) layers in epitaxial layer transfer (ELTRAN) wafers and in low-dose separation by implanted oxygen (SIMOX) wafers. We measured the front- and back-gate characteristics of MOSFETs with SOI layers of different thicknesses. We used the current-Terman method to estimate the trap states at the gate oxide (GOX)/SOI interface and at the SOI/buried oxide (BOX) interface separately. As a result, we concluded that the high-density trap states in the SOI layers in SIMOX wafers cause a gate-voltage shift, which is attributed to the charged trap states only in the inversion layer. We also found that the trap states are distributed within about 30 nm from the SOI/BOX interface in the SOI layer in SIMOX wafers, which indicates that the distribution of trap states originates from the oxygen implantation that is peculiar to the SIMOX process. [J334]

"Guest Editorial on Nano-Optoelectronics and Applications"

This special issue features 23 articles which focus on nano-optoelectronics and applications. [J335]

"Nano-Processing Techniques Applied in GaN-Based Light-Emitting Devices With Self-Assembly Ni Nano-Masks"

We have developed a simple method to fabricate nanoscale masks by using self-assembly Ni clusters formed through a rapid thermal annealing (RTA) process. The density and dimensions of the Ni nano-masks could be precisely controlled. The nano-masks were successfully applied to GaN-based light-emitting diodes (LEDs) with nano-roughened surface, GaN nanorods, and GaN-based nanorod LEDs to enhance light output power or change structure properties. The GaN-based LED with nano-roughened surface by Ni nano-masks and excimer laser etching has increased 55% light output at 20 mA when compared to that without the nano-roughened process. The GaN nanorods fabricated by the Ni nano-masks and ICP-RIE dry etching showed 3.5 times over the as-grown sample in photoluminescence (PL) intensity. The GaN-based nanorod LEDs assisted by photo-enhanced chemical (PEC) wet oxidation process were also demonstrated. The electroluminescence (EL) intensity of the GaN-based nanorod LED with PEC was about 1.76 times that of the as-grown LED. The fabrication, structure properties, physical features, and the optical and electrical properties of the fabricated devices will be discussed. [J336]

"Microwatt MOSLED Using With Buried Si Nanocrystals on Si Nano-Pillar Array"

Microwatt light emission from a metal-oxide-semiconductor light-emitting diode (MOSLED) made by using SiOx film with buried Si nanocrystals on Si nano-pillar array is demonstrated. The Si nano-pillar array obtained by drying the rapidly self-aggregated Ni nano-dot-masked Si substrate exhibit size, aspect ratio, and density of 30 nm, 10, and 2.8times1010cm-2, respectively. These high-aspect-ratio Si nano-pillar array helps to enhance the Fowler-Nordheim tunneling-based carrier injection and to facilitate the complete relaxation on total internal reflection, thus increasing the quantum efficiency by one order of magnitude and improving the light extraction from the nano-roughened device surface by three times at least. The light-emission intensity, turn-on current and power-current slope of the MOSLED are 0.2 mW/cm2, 20-30 muA, and 3plusmn0.5 mW/A, respectively. At a biased current of 400 muA, the highest external quantum efficiency is over 0.2% to obtain the maximum EL power of > 1 muW. Compared with the same device made on smooth Si substrate under a power conversion ratio of 1 times 10-4, such an output power performance is enhanced by at least one order of magnitude. [J337]

"Progress in Epitaxial Growth and Performance of Quantum Dot and Quantum Wire Lasers"

We report on interplay of epitaxial growth phenomena and device performance in quantum dot (QD) and quantum wire (QWW) lasers based on self-organized nanostructures. InAs QDs are the most explored model system for basic understanding of "near-ideal" QD devices. Vertically-coupled growth of QDs and activated phase separation allow ultimate QD wavefunction engineering enabling GaAs lasers beyond 1400 nm and polarization-insensitive optical amplification. A feasibility of QD semiconductor optical amplifiers at terabit frequencies using InAs QDs is manifested at 1300 and 1500 nm. 1250-1300 nm QD GaAs edge emitters and VCSELs operate beyond 10 Gb/s with ultimate temperature robustness. Furthermore, temperature-insensitive operation without current or modulation voltage adjustment at >20 Gb/s is demonstrated up to ~90 degC. Light-emitting devices based on InGaN-QDs cover ultraviolet (UV) and visible blue-green spectral ranges. In these

applications, InN-rich nanodomains prevent diffusion of nonequilibrium carries towards crystal defects and result in advanced degradation robustness of the devices. All the features characteristic to QDs are unambiguously confirmed for InGaN structures. For the red spectral range InGaAlP lasers are used. Growth on misoriented surfaces, characteristic to these devices, leads to nano-periodi- cally-step-bunched epitaxial surfaces resulting in two principal effects: 1) step-bunch-assisted alloy phase separation, leading to a spontaneous formation of ordered natural super lattices; 2) formation of quantum wire-like structures in the active region of the device. A high degree of polarization is revealed in the luminescence recorded from the top surface of the structures, in agreement with the QWW nature of the gain medium. QD and QWW lasers are remaining at the frontier of the modern optoelectronics penetrating into the mainstream applications in key industries. [J338]

"Enhanced Terahertz Emission From ZnSe Nano-Grain Surface"

ZnSe(111) nano-grain surface is fabricated by the femtosecond laser ablation technology and is applied for terahertz (THz) generation. Compared with bare ZnSe surface, this nano-grain surface can improve THz emission properties. The power of THz radiation from ZnSe nano-grain surface is about twice as large as that from bare surface at optical rectification range. This enhancement can be attributed to the local field enhancement of the ZnSe nano-grain surface. The primary field enhancement mechanism is the macroscopic local-field enhancement which includes both of the lightning-rod effect and the local-plasmon effect. [J339]

"Drive Current Enhancement in Silicon-on-Quartz MOSFETs"

We proposed the advantages of MOSFETs fabricated on silicon-on-quartz (SOQ) wafers over MOSFETs on silicon-on-insulator (SOI) wafers. We demonstrated by device simulation that ionized acceptors under a buried oxide (BOX) layer are eliminated in an SOI MOSFET with a BOX layer that is thick enough in an SOQ MOSFET, and carriers in the channel are induced more effectively by the gate electric field in SOQ MOSFETs than in SOI MOSFETs. Additionally, we confirmed experimentally the enhancement of induced carriers and its resultant improvement of the subthreshold characteristics and transconductance characteristics in SOQ MOSFETs. [J340]

"Thermomechanical Reliability of Nickel Pillar Interconnections Replacing Flip-Chip Solder Without Underfill"

Interconnect technologies between ICs and packages or boards have a significant impact on the IC performance and packaging density. Today, the interconnections are typically accomplished with either wire bonding or flip-chip solders. While both of these technologies are incremental, they also run into either electrical or mechanical barriers as they are extended to higher density of interconnections. Downscaling traditional solder bump interconnect might not satisfy the thermomechanical reliability requirements at very fine-pitches. Alternate interconnection approaches such as compliant interconnects typically require lengthy connections and are therefore limited in terms of electrical properties, although expected to meet the mechanical requirements. This paper reports fine-pitch interconnection technologies using nano-structured nickel as primary interconnection material. The nano-grained nickels are produced by electroplating process. The primary nano-structured interconnects are assembled with different bonding methods to provide organic compatible low-temperature fabrication. Au-Sn and Sn-Cu are used for solder-based assembly of nano-nickel interconnections. Low modulus anisotropic conductive films (ACFs) are also used as an alternate bonding route of the solders. No underfilling is used in all the interconnect structures evaluated in this paper. Assembly are accomplished on different coefficient of thermal expansion (CTE) substrates including FR-4 with 18 ppm/degC, advanced organic substrates with 10 ppm/degC, novel low CTE (3 ppm/degC) substrates based on carbon-silicon carbide (C-SiC). The thermomechanical reliability of all the nano-interconnects assembled on different CTE substrates with different bonding approaches is evaluated by thermal shock testing and finite-element analysis. Nano-nickel interconnects bonded with the ACF showed the highest reliability withstanding 1500 cycles. In all cases, no apparent failure was observed in the primary nano-nickel-- metal interconnects. This technology is expected to be easily downscaled to submicrometer and nano-scale unlike the current solder technologies leading to true nano-interconnections. [J341]

"Bed of Nails-100- m-Pitch Wafer-Level Interconnections Process"

The rapid advances in integrated chip (IC) design and fabrication continue to challenge electronic packaging technology, in terms of fine pitch, high performance, low cost, and reliability. Demand for higher input/output (I/O) count per IC chip increases as the IC chip fabrication technology is continuously moving towards nano ICs with feature size less than 90 nm. As micro systems continue to move towards high speed and microminiaturization technologies, stringent electrical and mechanical properties are required. To meet the above requirements, chip-to-substrate interconnection technologies with less than 100-mum pitch are required. Currently, the coefficient of

thermal expansion (CTE) mismatch between the Si chip and the substrate serves as the biggest bottleneck issue in conventional chip to substrate interconnections technology, which becomes even more critical as the pitch of the interconnects is reduces. Further, the assembly yield of such fine-pitch interconnections also serves as one of the biggest challenges. Bed-of-nails (BoN) interconnects show great potential in meeting some of these requirements for next-generation packaging. In the present study, BoN interconnects prepared by a novel process called copper column wafer-level packaging is presented. The BoN interconnect technology is being developed to meet fine pitch of 100 mum and high-density interconnections. These BoN interconnects are demonstrated by designing a test chip of 10times10mm2size with 3338 I/Os and fabricated using an optimized process. The board-level reliability tests performed under temperature cycling in the range of -40degC to 125degC show promising results. [J342]

"Design of a transmission gate based CMOL memory array"

A design of a nanoelectronic memory array, compatible with both the molecular switch (nanodevice) electrical characteristics and CMOS 45 nm semiconductor technology node is presented. The proposed transmission gate based CMOL (hybrid CMOS/MOLecular) memory cell does not suffer from the operational difficulties faced by the conventional CMOL cell. The control circuitry with improved multiplexer designs is introduced, and it shows that the required voltage levels to program the nanodevices can be achieved. Moreover, the proposed memory cell has the same area as the existing CMOL inverter cell allowing easier implementation of both logic and memory circuits on the same chip. [J343]

"Circuit modelling of nano-devices"

A parsimonious set of ideal circuit components is proposed for dealing with the new devices produced by the emerging technologies, in particular nanotechnology. It is shown that only one of the four (alpha, beta) components, recently suggested by Chua, is necessary to their modelling. [J344]

"Study on Composite Material for Shielding Mixed Neutron and -Rays"

Optimized lightweight, compact and high temperature sustaining shielding materials for neutron and gamma radiation were developed by genetic algorithms (GA) combined with the Monte Carlo N-Particle (MCNP) code. A series of samples were designed according to the method. Deep penetration tests by the MCNP code were completed. The results show that the designed samples have more advantages related to the radiation shielding effects in comparison with PB202 and KRAFTON-XP3, especially the Cakes with multi-layers structures of the Fe-interlayer-Pb have excellent performance. Taking into account the ratios designed of components among elements in the material, the manufacturing process of polymer with nano-TiO2was studied experimentally by differential scanning calorimetry (DSC). Several samples have been tested. The attenuation experiments on the samples were carried out using tandem electrostatic accelerator neutron source, spontaneous fission neutron source of 252Cf and gamma-rays source of 60Co. The experimental results verify the correctness of optimal design and craft. The Cakes are quite suitable for applications in the practices of nuclear science and technology. [J345]

"Fabrication and characterisation of CMOS compatible silicon nanowire biosensor"

A silicon nanowire (SiNW) biosensor for label-free and real-time detection has been fabricated by complementary metal-oxide semiconductor (CMOS) technology. For the detection of prostate-specific antigen (PSA) used as a biomarker of prostate cancer the SiNW surface was modified to immobilise the antibody of PSA (anti-PSA). Real-time monitoring reveals the change in conductivity of the SiNW on specific binding of PSA to anti-PSA. For 355 nm SiNW, the response to 10 ng/ml of PSA was 7.3 . [J346]

"Junction Temperature Measurement of InAs Quantum-Dot Laser Diodes by Utilizing Voltage-Temperature Method"

Junction temperature of InAs quantum-dot laser diodes (LDs) is measured by utilizing a forward voltage-temperature method. Although the forward voltage decrease with junction temperature increment is low, the linear relation between forward voltage and temperature clearly occurs. It is found that SiNxis more useful than SiO2to keep junction temperature low. Injection current to shift the lasing wavelength from ground to excited state is increased over 200 mA by using SiNxinstead of SiO2as the insulating layer. As a result, ground state optical power is doubled. [J347]

"Book Reviews [J8 book reviews]"

The following books are reviewed in this issue: Electromagnetic Compatibility in Power Systems (Lattarulo, F.,

Ed.; 2007); Propellants and Explosives, Second Edition (Kubota, N.; 2007); Designing and Building Fuel Cells (Spiegel, C.S.; 2007); Handbook of Conducting Polymers, Third edition (Skotheim, T.A. and Reynolds, J.R.; 2007); Electrical Contacts-Fundamentals, Applications, and Technology (Braunovic, M. et al.; 2007); Nano and Micro-Electromechanical Systems, Second edition (Lyshevski, S.E.; 2005); Digital Filter Design Solutions (DeFreitas, J.M.; 2005); Statistics for Experimenters, Second edition (Box, G.E.P. et al.; 2005). [J348]

"Mode Analysis and Design of a Low-Loss Photonic Crystal 60 Waveguide Bend"

The guided modes of a two-dimensional photonic crystal straight waveguide and a waveguide bend are studied in order to find the high transmission mechanism for the waveguide bend. We find that high transmission occurs when the mode patterns and wave numbers match, while the single-mode condition in the waveguide bend is not necessarily required. According to the mechanism, a simply modified bend structure with broad high transmission band is proposed. The bandwidth is significantly increased from 19 to 116 nm with transmission above 90%, and covers the entire C band of optical communication. [J349]

"Loss-Reduction in Flexibly Vertical Coupled Ring Lasers Through Asymmetric Double Shallow Ridge and ICP/ICP Cascade Etching"

Loss-reduction in flexibly vertical coupled ring lasers is demonstrated through asymmetric double shallow ridge in the main ring area and inductively coupled plasma (ICP)/ICP cascade etching. Compared with the previous counterpart, the reduced threshold current and enhanced output power are obtained; coupling ratio is tuned from 27% to 1.5% when threshold current is varied from 60 to 80 mA. Single-mode lasing with sidemode-suppression ratio of 27 dB and quality factor of 13120 is achieved when Ic=15 mA, Id=58 mA, which are nearly twofolds of that in the previous one. Such strategies can be widely employed to reduce loss in other vertical coupled photonic circuits. [J350]

"30 Gb/s Over 100-m MMFs Using 1.1- m Range VCSELs and Photodiodes"

We developed 1.1-mum-range vertical-cavity surface-emitting lasers based on InGaAs-GaAs quantum wells, back-illuminated InGaAs photodiodes, and transimpedance amplifiers (InP heterojunction bipolar transistor) for high-speed optical interconnection. Clear eye opening operation and error-free transmission at 30 Gb/s over 100-m multimode fibers (GI32) were successfully achieved for the first time. [J351]

"Experimental Missions in W -Band: A Small LEO Satellite Approach"

W-band (75-110 GHz) is proposed nowadays as a valuable alternative to intensively-exploited Ku- and Ka-bands for high-speed transmission over satellite networks. In such a framework, some experiments are being carried out, which are targeted to verify the feasibility of exploitation of W-band for broadband service deployment. From a theoretical viewpoint, the large bandwidth availability and the scarce amount of interference typical of W-band should guarantee high capacities. Nevertheless, many crucial aspects are still to be carefully investigated, e.g., signal propagation issues, RF impairments, choice of modulation and coding, efficient antenna design, etc. In this paper, an overview is made on the low Earth orbit (LEO) nano-satellite mission in-orbit key-test and validation of W-band (IKNOW). IKNOW mission is an ongoing advanced feasibility study part of an Italian Space Agency Project, named W-band analysis and verification (WAVE), coordinated by the Department of Electronic Engineering, University of Rome ldquoTor Vergatardquo. The main objective of the IKNOW mission is to tackle some of the unexplored critical aspects concerning W-band satellite transmission. In such a perspective, IKNOW should be regarded as a ldquopilot mission,rdquo whose results will be used for a first uplink-downlink satellite channel characterization, in-orbit validation of W-band technology, and space qualification processes. This paper is focused on the research work carried out in a preliminary phase of the IKNOW study and will also consider a number of elements related to the mission configuration, payload architecture, link analysis, potential RF impairment factors, and atmospheric effects. Proposed analysis and preliminary results shown can provide to interested readers the basic guidelines that will drive the practical implementation of IKNOW mission, as well as the most relevant issues to be faced by future developers of W-band missions using small LEO satellites. [J352]

"Improved Light Output of Photonic Crystal Light-Emitting Diode Fabricated by Anodized Aluminum Oxide Nano-Patterns"

A photonic crystal (PC) light-emitting diode (LED) was fabricated using an anodized aluminum oxide (AAO) nano-pattern technique, which has potential applications to mass production. The AAO nano-pattern, which was anodized in 0.3-M oxalic acid at 70 V, was transferred to the n-GaN bottom cladding through reactive ion etching and covered during the regrowth of GaN to form periodic air holes. The PC was embedded into the

bottom cladding, which resulted in a low operating voltage. For the PC LED, the light output was enhanced by more than 20%, while the operating voltage increased only slightly. The radiation pattern of the PC LED showed two lobes at approximately plusmn30deg, which originated from the diffraction by PC. [J353]

"A Study on the Measurement Technique of Image Retention in AC Plasma Display Panels"

A technique for quantitatively measuring the image retention is suggested. This work focuses on dark image retention, which occurs during the reset period. To investigate the dark image retention phenomenon, characteristics of reset discharge were observed in accordance with the slope of the reset pulse. The temporal behaviors of luminance, chromatistic values, and infra red emission were observed with the black-level image after a five-minute repeatedly strong discharge. The image retention time of the luminance and chromatistic values increased with a decrease in the rising time of the reset ramp pulse. For the case of infrared (IR) emission, there was no clear tendency, in contrast with the image retention or temporal image sticking phenomenon. The results indicate that measurement of the temporal behaviors of luminance and chromatistic values provide suitable measurement for investigating the image retention in AC plasma display panels (PDPs), whereas the IR emission does not provide a useful guide in this regard. [J354]

"Local properties at interfaces in nanodielectrics: An ab initio computational study"

First-principles computational methodologies are presented to study the impact of surfaces and interfaces on the dielectric and electronic properties of emerging technologically important systems over length scales of the order of inter-atomic distances. The variation of dielectric constant across Si-SiO2, Si-HfO2and SiO2-polymer interfaces has been correlated to interfacial chemical bonding environments, using the theory of the local dielectric permittivity. The local electronic structure variation across Si-HfO2and SiO2-polymer interfaces, including band bending, band offsets and the creation of interfacial trap states have been investigated using a layer-decomposed density of states analysis. These computational methods form the groundwork for a more thorough analysis of the impact of surfaces, interfaces, and atomic level defects on dielectric and electronic properties of a wide variety of nano-structured systems. [J355]

"Quantum dot based nanophotonics and nanoelectronics"

Invention of non-disruptive fabrication technologies for semiconductor quantum dots presented a dream for generations of semiconductor device engineers. Today such technologies exist. A wealth of completely novel devices and such with dramatically improved properties based either on a single/few or a large density of quantum dots appears. Among them are single q-bit emitters, nano-flash memories, ultrafast lasers and amplifiers enabling a wealth of advanced systems. [J356]

"A 40-MHz Double Differential-Pair CMOS OTA With IM3"

A configuration of a linearized operational transconductance amplifier (OTA) for low-voltage and high-frequency applications is proposed. By using double pseudodifferential pairs and the source-degeneration structure under nano-scale CMOS technology, the nonlinearity caused by short channel effect from a small feature size can be minimized. A robust common-mode control system is designed for input and output common-mode stability and thus reduces distortion caused b y common-mode voltage variation. Tuning ability can be achieved by using MOS transistors in the linear region. The linearity of the OTA is about third-order inter-modulation (IM3) distortion for up to 0.9 at 40 MHz. This OTA was fabricated by the TSMC 180-nm deep n-well CMOS process. It occupies a small area of 15.1 x 10-3mm2and the power consumption is 9.5 mW under a 1.5-V supply voltage. [J357]

"Profile Control in Silicon Nanostructures Using Fluorine-Enhanced Oxide Passivation"

Nanostructures with controllable geometries are increasingly needed for mechanosensor applications due to their superior capabilities in measuring minute mechanical forces at small scales. Previous nanofabrication technologies are deficient in creating such structures due to high cost, complicated process and poor geometric control. In this paper, we introduce an innovative use of fluorine enhanced oxidation to realize a segment by segment sidewall control strategy for creating silicon nanostructures. This method is based on fluorine reactive ion etching, where the rich amount of fluorine species accumulated on the surface are utilized to enhance surface oxidation during an additional oxygen exposure. The experimental results showed good repeatability. The characteristic feature size of the resulting nanostructures is about 200 nm. The minimum feature size goes down to 50 nm. This method requires minimal use of equipment, and demonstrates good control of sidewall profiles. It thus has technical and economic significance in development of functional nanomechanosensors, which are potent for quantitative mechanical sensing and actuating at small scales. [J358]

"Direct Fabrication of Nanoscale Light Emitting Diode on Silicon Probe Tip for Scanning Microscopy"

We have fabricated a silicon microprobe integrated with a nanometer-sized light emitting diode (Nano-LED) on the tip. This paper describes the fabrication procedure and preliminary topographic testing results. The silicon probe with electrode pattern was made by wet-etching a silicon-on-insulator wafer using oxide as the mask. Subsequently, the probe tip was cut using a focused ion beam (FIB) to form a 150 nm-wide gap. Semiconductor nanoparticles (CdSe/ZnS core-shell nanoparticles) were electrostatically trapped and excited within the electrode gap made on the probe tip. The LED-tip is approximately 150 nm 150 nm. The nano-LED light intensity and current were measured as a function of the driving voltage up to 25 V. In addition to the electroluminescence peaks from the CdSe particles, possible emission from silicon dioxide doped in the FIB milling process was also observed in the measured spectra. Basic mechanical characteristics of the silicon probe were measured by mounting the probe on a tuning fork in a standard near-field scanning optical microscopy (NSOM) set up. It was observed that the drag force reduces the probe oscillation as the vibrating tip approached the near-field of the sample surface. The topographic images of a chromium test pattern on a glass substrate were successfully acquired by keeping the probe tip within roughly 5 nm from the sample surface. Although the probe tip shape and the location of the Nano-LED are yet to be further optimized before realizing near-field optical scanning experiment, the result showed its great promise as a new type of NSOM tip with the ldquoon-proberdquo light-source. [J359]

"Improved External Quantum Efficiency of GaN p-i-n Photodiodes With a TiO2 Roughened Surface"

Gallium nitride p-i-n ultraviolet photodiodes (PDs) with a titanium dioxide (TiO2) nano-particles roughened surface have been fabricated. It was found that the responsivity and external quantum efficiency can be improved 60% on the surface roughened PDs. It was also found that light absorption can be enhanced from various incident angles by the TiO2roughened surface. Furthermore, the high detectivity of 9.2 times 1013cmldrHz1/2ldrW-1can be achieved from the PD with a rough surface. [J360]

"Loser: Nanotechnology-Still Waiting for Nanotube Memory Chip"

Nantero's alternative to flash memory has reached its sell-by date. Nantero's technology, based on carbon nanotubes, seemed to be the opening salvo in the nano-technology revolution. Nanotechnology nanotube-based nonvolatile memory chip is developed. [J361]

"A Novel Nanocomposite With Photo-Polymerization for Wafer Level Application"

A novel nanocomposite photo-curable material which can act both as a photoresist and a stress redistribution layer applied on the wafer level was synthesized and studied. In the experiments, 20-nm silica fillers were modified by a silane coupling agent through a hydrolysis and condensation reaction and then incorporated into the epoxy matrix. A photo-sensitive initiator was added into the formulation which can release cations after ultraviolet exposure and initiate the epoxy crosslinking reaction. The photo-crosslinking reaction of the epoxy made it a negative tone photoresist. The curing reaction of the nanocomposites was monitored by a differential scanning calorimeter with the photo-calorimetric accessory. The thermal mechanical properties of photo-cured nanocomposites thin film were also measured. It was found that the moduli change of the nanocomposites as the filler loading increasing did not follow the Mori-Tanaka model, which indicated that the nanocomposite was not a simple two-phase structure as the composite with micron size filler. The addition of nano-sized silica fillers reduced the thermal expansion and improved the stiffness of the epoxy, with only a minimal effect on the optical transparency of the epoxy, which facilitated the complete photo reaction in the epoxy. [J362]

"Efficiency Enhancement of Light Extraction in LED With a Nano-Porous GaP Surface"

Electrodeless photoelectrochemical etching is developed to produce a nano-porous n-GaP surface. Pores of diameter 300-700 nm are distributed on the surface with a density 1.2 times 108cm-2. Such a porous surface structure exhibits a short mean free path for the transport of visible light and enhances photon scattering in a red AlInGaP-based light-emitting device. The efficiency of extraction of light emitted from the active layer becomes about 30%-50% greater than that without an etching treatment at a current of 20-40 mA. [J363]

"Silicon-Based 2-D Slab Photonic Crystal TM Polarizer at Telecommunication Wavelength"

We report an extremely compact (15.4 mum x 8 mum) silicon-based 2D slab nano photonic crystal (PC) transverse-magnetic (TM) polarizer which blocks propagation of the transverse-electric (TE) polarized light but

passes TM polarized light around telecommunication wavelength (1550 nm). The TE polarized light totally vanishes but the TM polarized light propagates with some attenuation in a length of mere 4.9 mum and it has a great potential to be integrated in a complex photonic integrated circuits. To our knowledge, this is the first experimental demonstration of a silicon-based PC TM polarizer at 1.55-mum wavelength. The plane wave expansion method (PWEM) and 2-D and 3-D finite-difference time-domain (FDTD) simulation were utilized to design a periodic triangular array of air holes in 340-nm-thick silicon with a diameter of 170 nm and pitch distance of 347 nm for the TM polarizer and 371 nm for the input and output waveguide. Such a PC TM polarizer was fabricated in silicon-on-insulator wafer using focused ion beam and reactive ion etching. The device was characterized using tunable lasers in the wavelength range of 1528 nm~1604 nm. Transmitted light intensities of the TE and TM polarized lights were measured which clearly showed the TE polarized light is filtered out around 1.55-mum wavelength. [J364]

"Building your yield of dreams [Jreview of Design for Manufacturability and Yield for Nano-Scale CMOS by Charles Chiang and Jamil Kawa; 2007]"

This is a review of Design for Manufacturability and Yield for Nano-Scale CMOS (by Charles Chiang and Jamil Kawa). DFM is a rapidly growing field that uses design techniques to improve manufacturing yield. However, the dilution in the interface between design and manufacturing implies that today, to build a circuit with enhanced yield, a designer must know more about manufacturing than ever before. The first step to embracing yield considerations is to learn about them, and this book portrays the landscape of this area in an excellent way. It describes methods for modeling variations, optimizing them, and learning to design around them when they occur. The overall structure of this book is well thought out and logical, and the reader who peruses it will be rewarded with an excellent view of the field. [J365]

"Design and Modeling of a Nanomechanical Sensor Using Silicon Photonic Crystals"

Conventionally a line defect in the photonic crystal (PhC) is used to create a waveguide for light propagation through the PhC. A PhC based filter is designed by introducing micro-cavities within the line defect so as to form the resonant bandgap structure for PhC. Such a PhC waveguide (PhCWG) filter shows sharp resonant peak in output wavelength spectrum. We proposed a suspended silicon bridge structure comprising this PhCWG filter structure. Since the output resonant wavelength is sensitive to the shape of air holes and defect length of the micro-cavity. Shift of the output resonant wavelength is observed for suspended PhCWG beam structure under particular force loading. In other words, the induced strain modifies the shape of air holes and the spacing among them. Such an effect leads to shift of resonant wavelength. Under optical detection limitation of 0.1 nm for resonant wavelength shift, the sensing capability of this nanomechanical sensor is derived as that vertical deformation is 20-25 nm at the center and the smallest strain is 0.005% for defect length. This innovative design conceptualizes a new application area for PhCs, i.e., the nanometer-scale physical sensors for strains and forces. [J366]

"Stress-induced curvature of focused ion beam fabricated microcantilevers"

Microcantilevers with very low spring constants, as required to measure the short-range Casimir force, can be fabricated by focused ion beam thinning of conventional atomic force microscope cantilevers, but the resulting beams have a stress-induced curvature. This can be explained by consideration of the implanted gallium ions and associated damage effects in the etched surface. The problem can be overcome by using a complementary etch method in which top and bottom surfaces of the microcantilever are etched by the same amount. [J367]

"Nano-Underfills for High-Reliability Applications in Extreme Environments"

Silica particles are used as a filler material in electronic underfills to reduce coefficient of thermal expansion of the underfill-epoxy matrix. In traditional underfills, the size of silica particles is in the micrometer range. Reduction in particle sizes into the nanometer range has the potential of attaining higher volume fraction particle loading in the underfills and greater control over underfill properties for higher reliability applications. Presently, no-flow underfills have very low or no filler content because micron-size filler particles hinder solder joint formation. Nano-silica underfills have the potential of attaining higher filler loading in no-flow underfills without hindering solder interconnect formation. In this paper, property prediction models based on representative volume element (RVE) and modified random spatial adsortion have been developed. The models can be used for development of nano-silica underfills with desirable thermo-mechanical properties. Temperature dependent thermo-mechanical properties of nano-underfills have been evaluated and correlated with models in a temperature range of -175degC to 150degC. Properties investigated include, temperature dependent stress-strain, creep and stress relaxation behavior. Nano-underfills on 63Sn37Pb eutectic and 95.5Sn3.5Ag1.0Cu leadfree flip-chip devices have been subjected to thermal shock tests in the range of -55degC to 125degC and -

55degC to 150degC, respectively. The trade-offs between using nano-fillers instead of micron-fillers on thermo-mechanical properties and reliability has been benchmarked. [J368]

"Enhancing the Light Extraction of (Alx Ga1 − x) 0.5 In0.5 P-Based Light-Emitting Diode Fabricated via Geometric Sapphire Shaping"

AlGaInP-based light-emitting diodes (LEDs) with a transparent sapphire substrate were fabricated by the glue-bonding (GB) method. This transparent sapphire substrate is a geometric shaping structure by wet etching processes. Furthermore, the n-side-up surface has a nano-roughened texture by natural mask and chemical wet etching processes. The light output of this novel LED structure could be enhanced about 26.7% (at 350 mA) due to the higher light extraction as compared with the conventional GB-LEDs. [J369]

"Optical Forces on a Quantum Dot in Metallic Bowtie Structures"

We present a numerical scheme to calculate the electromagnetic force on a quantum dot in the near-field of subwavelength metallic nano-structures. As an application, we examine the forces on a quantum dot placed in the center of a gold nano-structure. The forces on the quantum dot are calculated using an adaptive mesh refinement finite-difference time-domain code combined with microscopic material equations. Is is shown that the dot may be laterally confined in the proposed geometry. [J370]

"Simultaneous scheduling and binding for low gate leakage nano-complementary metaloxide-semiconductor data path circuit behavioural synthesis"

The authors present two polynomial time-complexity heuristic algorithms for optimisation of gate- oxide leakage (tunnelling current) during behavioural synthesis through simultaneous scheduling and binding. One algorithm considers the time-constraint explicitly and the other considers it implicitly, whereas both account for resource constraints. The algorithms selectively bind the off-critical operations to instances of the pre-characterised resources consisting of transistors of higher oxide thickness, and critical operations to the resources of lower oxide thickness for power and performance optimisation. We design and characterise functional and storage units of different gate-oxide thicknesses and built a data path library. Extensive experiments for several behavioural synthesis benchmarks for 45 nm complementary metal-oxide- semiconductor technology showed that reduction as high as 85% can be obtained. [J371]

"Improved Extraction Efficiency of Light-Emitting Diodes by Modifying Surface Roughness With Anodic Aluminum Oxide Film"

An anodic alumina oxide (AAO) film with nano-roughening is added on the top window layer of AlGaInP light-emitting diodes (LEDs) to improve the light extraction of the device. The AAO film has a natural porosity to provide light scattering centers at the surface, allowing an increase of light emission intensity with no loss of or damage to the semiconductor material. Further, the fabricated AAO film with a refractive index is about which is intermediate between those of air and the window layer of GaP. By inserting this layer between the ambient and GaP, it broadens the critical angle for light emission and reduces internal reflection. Experiments with laboratory-fabricated AlGaInP devices of conventional design demonstrated a 32% improvement in the luminous intensity at 20 mA for the device with the AAO layer. This letter shows by theory and experiment that AAO films can be used as a low-cost, easily implemented surface nano-roughening for improving extraction efficiency of AlGaInP LEDs. [J372]

"Fabrication of Magnetic Force Microscopy Tips via Electrodeposition and Focused Ion Beam Milling"

A method is described for the fabrication of magnetic force microscopy tips via localized electrodeposition and focused ion beam milling departing from commercial tapping mode tips. Very high aspect ratios and interacting magnetic moments are possible without altering significantly the tapping resonant frequency of the cantilever. These tips can achieve high magnetic resolution at room temperature and open atmosphere. They can also be fabricated into any shape, with applications for ferromagnetic resonance measurements and nano-imprinting. [J373]

"Calculation of Minimum Parameters Required for Low-Field Low-Size Nano Nuclear Magnetic Resonance (NanoNMR)"

The objective of this research is to calculate the minimum parameters required to make low-field low-size nano nuclear magnetic resonance (NanoNMR) a viable technology and potentially one of the future lab-on-chip

technologies. By low field we signify an externally applied magnetic field of less than 0.5 T, and by low size we mean a magnet whose largest physical dimension does not exceed 25 mm. The goal is to develop small and cost-effective NMR spectrometers that can be used at room temperature in a small office environment. In this paper, tunneling magneto resistance (TMR) devices are used to sense the NMR signal. The parameters that are calculated are: minimum sample size and concentration required to obtain an adequate NMR signal, TMR sensor size, and its distance to the sample, RF coil size, RF frequency, and power. The nanoscale TMR sensors proposed in this paper were designed using an in-house developed software tool. The optimally calculated TMR sensors have Fe50Co50PL and FL layers, an area of 100 nm times 100 nm, a 0.3-nm-thick Al2O3barrier and is biased at 200 mV. [J374]

"Ultracompact AWG Using Air-Trench Bends With Perfluorocyclobutyl Polymer Waveguides"

Using air-trench bends, an ultracompact 8 times 8 arrayed waveguide grating (AWG) demultiplexer (200-GHz channel spacing) for wavelength-division multiplexing (WDM) has been designed and fabricated with perfluorocyclobutyl (PFCB) core and clad co-polymers on a polyimide substrate. Compared to a conventional AWG in the same material system, the air-trench bend AWG shrinks the required chip area by a factor of 20. The decreased size is a factor in reducing the measured thermal shift to -0.012 nm/degC and decreasing the polarization-dependent wavelength shift to 1.3 nm. [J375]

"Multiple Bit Upsets and Error Mitigation in Ultra-Deep Submicron SRAMS"

Recent measurements of the SEU (single-event upset) cross-section for 6 T SRAMs fabricated in a nano-scale commercial CMOS process were performed. Results indicated that the dominant upset mechanism was associated with multiple-cell upsets (MCUs) strikes on PMOS transistors. The dominance of the MCU cross section favors the use of a block architecture with widely spaced word bits and the use of EDAC (error detect and correct) along with periodic memory scrubbing to prevent the integration of single-bit errors. [J376]

"Reducing Contact Resistance Using Compliant Nickel Nanowire Arrays"

Electrical contact resistance can be reduced using an array of compliant and conductive nanowires which make a large area of intimate contact with an opposing surface. In this paper, analyses of electrical contact resistance, fabrication methods, and experimental results of contact resistance for compliant nickel nanowires are presented. To analyze, predict, and measure the contact resistance, models of surface contact between an array of conductive nanowires and a spherical tip probe are presented. Then, an estimate of real area of contact from the measured contact resistance is discussed. The fabrication methods elaborate on electroforming nickel fibers using commercially available nano-porous filters. Finally, experimental results of contact resistance between a spherical tip probe and arrays of nickel nanowires as well as the contact resistance between a flat tip probe and arrays of nickel nanowires are presented. From these experimental results, we show resistance reduction by a factor of more than 20 at a load of 10 mN or less, compared to contact with a flat sheet, and a reduction by a factor of 3 using a spherical probe. [J377]

"Light Extraction Improvement From GaN-Based Light-Emitting Diodes With Nano-Patterned Surface Using Anodic Aluminum Oxide Template"

An improvement of light extraction from GaN-based light-emitting diodes (LEDs) was demonstrated by forming surface nano-structures using an anodic aluminum oxide (AAO) template as a dry etching mask. Nano-pores were simultaneously formed on indium tin oxide and GaN surfaces of LED with different pore depths by the same procedural steps, with a pore density and pore diameter of 1.1Ч109/cm2and 163 plusmn 31 nm, respectively. The nano-patterned LEDs achieved a top-face light output power enhancemetop-face light output power enhancementnt of 72% compared to the conventional LEDs at 20 mA. The light extraction effects of the nano-structures on the trapped optical modes in LED were revealed by scanning electron microscopy and microscopic electroluminescence. [J378]

"An anchor for nanoscale science and engineering"

This article deals with The National Center for Learning and Teaching in Nanoscale Science and Engineering to produce a new pardigm for classrooms. In addition, the NCLT has collaborated with nano-experts from academia and national laboratories throughout the United States. These teams are conducting learning research on the best approaches for the integration of NSE into the classroom and are contributing in several areas including learning progressions for nanoscience, establishing nanoconcept inventories and assessments, and research on the motivations of students towards learning nanoscience for grade 7 through college. The Center's operation is designed to rapidly integrate the latest nanoscience concepts into the classroom. To do this, the Center provides teacher training, nanocurriculum, and an interactive virtual resource portal. [J379]

"Performance Comparison Between Metallic Carbon Nanotube and Copper Nano-Interconnects"

This paper addresses the problem of scaling interconnects to nanometric dimensions in future very-large-scale integration applications. Traditional copper interconnects are compared to innovative interconnects made by bundles of metallic carbon nanotubes. A new model is presented to describe the propagation of electric signals along carbon nanotube (CNT) bundles, in the framework of the classical transmission line theory. A possible implementation of a future scaled microstrip based on CNT bundle is analyzed and compared to a conventional microstrip. [J380]

"Random-Dopant-Induced Drain Current Variation in Nano-MOSFETs: A Three-Dimensional Self-Consistent Monte Carlo Simulation Study Using "Ab Initio " Ionized Impurity Scattering"

A comprehensive simulation study of random-dopant-induced drain current variability is presented for a series of well-scaled n-channel MOSFETs representative of the 90-, 65-, 45-, 35-, and 22-nm technology nodes. Simulations are performed at low and high drain biases using both 3-D drift diffusion (DD) and 3-D Monte Carlo (MC). The ensemble MC simulator incorporates an ldquo abinitiordquo treatment of ionized impurity scattering through the real-space trajectories of the carriers in the Coulomb potential of the random discrete impurities. When compared with DD simulations, the MC simulations reveal a significant increase in the drain current variability as a result of additional transport variations due to position-dependent Coulomb scattering that is not captured within the DD mobility model. Such transport variations are in addition to the electrostatic variation in carrier density that is alone captured within the DD approach. Through comparison of the DD and MC results, we estimate the relative importance of electrostatic and transport-induced variability at different drain bias conditions. [J381]

"High cleanliness of portable clean-unit-box to unite clean-unit system platforms (CUSPs) and CUSP units"

As a platform for nano-science and technology, cleanliness in a compact and local clean environment, i.e. a portable clean-unit-box (CUP), is reported for establishing a large-scale network of an ultrahigh clean environment platform towards cross-disciplinary research. Analyses of experimental results indicate that the CUP has cleanliness of ISO class ~2, which is one order of magnitude better than the conventional wafer transportation cleanbox. [J382]

"QoS provisioning in wireless video sensor networks: a dynamic power management framework"

Recent technological advances in microelectronics and nano-systems technologies have made it feasible to equip wireless sensor nodes with small low-cost cameras to capture and transmit video. Wireless video sensor networks are gaining popularity due to numerous potential applications such as video surveillance, environmental and habitat monitoring, and so on. However, due to the limited battery available in wireless video sensor nodes, provisioning of QoS in such a network is a challenging task. We provide a survey on the major issues related to QoS provisioning in wireless video sensor networks and possible solution approaches. A dynamic power management framework is proposed for a wireless video sensor node to improve energy saving performance so that the lifetime of the sensor node can be increased. This framework considers the video traffic arrival process in the sensor node, the sleep and wakeup processes in the camera and wireless transceiver electronics, the queue status, and the wireless channel condition. Performance analysis results show that the proposed mechanism can achieve considerable energy saving in a sensor node while providing a target level of QoS performance. [J383]

"Analysis of interface trap states at Schottky diode by using equivalent circuit modeling"

The authors have developed a new equivalent circuit model to analyze the charging dynamics of the interface states in Schottky barrier diodes at reverse bias condition. Trap density and the capture/emission times are extracted by incorporating the measured ac admittance of erbium silicide Schottky diode with the newly developed equivalent circuit model. The extracted trap density is 1.5Ч1012cm-2eV-1and the capture and emission transition times are 19 and 5.9mu s, respectively. Trap density decreases to 6.1Ч109cm-2eV-1after N2annealing. [J384]

"Spectral Behavior in Nano-Coated Tilted Fiber Bragg Gratings: Effect of Thickness and External Refractive Index"

This work reports on the experimental investigation of the spectral effects induced by uniform high refractive

index nano-coatings deposited on weakly tilted fiber Bragg gratings (TFBGs). To this aim, weakly TFBGs with different tilt angles were fabricated and then coated with thin overlays of syndiotactic polystyrene. Automated dip coating technique was used to obtain ring-shaped coatings with thickness ranging in hundreds of nanometers. The transmission spectra of the obtained devices were collected in order to outline the effects of thickness, tilt angle, and surrounding refractive index. Experimental results reveal interesting differences with respect to the uncoated case, both in terms of spectral envelope and wavelength shifts related to cladding modes coupling. [J385]

"Guest Editorial"

The 21 papers in this special issue focus on nano-electronic circuits and nano-architectures. [J386]

"3-D Nanoarchitectures With Carbon Nanotube Mechanical Switches for Future On-Chip Network Beyond CMOS Architecture"

We have proposed 3 nanoarchitectures with carbon nanotube-based nano-electromechanical systems (CNT-NEMS) switch with a floating gate. It is shown that logic based on them has the potential to replace CMOS using process technology of less than 45 nm. Furthermore, CNT-NEMS-based 3-D circuits realize extremely high bandwidth of over 10 petabyte/s with very low latency of less than several 10 ps. The most effective applications are 3D on-chip crossbar bus and future on-chip network, which will largely determine the performance of future microchips. The performance of 3-D on-chip crossbar based on CNT-NEMS is also compared with that based on CNT-transistors. [J387]

"Fault-Tolerant Nanoscale Processors on Semiconductor Nanowire Grids"

Nanoscale processor designs pose new challenges not encountered in the world of conventional CMOS designs and manufacturing. Nanoscale devices based on crossed semiconductor nanowires (NWs) have promising characteristics in addition to providing great density advantage over conventional CMOS devices. This density advantage could, however, be easily lost when assembled into nanoscale systems and especially after techniques dealing with high defect rates and manufacturing related layout/doping constraints are incorporated. Most conventional defect/fault-tolerance techniques are not suitable in nanoscale designs because they are designed for very small defect rates and assume arbitrary layouts for required circuits. Reconfigurable approaches face fundamental challenges including a complex interface between the micro and nano components required for programming. In this paper, we present our work on adding fault-tolerance to all components of a processor implemented on a 2-D semiconductor NW fabric called nanoscale application specific integrated circuits (NASICs). We combine and explore structural redundancy, built-in nanoscale error correcting circuitry, and system-level redundancy techniques and adapt the techniques to the NASIC fabric. Faulty signals caused by defects and other error sources are masked on-the-fly at various levels of granularity. Faults can be masked at up to 15% rates, while maintaining a 7 density advantage compared to an equivalent CMOS processor at projected 18-nm technology. Detailed analysis of yield, density, and area tradeoffs is provided for different error sources and fault distributions. [J388]

"Novel Samsung advanced resist for thermal flow process material for nano-processing"

A resist flow process using a cross-linkable additive called the Samsung advanced resist for thermal flow process (SMART) was studied. SMART consists of conventional polyhydroxystyrene-based polymers and additives inducing thermal cross-linking reactions with the base polymers. With the SMART resist, 240nmcontact holes were defined by KrF lithography system, and then following a one-step thermal flow process, resulted in contact holes down to 80nmwith a vertical sidewall profile. At 90nmresolution, the critical dimension variation on a 200mmwafer was less than 10nm. It also showed good etch selectivity to silicon oxide due to the cross-linking reaction of the additive. The main advantage of the SMART system is a one-step process having a linear dependency of flow rate on baking temperature. The amount of resist flow can be controlled within the range of 100-150nmwithout any significant pattern deformation. The thermal flow process using the SMART is a promising candidate for the fabrication of nanodevices. [J389]

"Three dimension analysis of EЧB mass separator"

Three dimension modeling is used to design an EЧBmass separator. After the perpendicular separating principle and basic properties are analyzed in three dimensions, an EЧBmodel is built and optimized to obtain a homogeneous field with negligible fringing. An example of 30keVSi+ions is given to show its mass resolution, ion motion trajectory, and achromatic aberration in both collimated and crossover modes. Results show that the improved separator can operate in both modes in a nanometer optical column, but has better performance using a crossover mode. [J390]

"Void-free low-temperature silicon direct-bonding technique using plasma activation"

A low-temperature silicon direct-bonding technique has been researched using variant plasma (N2, O2, Ar, and H/He) pretreatment prior to bonding for surface activation. In plasma bonding, after annealing at 300°Cfor an hour the authors get a bonding energy of about 2-2.5J/m2, which is near the fracture strength of bulk silicon. In Si-Si wafer bonding, our experiments demonstrate that the origin of voids appearing in low-temperature annealing is related to the plasma variety and activation conditions. The authors believe that the annealing voids and bubbles, which appear and accumulate at the microdefects, are caused by plasma activation. They used an optimized O2and H/Heplasma-activation process for wafer direct bonding and obtained a high surface energy, void-free hydrophilic Si-Si wafer bonding. The wafers' root-mean-square surface roughness after plasma activation was measured by an atomic force microscope. The cross-sectional image of the bonding interface was observed by a scanning electron microscope. Compared with the standard wet-chemical surface treatment that requires high-temperature annealing (1000°C), both the low-temperature and shorter time annealing using plasma pretreatment are suitable for the microelectromechanical systems manufacture process and wafer-scale packaging. [J391]

"Aerodynamically assisted jetting: a rapidly emerging microfabrication methodology"

Processing science and technology can have an immense influence on advancing a field of research, with the power to bridge the physical with the life sciences. An emerging processing science is reported, which is completely driven by aerodynamic forces that are brought about by a pressure difference over an orifice. Free jets formed by this methodology had previously been investigated for single-phase media for relatively low applied chamber pressures. Applying this technology to materials science implies that the media generally or in most cases would be multiphase in nature having high viscosity. Developmental studies on this jetting route demonstrate the promise this processing methodology shows in handling multi-phase high-viscosity media (nano- suspensions). Furthermore, the investigations extend to elucidating the protocol to manipulate operational parameters together with the rheological properties of the multi-phase media to generate a near-mono distribution of composite droplets and threads for deposition. This is most important if this technique is to play a pivotal role in materials science and engineering. The results presented here give birth to a novel microfabrication by drop/thread-and-place approach by way of aerodynamically assisted jetting. [J392]

"Micro goes nano"

Carbon nanotubes have long been a solution waiting for a problem. Now the microelectronics industry is looking at using them to overcome one of its most pressing issues-continuing to shrink the basic transistors that make up integrated circuits (ICs). [J393]

"Influence of oxygen diffusion on residual stress for tantalum thin films"

The influence of oxygen diffusion on the residual stress of 500Ethick tantalum thin films sputtered on Si substrate after annealing temperature from 200to400°Cis examined in this article. The intensity of diffraction peaks for tetragonal beta -Taphase decreases when annealing temperatures increase by utilizing glancing incident angle x-ray diffraction measurements, and x-ray photoelectron spectroscopy was performed to understand the Ta2O5oxidation layer on the surface of Ta films after the annealing processes. Furthermore, simulated x-ray reflectivity (XRR) results show that the thicker Ta2O5oxidation layer is formed when the annealing temperature increases. The compressive stress is nearly proportional to the thickness of the Ta2O5oxidation layer after the annealing process because of the incorporation of the oxygen into interstitial sites of beta -Taunit cell, which leads to the 5.4E3volume expansion of the beta -Taunit cell. Besides, Auger electron spectroscopy was also used to analyze the depth profile of oxygen diffusion which has consistent tendency with XRR results. The above results indicate that oxidation of Ta films with annealing processes will increase the compressive stress in textured beta -Tathin films. [J394]

"Key integration technologies for nanoscale FRAMs"

We discuss key technologies of 180-nm node ferroelectric memories, whose process integration is becoming extremely complex when device dimension shrinks into a nano scale. This is because process technology in ferroelectric integration does not extend to conventional shrink technology due to many difficulties of coping with metal-insulator-metal (MIM) capacitors. The key integration technologies in ferroelectric random access memory (FRAM) comprise: etching technology to have less plasma damage; stack technology for the preparation of robust fer-roelectrics; capping technology to encapsulate cell capacitors; and vertical conjunction technology to connect cell capacitors to the plate line. What has been achieved from these novel approaches is not only to have a peak-to-peak value of 675 mV in bit-line potential but also to ensure a sensing margin of 300 mV in

opposite-state retention, even after 1000 hour suffering at 150degC. [J395]

"Hybridization of CMOS With CNT-Based Nano-Electromechanical Switch for Low Leakage and Robust Circuit Design"

Exponential increase in leakage power has emerged as a major barrier to technology scaling. Existing circuit techniques for leakage reduction either suffer from reduced effectiveness at nanometer technologies or affect performance and gate-oxide reliability. In this paper, we propose application of a specific carbon nanotube (CNT)-based nano-electromechanical switch as a leakage-control structure in logic and memory circuits. In case of memory circuits, we demonstrate that the proposed hybridization can be employed to reduce both cell leakage and bitline leakage, thereby improving the read noise margin as well. Due to the unique electromechanical properties of CNTs, these switches have high current-carrying capacity, extremely low leakage current, and low operating voltages. Moreover, they can act as nonvolatile memory elements, which can be exploited for data retention of important registers and latches during power down. Simulation results for a set of benchmark circuits show that we can obtain several orders of magnitude improvement in leakage saving in logic circuits at iso-performance compared to existing multi-threshold CMOS technique. In memory circuits, simulations show reduction in standby leakage and reduction in bitline leakage compared with the best existing techniques. [J396]

"Accelerated Discrete Degradation Models for Leakage Current of Ultra-Thin Gate Oxides"

Using degradation measurements is becoming more important in reliability studies because fewer failures are observed during short experiment times. Most of the literature discusses continuous degradation processes such as Wiener, gamma, linear, and nonlinear random effect processes. However, some types of degradation processes do not occur in a continuous pattern. Discrete degradations have been found in many practical problems, such as leakage current of thin gate oxides in nano-technology, crack growth of metal fatigue, and fatigue damage of laminates used for industrial specimens. In this research, we establish a procedure based on a likelihood approach to assess the reliability using a discrete degradation model. A non-homogeneous Weibull compound Poisson model with accelerated stress variables is considered. We provide a general maximum likelihood approach for the estimates of model parameters, and derive the breakdown time distributions. A data set measuring the leakage current of nanometer scale gate oxides is analyzed by using the procedure. Goodness-of-fit tests are considered to check the proposed models for the amount of degradation increment, and the rate of event occurrence. The estimated reliabilities are calculated at lower stress of the accelerated variable, and the approximate confidence intervals of quantiles for breakdown time distribution are given to quantify the uncertainty of the estimates. Finally, a simulation study based on the gate oxide data is built for the discrete degradation model to explore the finite sample properties of the proposed procedure. [J397]

"A Review of Reliability Research on Nanotechnology"

Nano-reliability measures the ability of a nano-scaled product to perform its intended functionality. At the nano scale, the physical, chemical, and biological properties of materials differ in fundamental, valuable ways from the properties of individual atoms, molecules, or bulk matter. Conventional reliability theories need to be restudied to be applied to nano-engineering. Research on nano-reliability is extremely important due to the fact that nano-structure components account for a high proportion of costs, and serve critical roles in newly designed products. This review introduces the concepts of reliability to nano-technology; and presents the current work on identifying various physical failure mechanisms of nano-structured materials, and devices during fabrication process, and operation. Modeling techniques of degradation, reliability functions, and failure rates of nano-systems are also reviewed in this work. [J398]

"Tools and Products"

A look at new products on the market, including Aguru Images' Aguru Dome, Organic Motions' motion-capture system, Mesa Imaging's SR-3000, EyeTech's ET3 eye-tracking system, ARC Science's OmniGlobe, Holografika's HoloVisio, Field Emission Technologies' 240-Hz drive nano-Spindt field emission display, Tobii eye-tracking system, Texas Instruments' DLP 3D high-definition TV, Antics Technologies' Antics Pre-Viz v. 2.5, PictoColor's iCorrect EditLab ProApp 6.0, Artlandia's SymmetryWorks 4 and SymmetryShop, Cerebrosoft's B*Gallery, and CEI's EnSight. [J399]

"Nano Particles Without Macroproblems"

Little by little, nanotechnology has crept up on us. From a mostly academic exercise 20 years ago, it has swiftly progressed to the point where the technology is just about everywhere. However, research into possible environmental and health implications of solvents and other chemicals, including arsine and trichloroethylene, wasn't done at the birth of the industry, before such toxic substances were widespread in the environment. If it

had been, we might not be stuck with polluted sites left by manufacturing plants. [J400]

"nextnano: General Purpose 3-D Simulations"

nextnano is a semiconductor nanodevice simulation tool that has been developed for predicting and understanding a wide range of electronic and optical properties of semiconductor nanostructures. The underlying idea is to provide a robust and generic framework for modeling device applications in the field of nanosized semiconductor heterostructures. The simulator deals with realistic geometries and almost any relevant combination of materials in one, two, and three spatial dimensions. It focuses on an accurate and reliable treatment of quantum mechanical effects and provides a self-consistent solution of the Schrodinger, Poisson, and current equations. Exchange-correlation effects are taken into account in terms of the local density scheme. The electronic structure is represented within the single-band or multiband kldrp envelope function approximation, including strain. The code is not intended to be a ldquoblack boxrdquo tool. It requires a good understanding of quantum mechanics. The input language provides a number of tools that simplify setting up device geometry or running repetitive tasks. In this paper, we present a brief overview of nextnano and present four examples that demonstrate the wide range of possible applications for this software in the fields of solid-state quantum computation, nanoelectronics, and optoelectronics, namely, 1) a realization of a qubit based on coupled quantum wires in a magnetic field, 2) and 3) carrier transport in two different nano-MOSFET devices, and 4) a quantum cascade laser. [J401]

"Predictive Simulation of Advanced Nano-CMOS Devices Based on kMC Process Simulation"

In this paper, accurate and advanced CMOS process and device simulations based on atomistic kinetic Monte Carlo (kMC) process simulator are presented. First, the methodology used to predict continuum 2-D/3-D doping profiles from 3-D atomistic distribution that can be directly transferred from process to device simulator is described. Calibration of damage evolution, dopant diffusion and clustering, interaction with interfaces, and the impact of impurities, which are crucial for accurate simulations, will be presented and discussed. Subsequently, comparison with a wide range of electrical-device characteristics showed that experimental results were remarkably well reproduced by the simulations. Finally, we shall demonstrate that device optimization can be achieved based on kMC process simulations, even for novel coimplant processes. This paves the way for the use of kMC in the design of devices and the optimization of device performance in technology computer-aided design for manufacturing. [J402]

"On-Chip Voltage Down Converter to Improve SRAM Read/Write Margin and Static Power for Sub-Nano CMOS Technology"

VDC-based dynamic power supply approach has been demonstrated to effectively improve the read margin, write margin and static power dissipation for the sub-nano SRAM design. The static power dissipation is found to be 5times improvement in the room and high temperatures while the chip is in the standby mode. The measured data indicate the excellent Vccminimprovement at around 240 mV. This 2M 65 nm SRAM chip can operate at 0.7 V with the help of the on-chip VDC. Furthermore, with the programmability of the VDC, we can optimize the read margin and write margin separately to have dramatic yield improvement. In the advancement of CMOS technology, the VDC approach can improve the future SRAM cell operation without additional external power supplies and complicate design modification. [J403]

"A Review of Metrology for Nanoelectronics"

This paper highlights some new and old techniques that will have important metrology inroads for nanoelectronics beyond CMOS. Traditional electron microscopy techniques are envisioned to remain and play a core role at the nanoscale level, and others such as probing techniques and special holographic imaging will further be enhanced and provide more diverse capabilities. The paper presents metrology techniques for beyond CMOS as presented at the First Metrology for Beyond CMOS workshop hosted by the Focus Center Research Program Center of Functional Engineered Nano Architectonics, the National Science Foundation Nanoscale Science and Engineering Center for Nanoprobing, and the California Institute of Technology (CNSI). [J404]

"Electronic Properties of Molecular Memory Circuits on a Nanoscale Scaffold"

Significant challenges exist in assembling and interconnecting the building blocks of a nanoscale device and being able to electronically address or measure responses at the molecular level. Here we demonstrate the usefulness of engineered proteins as scaffolds for bottom-up self-assembly for building nanoscale devices out of multiple components. Using genetically engineered cowpea mosaic virus, modified to express cysteine residues on the capsid exterior, gold nanoparticles were attached to the viral scaffold in a specific predetermined pattern

to produce specific interparticle distances. The nanoparticles were then interconnected using thiol-terminated conjugated organic molecules, resulting in a three-dimensional network. Network properties were engineered by using molecular components with different I-Vcharacteristics. Networks consisting of molecular wires alone were compared with networks containing voltage controlled molecular switches with two stable conductance states. Using such bistable molecules enabled the formation of switchable molecular networks that could be used in nanoscale memory circuits. [J405]

"Nanoscale optical imaging of pigment particles in paint with near-field scanning optical microscopy"

The distribution of pigment at the nano to micron scale illuminates the length scale of failure in paint samples. The authors use optical and topographical images from near-field scanning optical microscopy (NSOM) to compare a high quality paint sample with one that fails a standard quality control test based on visual inspection. NSOM provides the required nanometer to micrometer mesoscopic regime resolution and range, combined with simultaneous topographic and optical information. Features such as pigment clumping and pigment density fluctuations are simultaneously analyzed. The two types of samples are distinguished by fluctuations at different length scales. The authors observed individual pigment particles near the polymer surface of both samples. [J406]

"Improvement of Light Extraction From Patterned Polymer Encapsulated GaN-Based Flip-Chip Light-Emitting Diodes by Imprinting"

To improve surface light extraction of GaN-based flip-chip light-emitting diodes (FC-LEDs), we employed an imprint approach of thermosetting polymer for patterning microscale surface grating on the polymer encapsulant. One-dimensional (1-D) and two-dimensional (2-D) taper-like polymer gratings with a period of 6 mum were successfully realized on encapsulant above the sapphire backplane of GaN LED. By adopting the 1-D and 2-D taper-like grating encapsulant, the improvement of light extraction from the 1 mm times 1 mm FC-blue LED with a reflective Ag film on the p-side was about 18.5% and 31.9% compared to the LED encapsulated by flat polymer, respectively. To evaluate the concept of a diffraction grating in enhancement of light extraction, we performed a simulation of diffraction based on 1-D rigorous coupled wave analysis with the supporting experiments. [J407]

"Fabrication of arched MEMS electric contactor with Cu-based carbon nanofibre composite film"

A novel method for fabricating arched micro-electronic-mechanical system (MEMS) electric contactors with carbon nanofibre (CNF) composite film is presented. The arched structure is helpful for operational stability and is fabricated using ultraviolet-Lithografie Galvanoformung Abformung technology and a special melting photoresist process. Cu-based CNF composite film is used as a contact electrode and fabricated on the arched structure. During the whole electroplating process, all the elements for fabricating Cu-based CNF film must be dipped in the ultrasonic agitation environment to avoid agglomeration of CNFs on the surface of the composite film. The fabricated contactor shows good electrical charateristics and excellent mechanical properties. The whole process needed only three masks with the potential of integration of other miniaturised components. [J408]

"Validation of a Full-Chip Simulation Model for Supply Noise and Delay Dependence on Average Voltage Drop With On-Chip Delay Measurement"

Power integrity is a crucial design issue for nano-meter technologies because of decreased supply voltage and increased current. We focused on gate delay variation caused by power/ground noise, and developed a full-chip simulation current model with capacitance and a variable resistor to accurately model current dependency on voltage drop. Measurement results for 90-nm technology are well reproduced in simulation. The error of average supply voltage is 0.9% in average. Measurement results also demonstrate that gate delay depends on average voltage drop. [J409]

"Surface treatments of SiGe for scanning tunneling microscopy/spectroscopy and characterization of SiGe p-n junction"

Hydrogen-termination of SiGe(001) surfaces for scanning tunneling microscopy/spectroscopy (STM/STS) measurements was realized by optimizing the chemical treatment. It was found that the chemical oxidation with H2SO4made the SiO2/SiGeinterface smooth and that the resultant hydrogen-terminated surface treated in the HF+HClsolution had few surface states in the band gap. This surface enabled the authors to evaluate the electrical properties of SiGe by STM/STS. Using the chemical method developed here, STM images of SiGe p-njunctions clearly visualized the existence of the depletion region. Furthermore, the distribution of the local

electric properties of SiGe p-njunctions could be revealed with the spatial resolution better than 5Ч5nm2. It is concluded that STM/STS is a powerful technique to evaluate the local properties of Si/SiGedevices. [J410]

"Measurement and analysis of thermopower and electrical conductivity of an indium antimonide nanowire from a vapor-liquid-solid method"

It has been suggested by theoretical calculation that indium antimonide (InSb) nanowires can possess improved thermoelectric properties compared to the corresponding bulk crystal. Here we fabricated a device using electron beam lithography to measure the thermopower and electrical conductivity of an individual InSb nanowire grown using a vapor-liquid-solid method. The comparison between the measurement results and transport simulations reveals that the nanowire was unintentionally degenerately doped with donors. Better control of the impurity doping concentration can improve the thermoelectric properties. [J411]

"Spectroscopic study of carbonaceous dust particles grown in benzene plasma"

Carbonaceous dust particles have been synthesized from benzene using an rf glow discharge. Scanning electron microscope inspection revealed that the plasma-synthesized dust particles can be classified into two types. Shell-structured dust particles showed a wide size distribution from 3 to40 mcm. The other type, with different degrees of aggregation, appeared to be dense and spherical with a very distinctive yellow color and size distribution from 100 nm to 2 mcm. Analyses using micro-Raman and Fourier transform infrared microscopy indicated that the main components of the dust particles are polyphenyls and hydrogenated amorphous carbon (HAC). The luminescence background in Raman spectra and the infrared C-H stretching vibrational features observed around 3.4 mcmfor the dust particles are attributed to HAC. The formation mechanisms and spectroscopic characterization of carbonaceous dust particles are discussed. [J412]

"The nano- and mesoscopic cooperative collective mechanisms of inhomogenous elastic-plastic transitions in polycrystalline TiNi shape memory alloys"

The cooperative collective effects of strain-induced martensitic variant accommodation in nano- and micrograined polycrystalline TiNi shape memory alloys were discovered to form macroscopic strain-induced shearing bands-the Luders-like deformation bands. We use the in situ electron backscattered diffraction technique and the single surface trace analysis method to unambiguously elucidate the formation and propagation of shearing bands derived from the chain effect of intergrain selective martensite habit plane variants. The macroscopic characteristics of shearing bands can be well interpreted by mesoscale crystallographic features using phenomenological crystallographic theory and Schmid's law with a strong correlation to texture. It was also discovered that the nonlinear elastic feature in the stress-strain curve prior to the stress-strain plateau correlates to lattice/grain rotations other than martensitic variant reorientation. [J413]

"The effect of transverse wave vector and magnetic fields on resonant tunneling times in double-barrier structures"

The effect of transverse wave vector and magnetic fields on resonant tunneling times in double-barrier structures, which is significant but has been frequently omitted in previous theoretical methods, has been reported in this paper. The analytical expressions of the longitudinal energies of quasibound levels (LEQBL) and the lifetimes of quasibound levels (LQBL) in symmetrical double-barrier (SDB) structures have been derived as a function of transverse wave vector and longitudinal magnetic fields perpendicular to interfaces. Based on our derived analytical expressions, the LEQBL and LQBL dependence upon transverse wave vector and longitudinal magnetic fields has been explored numerically for a SDB structure. Model calculations show that the LEQBL decrease monotonically and the LQBL shorten with increasing transverse wave vector, and each original LEQBL splits to a series of sub-LEQBL which shift nearly linearly toward the well bottom and the lifetimes of quasibound level series (LQBLS) shorten with increasing Landau-level indices and magnetic fields. [J414]

"Honey I shrunk the world"

This article provides a brief snapshot of some of the agricultural, biological, electronics, medical, and manufacturing applications currently under active research and development at the University of Illinois Center for Nanoscale Silence and Technology (CNST) collaboratory. The trend has been to prefix the word nano to any application (such as nanoagriculture, nanoelectronics, nanomedicine, etc.) that leverages features at the nanoscale to design and develop materials, processes, sensors, devices, and systems. [J415]

"Korean minds eye nanotechnology"

This paper discussed about how the National Center for Nanomaterials Technology (NCNT) started its full

operation of semiconductor/display materials and equipment technology in South Korea. The government sponsored NCNT project is designed to build an infrastructure in the Pohang region. The facility will also bring large and small/medium scale companies together under one roof for collaboration in technology development, where they can perform the function of development, prototype manufacturing, and pilot production. The NCNT has also launched international joint R & D programs that will contribute to global proliferation of nanotechnology and benefit the participating institutions and nano scientists. The paper also discussed the vision and goal of NCNT to become a world leader in nanomaterials and devices core technology core technology development through extensive and global collaboration. [J416]

"Scanning tunneling microscope based fabrication of nano- and atomic scale dopant devices in silicon: The crucial step of hydrogen removal"

The use of a scanning tunneling microscope (STM) to pattern a hydrogen resist on the Si(001) surface has recently become a viable route for the fabrication of nanoscale planar doped devices in silicon. A crucial step in this fabrication process is the removal of the hydrogen resist after STM patterning before Si encapsulation of the dopants via molecular beam epitaxy. We compare thermal and STM-stimulated hydrogen desorptions in terms of surface morphology and integrity of dopant nanostructures embedded in the surface. We find that the boundaries of STM patterned P-in-Si nanostructures are maintained by STM-stimulated hydrogen desorption. In comparison, for an optimized thermal annealing at 470°Cfor 15sto remove the hydrogen there is a lateral diffusion out of the nanostructured region of up to 7-8nm. Our results demonstrate the advantages of nonthermal hydrogen desorption for the preservation of atomic scale dopant patterns in silicon. [J417]

"Effect of growth conditions on the structure and properties of tungsten films prepared using a thermal evaporation process"

We report the fabrication and characterization of tungsten films obtained using a thermal evaporation method. Single phase alpha -tungsten films were obtained at higher substrate temperatures (520-680°C)than the single phase beta -tungsten films (180-220°C). X-ray spectra show that both the alpha -tungsten films and the beta -tungsten films are polycrystalline having unusual preferred (200) and (321) orientations, respectively. Poor adhesion was observed when the films were deposited on bare silicon substrate. The adhesion is greatly improved by the introduction of a carbon layer between the film and the substrate. The field emission properties of the alpha -tungsten films and the beta -tungsten films were also examined. The alpha -tungsten films and beta -tungsten films exhibit turn-on fields at 1.3 and 2.8V/mcm, respectively. Current densities in the order of 10-1mA/cm2were observed. These field emission properties are believed to be better or much better than that of both tungsten nanowires and nanorods. The relation between the field emission properties and the film structures is discussed. [J418]

"Low energy N 2 ion bombardment for removal of (Hf O 2)x (Si O N)1-x in dilute HF"

The ion assisted wet removal of (HfO2)x(SiON)1-xhigh dielectric constant (k)materials and its effect on electrical properties were investigated. Crystallization temperature of (HfO2)x(SiON)1-xincreased as the percentage of SiON increased. The crystallized (HfO2)0.6(SiON)0.4was damaged and turned to an amorphous film via incorporation of N species into the film by N2plasma treatment. In addition, the structure of (HfO2)0.6(SiON)0.4was disintegrated into HfO2, SiO(N), and ON after N2plasma treatment. N2plasmas using low bias power were applied for wet removal of high-kfilms and the mechanism of the ion assisted wet removal process was explored. When high bias power was applied, the surface of source and drain regions was nitrided via the reaction between N and Si substrates. Feasibility of the low bias power assisted wet removal process was demonstrated for short channel high-kmetal oxide semiconductor device fabrication by the smaller shift of threshold voltage, compared to the high bias power assisted wet removal process as well as the wet-etching-only process. [J419]

"Four-probe measurements of the in-plane thermoelectric properties of nanofilms"

Measuring in-plane thermoelectric properties of submicron thin films has remained a challenging task. Here we report a method based on a suspended microdevice for four-probe measurements of the Seebeck coefficient, thermal conductivity, electrical conductivity, and thermoelectric figure of merit of patterned indium arsenide (InAs) nanofilms assembled on the microdevice. The contact thermal resistance and intrinsic thermal resistance of the 40nmthick InAs nanofilm sample were measured by using the nanofilm itself as a differential thermocouple to determine the temperature drops at the contacts. The microdevice was also used to measure a 190nmthick silicon dioxide (SiO2)film and the results were compared with those reported in the literature. A through-substrate hole under the suspended microdevice allows for transmission electron microscopy characterization of the nanofilm sample assembled on the device. This capability enables one to correlate the measured

thermoelectric properties with the crystal structures of the nanofilm. [J420]

"Micro-nano mixture patterning by thermal-UV novel nanoimprint"

Hybrid patterning by thermal and UV nanoimprint lithography (NIL) is demonstrated to fabricate micro and nano mixed structures. The SU-8 resist is thermally imprinted using a quartz mold, which has fine nanostructures and micro Cr mask patterns. After the thermal nanoimprint, UV light is exposed to the resist through the mold. Then, the mold is released and the resist is developed to fabricate microstructures. Using this process, nanodots having 200nmfeature sizes are successfully demonstrated on the microgratings with 40mcmwidth and 20mcmheight. Also, fabrication of nanocorn array on the bottom of the deep microwell is demonstrated using Ni mold replicated from the resist master structure fabricated by the hybrid NIL. [J421]

"Microfluidic encapsulated nanoelectromechanical resonators"

Resonant nanoelectromechanical systems have been demonstrated as sensitive mass detectors with subattogram and even single molecule sensitivity [Ilic etal, Nano Lett. 5, 925 (2005); Ilic etal, J. Appl. Phys. 95, 3694 (2004)]. Measurements of sub-ng/ml protein concentrations and DNA hybridization using deflection based microelectromechanical system (MEMS) devices have also been shown [Wu etal, Nat. Biotechnol. 19, 856 (2001); Fritz etal, Science 288, 316 (2000)]. Sample delivery is generally difficult in such cases requiring the entire device chip to be submersed into an analyte containing mixture. Additionally, in the case of MEMS resonators, high vacuum is required to remove viscous damping to improve sensitivity. In this work, the authors present a method where arrays of nanoelectromechanical devices are encapsulated in individually accessible, parallel microfluidic channels. The microchannels were used for delivery of liquids and nitrogen (for drying). The channels were pumped down to pressures where viscous damping effects are negligible. Due to the small volume of the channels, achieving the necessary vacuum took less than 1min; the cycle time for measurement was therefore vastly reduced. The methods for encapsulation described herein are not limited to nanomechanical resonators and could have applications with other types of nanoelectromechanical systems. [J422]

"Optimizing nanoimprint and transfer-bonding techniques for three-dimensional polymer microstructures"

Successful fabrication of three-dimensional multilayer microstructures in thermoplastic polymers using optimized layer-transfer and transfer-bonding techniques are reported in this work. For successful multilayer fabrication, it is very important to control the adhesion between two polymer layers and between mold and polymer. The authors discuss two techniques, bonding with a thin adhesive layer and direct thermal bonding near glass transition temperature, to achieve good bonding between two polymer layers while maintaining the structural integrity of the bottom polymer layers. Bonding with an adhesive layer achieves near 100%yield and heterogeneous materials can be bonded by this method. Direct thermal bonding is a generic approach that is suitable for all thermoplastic polymers. It opens up the possibilities of creating 3D multilayer structures in functional polymers for advanced applications. The capability and flexibility of the techniques developed here are expected to have deep impact on the applications of soft materials such as polymers in micro- and nanofabricated devices and systems. [J423]

"Nanoimprint lithography processes on 200 mm Si wafer for optical application: Residual thickness etching anisotropy"

It is well known that one limitation of thermal nanoimprint lithography is the difficulty to imprint simultaneously nano- and microstructures because of the resulting different residual layer thicknesses, which induce a very poor control of the pattern sizes during the etching steps. Line gratings with densities varying from 1 to 15 have been imprinted on 8in.wafers. The residual thickness varies from 38to158nm. Different plasma chemistries have been studied for the etching of the residual layer. The patterns have been characterized after the imprint and the etching steps by scatterometry. The results show that some chemistries are very promising for the control of the patterns during the etching step. A O2/C12/Ar process has been particularly studied, and it has been demonstrated that it presents a very high anisotropy, which allows the use of long etching times in order to remove the residual layer in gratings with various densities with no variation of the critical dimension. [J424]

"Thickness dependence of parallel and perpendicular anisotropic resistivity in Ta/NiFe/IrMn/Ta multilayer studied by anisotropic magnetoresistance and planar Hall effect"

Ferromagnetic layer thickness dependence of anisotropic magnetoresistivities in Ta/NiFe(t)/IrMn (10 nm)/Tahas been investigated for t=3, 4, 5, 7, 8, 10, 12, 15, and 20 nm by the method of anisotropic magnetoresistance and planar Hall effect. Our results revealed that the parallel and perpendicular resistivity components performed a

varying function with increment in NiFe thickness. Both the resistivities at first were observed to increase when the NiFe thickness increases from 3 to 10 nm; then for the NiFe thicknesses from 10 to 20 nm, the resistivities of NiFe layer decrease as the NiFe thickness increases. However, the anisotropic resistivity change, which is the difference between parallel and perpendicular resistivities, was observed to increase for the whole range of thicknesses when the NiFe thickness increases. The measured quantities were found to be in good agreement with the theoretically estimated parameters using single domain model; thus these behaviors are well explained based on the modern electron theory transition metals. [J425]

"Advanced nanoimprint lithography using a graded functional imprinting material tailored for liquid crystal alignment"

Nanoimprint lithography technology, which is able to easily create nanometer-resolution two-dimensional surface grooves on substrates over a large area by a step and stamp process, opens up an intriguing opportunity for functional liquid crystal (LC) alignment. We describe here a hybrid polymer consisting of two distinct moieties with largely different thermomechanical properties and surface activity. We present the results of nanoimprint lithography experiment using the hybrid polymer to demonstrate the practical applicability as an LC alignment layer. This material shows excellent capability both as a nanoimprinting material, requiring softness at moderate temperatures, and as a LC alignment layer, requiring sufficient rigidity. LC devices using the alignment layer show fairly stable electro-optic characteristics even after thermal aging, due to its high thermal stability. The soft component of the hybrid polymer helps it provide the multiple imprinting capabilities at higher temperatures virtually without any mold damages. [J426]

"Annealing of nanostructured silver films produced by supersonic deposition of nanoparticles"

Silver nanostructured films were produced by supersonic jet deposition of nanoparticles generated by laser ablation of microparticle aerosols (LAMA). The nano- and microscale morphologies of films were investigated and the electrical conductivities of films were measured in the as-deposited state and after annealing at temperatures from 100 to 400 °C. Scanning electron microscopy (SEM) and x-ray diffraction (XRD) were used to analyze the film morphologies and the grain sizes within the films. These analyses showed that the as-deposited grain size was 14-24 nm and the relative film densities ranged from 60% to 80%, depending on processing conditions. As a result of the extremely fine grain size and the lack of organics present on the surface of the grains within the films, the annealing temperatures required to achieve reasonable conductivities (20%-50%of bulk) were reduced dramatically compared to films produced from suspensions. For example, the grain size in the films began to increase at annealing temperatures of as low as 100 °C, and the corresponding conductivity was greater than 25%of the conductivity of bulk silver. Increases in annealing temperature resulted in greater coarsening and further increases in conductivity. Calculations showed that increases in conductivity during annealing at temperatures less than 400 °Cresulted primarily from grain size coarsening rather than densification. [J427]

"Structural and electrical properties of high-kappa Bi 2 Mg 2/3 Nb 4/3 O7 pyrochlore films on silicon for possible gate dielectric applications"

Bi2Mg2/3Nb4/3O7pyrochlore films were deposited on p-type Si (100) substrates using radio frequency reactive magnetron sputtering technique. Rapid thermal annealing (RTA) in O2ambient followed by RTA in N2ambient was carried out. The structural, morphological, and chemical bonding features of these films were studied by x-ray diffraction, scanning electron microscopy, atomic force microscopy, and x-ray photoelectron spectroscopy. All the films exhibit smooth, homogeneous, continuous, crack free, and dense films surfaces with root-mean-square roughness values in the range of 1.91-4.16E. The films show high crystallization temperature at about 900 °C. High temperature annealing gives rise to more oxygen incorporation in the films with probable formation of silicate type bonding at the interface. Effective oxide charge density, flatband voltage, hysteresis, oxide trap charge density, and interface state density values are comparable to those of some of the most widely investigated high-kgate dielectrics. The values decrease with increasing annealing temperature. A minimum leakage current density of the order of 10-6A/cm2at a bias voltage of -1Vhas been obtained even after annealing at 800 °C. All the annealed films show high breakdown field values of more than 5 MV/cm. [J428]

"Growth mechanism from nano-ordered clusters to nanocrystals in a deeply undercooled melt of Zr-Ni-Ti metallic glass"

Both experimental studies and molecular dynamics (MD) simulations reveal a unique atomic-scale growth mechanism during crystallization of an amorphous alloy Zr65Ni25Ti10. By using a high-resolution transmission electron microscope incorporated with nanobeam diffraction technique, we have clearly seen imperfect ordered packing of nano-ordered clusters (NOCs) with a size of 1-2 nm embedded in this amorphous material. Under a

very large undercooling condition, NOCs essentially act as preexisting nuclei that can grow directly into nanocrystals during annealing treatments. The growth mechanism includes three distinct steps in succession: formation of quasi-ordered structure with one-dimensional (1D) periodicity, and then 2D periodicity, and finally forming 3D nanocrystals. These three growth steps are cross-linked, and atomic movements are also accommodated by a rotation of atomic planes. This growth mechanism is unambiguously verified by MD simulation. [J429]

"UV nanoimprint materials: Surface energies, residual layers, and imprint quality"

UV nanoimprint lithography is attracting more and more interest, because it has the potential of becoming a high-resolution, low-cost patterning technique. The availability of suitable UV curing materials is mandatory for successful imprinting. Within this work, a systematic investigation of commercially available photocuring materials was conducted to provide an overview of the properties of these materials. Their wetting behavior with respect to different substrate surfaces was characterized and their surface tensions were determined from their contact angles against two specifically selected solid surfaces: This method is presented here for the first time. The adhesion properties of the UV curing materials to different substrate surfaces and to the mold were investigated and necessary curing times were estimated. Additionally, the dependence of the residual layer thickness on the viscosity and the initial dispensed volume of UV curing materials was analyzed. It was found that the resist formulation of the UV curing materials strongly influences the surface tension as well as the adhesion to different substrate surfaces. Furthermore, the experiments verified that the thickness of the residual layer for UV curing materials increases with the square root of their viscosity which is predicted by theory. To demonstrate the suitability of the UV curing materials, first imprints with the prototype imprint tool, Nano Patterning Stepper 300 from Suss MicroTec, with pattern sizes down to 50nmare shown. [J430]

"Embedded vertically grown carbon nanotubes for field emission applications"

Vertically aligned carbon nanotubes, embedded in titanium oxide, have been fabricated and their electron emission behavior has been characterized. The growth of carbon nanotubes was achieved using a dc plasma enhanced chemical vapor deposition method with a mixture of acetylene and hydrogen, and nickel was used as the catalyst layer. Titanium oxide, deposited using an atmospheric pressure chemical vapor deposition, was used to encapsulate the grown carbon nanotubes and the physical properties of the as-grown carbon nanotubes as well as the encapsulated structures have been investigated using scanning electron microscopy. By a sequential polishing and plasma ashing, it is possible to open up the top side of the encapsulated carbon nanotubes. Also by means of a reactive ion etching, carbon nanotubes are exposed with an inherent gate surrounding each one. This technique allows the evolution of individually processed nanotubes with no need of nanolithography. The emission of electrons from carbon nanotubes was examined and a preliminary field emission display was prepared. [J431]

"Thermal radiation in dense nano- and microparticulate media"

Thermal radiation transport in dense nano/microparticulate media is considered. The particulates are both scattering and absorbing. Effective field approximation and quasicrystalline approximation are used to obtain the dispersion relation for electromagnetic wave in nano/microparticulate media. Nano/microparticles are considered due to their promise for future applications such as nanofluids and also for current technologies such as fluidized and packed beds combustors. Due to multiple and dependent scattering, the density of states, phase velocity, and group velocity of photons are modified. Modification of these parameters modifies the Planck blackbody equilibrium emissive power. Results show that heat flux and temperature predictions made by models in the literature for multiple and dependent scattering and absorption are not very accurate, as these models do not take the modification of equilibrium emissive power into account. [J432]

"Crystallization process and amorphous state stability of Si-Sb-Te films for phase change memory"

Crystallization process and amorphous state stability of Si-Sb-Te films with different Si concentration (10, 20 at. %) and Sb/Te ratio (2:3 and 1:1) have been studied and compared with Ge2Sb2Te5(GST) film by in situ film resistance measurements. The effects of Si concentration and Sb content on crystalline resistivity, crystallization temperature, activation energy of crystallization, and amorphous state stability of films have been studied. The activation energy Eaof crystallization of GST film was confirmed to be 2.34 eV, while the activation energy Eaof Si10Sb36Te54film increased to 2.99 eV and further reached to 3.65 eV for Si20Sb32Te48film when the Si content increased to 20 at. %. Si addition increased the crystallization temperature and crystalline resistivity of Si-Sb-Te films largely, and enhanced the amorphous state stability of the films, while Sb revealed contrary effects to Si. The microstructures of Si-Sb-Te films were analyzed through x-ray diffraction and high resolution transmission electron microscopy. Phase separation has been observed in annealed Si-Sb-Te films, and Si-Sb-

Te films crystallized into rhombohedral Sb2Te3phase surrounded by amorphous Si-rich grain boundaries with high resistance, which would be helpful to reduce the writing current of phase change memory. [J433]

"Molecular dynamics simulation of thermal transport at a nanometer scale constriction in silicon"

To better understand thermal transport at nanoscale point contacts such as the tip-sample contact of a scanning probe microscope and at the contact between a nanotube and a planar surface, we have used a nonequilibrium molecular dynamics (MD) method to calculate the temperature distribution and thermal resistance of a nanometer scale constriction formed between two planar silicon substrates of different temperatures. Surface reconstruction was observed at the two free silicon surfaces and at the constriction. The radius of the heated zone in the cold substrate was found to approach a limit of about 20 times the average nearest-neighbor distance of boron doping atoms when the constriction radius (a)is reduced below the interdopant distance. The phonon mean free path at the constriction was found to be suppressed by diffuse phonon-surface scattering and phonon-impurity scattering. The MD thermal resistance is close to the ballistic resistance when ais larger than 1nm, suggesting that surface reconstruction does not reduce the phonon transmission coefficient significantly. When ais 0.5nmand comparable to the dominant phonon wavelength, however, the MD result is considerably lower than the calculated ballistic resistance because bulk phonon dispersion and bulk potential are no longer accurate. The MD thermal resistance of the constriction increases slightly with increasing doping concentration due to the increase in the diffusive resistance. [J434]

"Characterization of the morphology and optical properties of In As /Al As quantum dots with a GaAs insertion layer"

InAs self-assembled quantum dots by utilizing a thin GaAs insertion layer (IL) on a 1nmthick AlAs seed layer were grown on GaAs(100) substrates by using a molecular beam epitaxy technique. InAs quantum dots (QDs) were formed by varying the thickness of the GaAs IL from 1 to 9 ML (monolayer), and their morphological and optical properties were characterized by atomic force microscopy and photoluminescence (PL). As a result, when the GaAs IL was thicker than 5 ML, normal InAs QDs with an average diameter of 30nmand a density of 2Ч1010/cm2were formed, because the enhanced surface roughness due to the AlAs layer was leveled by the GaAs IL. However, when the thickness of the GaAs IL was decreased from 5 to 3 ML, the formed InAs QDs showed a bimodal size distribution, i.e., large dots with a lateral size of about 30nmand small dots with that of about 20nm. When the GaAs IL was below 1 ML, InAs QDs with an average diameter of less than 15nmand a high density of 1.5Ч1011/cm2were grown. Consequently, it was verified that the thickness parameter of the GaAs IL had an effect on the size distribution of InAs QDs. Furthermore, although the AlAs layer was used for the purpose of improving the density of the QDs, their PL intensity was comparable to that of the normal InAs QDs. [J435]

"Trimming Si surfaces for molecular electronics"

In the last two decades significant progress has been made in developing methodologies (fabrication and analysis) for organic functionalization of semiconductors, in view of applications in molecular electronics, nano-bio devices, and surface nanopatterning in general. A strategic route is the functionalization of Si surfaces to exploit both the existing Si technology and the strength of the Si-C bond. It is also interesting to take advantage of Si-O chemistry, creating Si-O-C covalent bridges and trying at the same time to protect the interface from spurious oxidation. The microscopic understanding of interactions at the organic/semiconductor interfaces, required to proceed in these directions is, however, still poor. Theoretical studies can thus be very helpful to identify relevant model systems, and predict the effects on the electronic structure. Here, we use state-of-the-art ab initio methods to investigate alkyl monolayers on the perfectly hydrogenated Si(100)surface, bonded through single Si-C or double Si-OO-C bridges. Our results point to structural differences between bridging mechanisms, leading to different overall surface orderings. We find also relevant electronic differences. Our results always show a sharp frontier between the organic and inorganic electronic states, with a well defined energy barrier. For configurations with a Si-C bridge the top valence states are free from molecular contributions, while in the case of bonding through the Si-OO-C double bridge the results point to a contribution from the interface oxygen atoms. [J436]

"Microstructures and magnetic alignment of L10 FePt nanoparticles"

Chemically ordered FePt nanoparticles were obtained by high temperature annealing a mixture of FePt particles with NaCl. After the NaCl was removed with de-ionized water, the transformed FePt nanoparticles were redispersed in cyclohexanone. X-ray diffraction patterns clearly show the L10phase. Scherrer analysis indicates that the average particle size is about 8nm, which is close to the transmission electron microscopy (TEM) statistical results. The coercivity ranges from 16kOeto more than 34kOefrom room temperature down to 10K.

High resolution TEM images reveal that most of the FePt particles were fully transformed into the L10phase, except for a small fraction of particles which were partially chemically ordered. Nano-energy dispersive spectroscopy measurements on the individual particles show that the composition of the fully transformed particles is close to 50/50, while the composition of the partially transformed particles is far from equiatomic. TEM images and electron diffraction patterns indicate c-axis alignment for a monolayer of L10FePt particles formed by drying a dilute dispersion on copper grids under a magnetic field. For thick samples dried under a magnetic field, the degree of easy axis alignment is not as high as predicted due to strong interactions between particles. [J437]

"Current-induced magnetic switching in nanopillar spin-valve systems with double free layers"

Double soft ferromagnetic layers-CoFe/Pd/CoFe-were employed as a free layer of nanopillar spin valve. The system showed double jumps in electric resistance with respect to the spin current. Each jump corresponds to the switching of one of the CoFe layers in the double free layer. The absolute change in resistance of each jump is the same in the resistance versus current scans taken at different applied field values. While both jumps are present only in larger fields, only one jump is observed in low fields, which is attributed to the reversal of the inner CoFe layer. Furthermore, in the latter case an inversion of the hysteresis has been observed, which is explained by telegraph noise. [J438]

"Effect of thickness on electrical properties of bismuth-magnesium niobate pyrochlore thin films deposited at low temperature"

Bi2Mg2/3Nb4/3O7(BMN) pyrochlore thin films were deposited at 25 and 100°Con Cu/Ti/Sisubstrates by pulsed laser deposition. Dielectric and leakage current properties of BMN films are investigated as a function of film thickness. The critical thicknesses showing the thickness dependence of dielectric constant are approximately 50 and 70nmin BMN films deposited at 25 and 100°C, respectively. The capacitances of interfacial layers in the films deposited at 25 and 100°Care approximately 5.5 and 3.9pF, respectively. The thickness dependence of leakage current characteristics was attributed to the copper diffusion into the BMN films. An intrinsic conduction of BMN films was controlled by Schottky emission and the barrier height was estimated as 0.9-1.2eVin the temperature range from 25to100°C. Film thickness in terms of leakage current characteristics is limited above 100nmfor embedded capacitor applications. [J439]

"Iterative Control Approach to Compensate for Both the Hysteresis and the Dynamics Effects of Piezo Actuators"

In this brief, the compensation for both the nonlinear hysteresis and the vibrational dynamics effects of piezo actuators is studied. Piezo actuators are the enabling device in many applications such as atomic force microscopy (AFM) to provide nano- to atomic-levels precision positioning. During high-speed, large-range positioning, however, large positioning errors can be generated due to the combined hysteresis and dynamics effects of piezo actuators, making it challenging to achieve precision positioning. The main contribution of this brief is the use of an inversion-based iterative control (IIC) technique to compensate for both the hysteresis and vibrational dynamics effects of piezo actuators. The convergence of the IIC algorithm is investigated by capturing the input-output behavior of piezo actuators with a cascade model consisting of a rate-independent hysteresis at the input followed by the dynamics part of the system. The size of the hysteresis and the vibrational dynamics variations that can be compensated for (by using the IIC method) is quantified. The IIC approach is illustrated through experiments on a piezotube actuator used for positioning on an AFM system. Experimental results show that high-speed, large-range precision positioning can be achieved by using the proposed IIC technique. Furthermore, the proposed IIC algorithm is also applied to experimentally validate the cascade model and the rate-independence of the hysteresis effect of the piezo actuator. [J440]

"Paperlike thermochromic display"

The authors report the design and implementation of a paperlike, thermally activated display fabricated from thermochromic composite and embedded conductive wiring patterns, shaped from mixture of metallic nanoparticles in polydimethylsioxane using soft lithography. The display exhibits good image quality and ease of control. Use of electric heating pulses is shown to reduce energy consumption while improving image quality control. The display has excellent mechanical bending flexibility. [J441]

"In situ real-time monitoring of biomolecular interactions based on resonating microcantilevers immersed in a viscous fluid"

The authors report the precise (noise-free) in situ real-time monitoring of a specific protein antigen-antibody

interaction by using a resonating microcantilever immersed in a viscous fluid. In this work, they utilized a resonating piezoelectric thick film microcantilever, which exhibits the high quality factor (e.g., Q=15) in a viscous liquid at a viscosity comparable to that of human blood serum. This implies a great potential of the resonating microcantilever to in situ biosensor applications. It is shown that the microcantilever enables them to monitor the C reactive protein antigen-antibody interactions in real time, providing an insight into the protein binding kinetics. [J442]

"Band gap energy modifications observed in trivalent In substituted nanocrystalline Sn O 2"

The effect of In doping concentration on the optical band gap of nano-SnO2is investigated as a function of calcination temperature. Changes in the band gap explain the room temperature H2gas sensing of doped nano-SnO2. The band gap was found to be lower than those reported for SnO2(3.6eV)from 2.55to3.43eVand may be explained by the presence of nonequilibrium oxygen vacancies in the oxide lattice and band bending effects at the nanoscale. [J443]

"Strained Si n -channel metal-oxide-semiconductor field-effect transistors formed on very thin SiGe relaxed layer fabricated by ion implantation technique"

Strained Si n-channel metal-oxide-semiconductor field-effect transistors (MOSFETs) were fabricated on the Si0.83Ge0.17relaxed thin layer formed by ion implantation technique. Although the SiGe thickness was as small as 100nm, the relaxation was highly enhanced thanks to the pre-ion-implantation into the Si substrate and the strained Si channel with very smooth surface was obtained. A nMOSFET was fabricated in this structure and 100% drive current improvement and 60% mobility enhancement over the control Si MOSFET were achieved. This indicates that the ion implantation technique is very promising for realization of relaxed-SiGe-based devices with very high performances. [J444]

"Efficient laser textured nanocrystalline silicon-polymer bilayer solar cells"

Excimer laser textured thin film silicon and poly(2-methoxy-5-(2'-ethyl-hexyloxy)-1,4-phenylenevinylene bilayer solar cells are fabricated and characterized with air mass 1.5 simulated solar irradiation. The polymer layer increases the light harvesting capability of the cell and increases the shunt resistance while increasing open circuit voltage. The highest efficiency of 0.87% for the thin film silicon/polymer bilayer device is observed due to enhanced charge collection resulting from the inclusion of the polymer layer. Generation of charge carriers is proposed to be occurring mainly in the silicon layer and charge transport is explained using an energy band diagram. [J445]

"Temperature stability of single-photon emission from InGaAs quantum dots in photonic crystal nanocavities"

This study demonstrates the feasibility to 60Koperation of photonic crystal (PC) nanocavities for self-assembled InGaAs quantum dots (QDs) in single-photon applications. With the proper quality factor and small mode volume, this PC nanocavity exhibits excellent spontaneous emission enhancement and high thermal stability. Measuring the second-order correlation function of single QD emission yields clear photon antibunching with a small timing jitter of 1ns, which is maintained from T=7to60K. These results demonstrate that PC nanocavities with an appropriate quality factor and mode volume are well suitable for developing thermal-stable single-photon sources. [J446]

"Switchable titanate-nanotube electrode sensitive to nitrate"

The redox peak current of the Ti(IV)/Ti(III)pair for titanate-nanotube (TNT) film-covered basal plane pyrolytic graphite disk electrode (PGE) was found sensitive to the varying concentration of nitrate in the acetate buffer solution. The TNT/PGE shows stable redox peak in 0.1Macetate buffer, which disappeared when changed into the same buffer solution containing over 5.6mMnitrate. The return of the TNT/PGE into bare acetate buffer induced a full recovery of the redox peak of Ti(IV)/Ti(III). These effects can be repeated, just as a switch with on/off function. The electrochemical activity of titanium oxide on the electrode surface can be reversibly retrieved between 0.1Macetate buffer solution (pH5.5) and nitrate. This system may be applicable to designing nitrate sensor. [J447]

"In-plane bistable nematic liquid crystal devices based on nanoimprinted surface relief"

The authors present a bistable nematic device, using a fourfold symmetrical bidirection nanometer-scale surface grating fabricated by the nanoimprinting lithography. The bistability is achieved by a composite action between two orthogonal surface undulations, which tend to stabilize the nematic director along either of the two diagonal

axes. The switching between the bistable states is easily driven by orthogonal in-plane electric fields. A recent model of groove-induced surface anchoring due to Fukuda etal [Phys. Rev. Lett. 98, 187803 (2007)] accounts for the azimuthal bistability in the present system. [J448]

"Anomalous photoconductivity of Ce O 2 nanowires in air"

The conductance of the CeO2nanowire film is found to decrease by about two orders of magnitude in air under ultraviolet illumination. Such a drastic decrease in conductance is attributed to light-induced desorption of H2Ofrom the nanowire's surface. When exposed in air, the surface conductivity of the nanowire increases significantly due to the adsorption of H2O. Considering the large surface-to-volume ratio of the nanowire, the conductance of the nanowire film is mainly controlled by surface conduction. Upon ultraviolet illumination, desorption of H2Oresults in the decrease of the conductance of the nanowire film, thus leading to the anomalous photoconductivity. [J449]

"Branched growth of degenerately Sb-doped Sn O 2 nanowires"

The authors report the growth of degenerately Sb-doped SnO2single crystalline nanowires with three-dimensionally branched morphology by a two-step Au-catalyzed vapor-liquid-solid growth approach. Raman scattering and transmission electron microscopy results indicate that the crystal phase of Sb-doped SnO2nanowires is rutile. Electrical transport measurements indicate that Sb-doped SnO2nanowire has a resistivity of 1.92Ч10-3Omega cmand an electron concentration of 2.8Ч1020cm3. Branched conducting nanowires are promising candidates for catalyst supports, biologic molecule detection, and three-dimensional nanodevices integration. [J450]

"Micro thermoindicators and optical-electronic temperature control for microfluidic applications"

The authors report the design and implementation of sensing and control of local temperature in polydimethylsiloxane microfluidic reaction chip, based on the fabrication of a microtemperature sensor with thermochromic color bars and the associated optical and electronic feedback controls. The thermochromic color bar demonstrates easy and accurate local temperature monitoring. In combination with a microheater, this contactless microchip temperature control approach may have wide application potentials in microchemical and microbiological analyses. [J451]

"Focal length modulation based on a metallic slit surrounded with grooves in curved depths"

According to the numerical calculation, the relative phase of emitting light scattered by surface plasmon in a single subwavelength metallic groove can be modulated by the groove depth. The focal length of the slit-groove-based focusing structures can be adjusted in certain value if the groove depths are arranged in traced profile. With the regulation of the groove depth profile, it is possible to modify the focus position in the precision of nanoscale without increasing the size of the nanodevice. The simulation results verify that the method is effective for the design of nano-optical devices such as optical microprobes. [J452]

"Observation of two-dimensional hole gas with mobility and carrier density exceeding those of two-dimensional electron gas at room temperature in the SiGe heterostructures"

Very high two-dimensional hole gas (2DHG) drift mobility of 3100cm2/Vsis obtained at extremely high density of 41Ч1011cm-2in the modulation doped, 20nmthick, strained Ge quantum well (QW) of SiGe heterostructure at room temperature. Very high 2DHG density is achieved by increasing the boron modulation doping, reducing the spacer layer thickness located between it and Ge QW, and increasing the valence-band offset of Ge QW, which also results in the enhancement of mobility. The obtained 2DHG mobility and carrier density exceed those reported for two-dimensional electron gas in the strained Si QW of SiGe heterostructures. [J453]

"Performance enhancement of n -channel impact-ionization metal-oxide-semiconductor transistor by strain engineering"

The introduction of lattice strain in impact-ionization metal-oxide-semiconductor (I-MOS)transistors for performance enhancement is reported. Lattice strain affects impact ionization and its impact on device performance is explained in relation to the physics of I-MOSdevice operation. By integrating epitaxial silicon-carbon (Si0.99C0.01)source and drain regions in a complementary-MOS-compatible fabrication process, strained n-channel I-MOSdevices were fabricated. Tensile strain in the channel and impact-ionization regions contributes to enhanced electron transport and device characteristics. The strained I-MOStechnology demonstrates an excellent subthreshold swing of 5.3mV/decadeat room temperature. Compared to control I-MOSdevices with Si raised source/drain, strained I-MOSdevices show significantly higher drive current and a steeper subthreshold

swing. [J454]

"ZnO-based film bulk acoustic resonator for high sensitivity biosensor applications"

Zinc oxide (ZnO)-based film bulk acoustic resonator consisting of a piezoelectric element (Au/ZnO/Pt)and a Bragg reflector (ZnO/Ptmultilayer structure) has been fabricated by magnetron sputtering. The transmission electron microscopy and x-ray diffraction measurements revealed that all thin film layers in the device were well crystallized and highly textured. By electrical measurements, it was found that the device had a high resonant frequency (3.94GHz)and mass sensitivity (8970Hzcm2/ng). The use of the device as a biosensor was demonstrated by comparing the resonant properties of the device with/without coatings of biospecies. [J455]

"Si-based electromagnetic noise suppressors integrated with a magnetic thin film"

Electromagnetic noise suppressors on Cu transmission lines and oxidized Si substrate integrated with a SiO2dielectric and a Co-Fe-Al-O magnetic layer are presented. Extremely large signal attenuation is achieved (-90dBat 20GHz) while the signal reflection is relatively small, being below -10dB. These characteristics are attributed to the distributed capacitance (C)formed by the Cu and the oxidized Si substrate and the Cu/SiO2/Co-Fe-Al-Oand the distributed inductance (L)due to the magnetic thin film. The main loss mechanism is the L-Cresonance and this emphasizes the role of the magnetic thin film providing the inductance. [J456]

"Erratum: "Wide bandgap photonic structures in dichromate gelatin emulsions" [JAppl. Phys. Lett. 89, 081116 (2006)]"

First Page of the Article [J457]

"Operation of a reversed pentacene-fullerene discrete heterojunction photovoltaic device"

The photoresponse of reversed bilayer organic photovoltaic device based on pentacene and C60is examined, and the mechanism of photocurrent generation is shown to be different to that in conventional heterojunction devices, with free charge carriers generated at the electrode-organic interfaces rather than the organic heterojunction. This hypothesis is tested with silver nanoclusters incorporated at the organic heterojunction to quench excitons and facilitate recombination of free charge carriers, which shows a predicted increase in Jsc. The large Vocin this reversed cell structure is also rationalized in the context of the model proposed. [J458]

"High quality AlGaN solar-blind Schottky photodiodes fabricated on AlN/sapphire template"

The authors report the high-performance AlGaN solar-blind Schottky photodiodes grown on AlN/sapphire templates by metal organic chemical vapor deposition. The devices exhibit dark current densities as low as 1.6Ч10-11A/cm2at -5Vbias. The peak responsivity is 41mA/Wat 256nmin the photovoltaic mode, corresponding to a quantum efficiency of 20%. A sharp spectral response cutoff of more than two orders of magnitude by 300nmis observed under a low illumination intensity of 10nW/cm2. The zero-bias resistance-area product of the device is found to be 5.0Ч1012Omega cm2, leading to an estimated detectivity of 7.0Ч1014cmHz1/2/Wat 256nm. [J459]

"Observation of whispering-gallery modes in Si microdisks at room temperature"

Whispering-gallery modes are observed at room temperature in silicon microdisk resonators fabricated on silicon-on-insulator substrates. Sharp luminescent peaks originating from the crystalline silicon film, corresponding to the whispering-gallery modes, are observed to change in microdisks with different diameters. Over 30 times enhancement of the photoluminescence from bulk silicon is observed due to the microdisk. [J460]

"Use of an asymmetric pulse profile for higher crystalline volumes from excimer laser crystallization of amorphous silicon"

An excimer laser is used to crystallize amorphous silicon on glass to nanocrystalline silicon, yielding higher crystalline volumes than reported earlier, by modifying the laser pulse profile used for crystallization at a given energy density. An asymmetric, shorter pulse profile, as opposed to the conventional Gaussian profile retains the desirable gradual leading edge of the Gaussian pulse for controlled evolution of hydrogen, while increasing the peak energy. The resultant films show an increased surface roughness along with higher crystalline volumes, which may be beneficial for photovoltaics and electron field emission cold cathodes. [J461]

"Screw dislocation assisted martensitic transformation of a bcc Cu precipitate in bcc Fe"

Molecular dynamics simulations of the interaction between a screw dislocation and a coherent bcc Cu precipitate in bcc Fe indicate that the screw dislocation stress field assists a martensitic transformation into a close-packed structure for precipitate diameters larger than 1.8nm, resulting in a stronger obstacle to dislocation glide. The observed martensitic transformation mechanism agrees with the Nishiyama-Kajiwara [Jpn. J. Appl. Phys. 2, 478 (1963)] model. For coherent bcc Cu precipitates with diameter larger than 2.5nm, the screw dislocation bypass mechanism becomes Orowan looping due to the coherency loss of the precipitates during the transformation. [J462]

"Electrical spin injection and detection in an InAs quantum well"

The authors demonstrate fully electrical detection of spin injection in InAs quantum wells. A spin-polarized current is injected from a Ni81Fe19thin film to a two-dimensional electron gas (2DEG) made of InAs based epitaxial multilayers. Injected spins accumulate and diffuse out in the 2DEG, and the spins are electrically detected by a neighboring Ni81Fe19electrode. The observed spin diffusion length is 1.8mcmat 20K. The injected spin polarization across the Ni81Fe19/InAsinterface is 1.9% at 20Kand remains at 1.4% even at room temperature. Their experimental results will contribute significantly to the realization of a practical spin field effect transistor. [J463]

"Carbon nanotubes grown on In 2 O 3 :Sn glass as large area electrodes for organic photovoltaics"

The authors report the growth of multiwall carbon nanotubes directly onto indium tin oxide glass via chemical vapor deposition as large area semitransparent electrodes for organic solar cell applications. The rate of nanotube growth on this ternary oxide is greatly reduced as compared to that of silicon dioxide and glass substrates enabling a high degree of control over nanotube height. The strong potential of this nanostructured semitransparent substrate as an interpenetrating hole-extracting electrode in bulk-heterojunction organic solar cells is also demonstrated. [J464]

"Al N /Al Ga N /Ga N metal-insulator-semiconductor high-electron-mobility transistor on 4 in. silicon substrate for high breakdown characteristics"

AlN/AlGaN/GaNmetal-insulator-semiconductor high-electron-mobility transistors (MIS-HEMTs) grown on 4in.silicon substrate have been demonstrated. The heterostructure exhibited high sheet carrier density with small surface roughness. AlN/AlGaN/GaNMIS-HEMT exhibited maximum drain current density (IDSmax)of 361mA/mmand maximum extrinsic transconductance (gmmax)of 152mS/mm. Due to the increase of sheet carrier density, the 2DEG channel shifts towards the AlGaN/GaN interface resulting in positive shift of the threshold voltage (-2.6to-1.8V). Two orders of magnitude low gate leakage current and reduced drain current collapse with high breakdown voltage of 230Vhave been observed on AlN/AlGaN/GaNMIS-HEMTs. [J465]

"Ti(N) thin film resistors for 20 dB Pi -type attenuator applications"

The authors report the effect of the film thickness on electrical properties of Ti(N) film resistors. The applications of titanium nitride thin film resistor in Pi -type attenuators are also characterized. As film thickness decreases from 100to30nm, the temperature coefficient of resistance significantly decreases from -60to-148ppm/K, while the sheet resistance increases from 37to270Omega / . The characterizations of 20dBattenuators using thin film resistors are improved in comparison with those using thick film resistors. The Pi -type attenuators using Ti(N) thin film resistors exhibit an attenuation of -19.94dBand voltage standing wave ratio of 1.16 at a frequency of 2.7GHz. [J466]

"Enhancement of room-temperature hole conductivity in narrow and strained Ge quantum well by double-side modulation doping"

The room-temperature two-dimensional hole gas (2DHG) conductivity as high as 649.3mu Sis obtained by implementation of double-side modulation doping (DS-MOD) of an 8nmthick strained Ge quantum well in a SiGe heterostructure. This conductivity is about three times higher than that of the conventional SiGe heterostructure with single-side modulation doping (SS-MOD). While the low-temperature (T=3K)mobility with DS-MOD is two times higher than that with SS-MOD, the room-temperature mobility of the two is practically the same, suggesting that phonon scattering is the dominant limiting mechanism at the device operating temperatures. [J467]

"Effect of excess bismuth concentration on dielectric and electrical properties of fully crystallized Bi 2 Mg 2/3 Nb 4/3 O 7 thin films"

The fully crystallized Bi2Mg2/3Nb4/3O7(BMN) films deposited at 400°Cwere characterized as a function of

excess bismuth amount. The films with 15mol%excess bismuth amount were fully crystallized having a monoclinic structure at 300°C. The dielectric constant of the films deposited at 400°Cincreases with increasing excess bismuth amount and the films with 15mol%excess bismuth exhibit a dielectric constant of 128 and a dissipation factor of 0.2%. The crystallized BMN films with 170nmthickness exhibit breakdown strengths above 600kV/cm(≥10V), irrespective of excess bismuth amount and a leakage current density of 2Ч10-8A/cm2at 590kV/cm. The conduction of crystallized BMN films was controlled by Schottky emission mechanism having a Schottky barrier height of 0.2-0.35eV. [J468]

"Silicon-based light emitters fabricated by embedding Ge self-assembled quantum dots in microdisks"

Silicon-based light emitters have been fabricated on silicon-on-insulator substrates by embedding Ge self-assembled quantum dots in microdisk resonators. Strong room-temperature resonant luminescence is observed from the microdisks under optical pumping. Photoluminescence from Ge quantum dots is significantly enhanced by the microdisk resonators. Different kinds of cavity modes, whispering-gallery modes, and Fabry-Perot modes are observed in the wavelength range from 1.2to1.6mcmfor microdisks with different diameters. [J469]

"Laser welding of a single tungsten oxide nanotip on a handleable tungsten wire: A demonstration of laser-weld nanoassembly"

The authors demonstrate that individual nanotips (W18O49)may be laser welded onto the supporting microtip. The nanotip-microtip assembly can be handheld or ready for further manual manipulation, and thus is very useful for individual nanowire's characterization, selection, and applications in nanoprobe analysis, nano-optical and nanoelectronic devices, and biostudy. Well mechanical and electrical connections are shown between the nanotip-microtip. Field emission characterization shows that the welded nanotip is a promising candidate for point electron source application. [J470]

"Shock compression response of nanoiron powder compact"

The shock compression response of nano-Fe powder (25nm)pressed to 35%theoretical maximum density was determined based on shock stress and wave velocity measurements using piezoelectric stress gauges. The obtained data show a discontinuity in shock wave velocity plotted against particle velocity and an inflexion in specific volume from compression to expansion with increasing shock stress. It is found that the Hugoniot of 25nmFe powder cannot be fully described using analytical models that are otherwise capable of predicting the Hugoniot of micron-sized powder or highly porous materials. [J471]

"Direct imaging of quantum wires nucleated at diatomic steps"

Atomic steps at growth surfaces are important heterogeneous sources for nucleation of epitaxial nano-objects. In the presence of misfit strain, we show that the nucleation process takes place preferentially at the upper terrace of the step as a result of the local stress relaxation. Evidence for strain-induced nucleation comes from the direct observation by postgrowth, atomic resolution, Z-contrast imaging of an InAs-rich region in a nanowire located on the upper terrace surface of an interfacial diatomic step. [J472]

"A PbS nanocrystal-C 60 photovoltaic device for infrared light harvesting"

PbS nanocrystal (nc-PbS)-C60photovoltaic devices are demonstrated, in which nc-PbS function as electron donors, showing infrared photosensitivity up to 1600nm. Annealing nc-PbS is proved to remove capping oleic acid ligands, studied using x-ray photoelectron spectroscopy, significantly improving the short circuit current, open circuit voltage, and fill factor. The device performance is rationalized by quantum confinement in nc-PbS and energy level alignment at the heterojunction based on direct measurements of nc-PbS ionization potential using ultraviolet photoelectron spectroscopy. [J473]

"Chemical phase transitions of a Si oxide film on SiC by MeV electron beam irradiation"

An ultrathin Si oxide film grown on a 6H-SiC(0001)wafer was irradiated with 1MeVelectron beam to examine its effect on the chemical species of a Si oxide/SiC wafer, where the Si oxide film was composed of SiO2, Si suboxides (Si3+, Si2+, and Si1+), and Si oxycarbides (Si-C-O). Scanning photoelectron microscopy and Si 2pcore-level spectroscopy show that e-beam irradiation induces chemical phase transitions from the Si suboxides and Si oxycarbides to SiO2. This suggests that e-beam irradiation is an efficient and simple method of producing a chemically uniform SiO2film on SiC without thermal and chemical treatments. [J474]

"Electrical properties of Bi 2 Mg 2/3 Nb 4/3 O 7 (BMN) pyrochlore thin films deposited on Pt and Cu metal at low temperatures for embedded capacitor applications"

200-nm-thick BMN films were deposited on Pt/TiO2/SiO2/Siand Cu/Ti/SiO2/Sisubstrates at various temperatures by pulsed laser deposition. The dielectric constant and capacitance density of the films deposited on Pt and Cu electrodes show similar tendency with increasing deposition temperature. On the other hand, dielectric loss of the films deposited on Cu electrode varies from 0.7% to 1.3%, while dielectric loss of films on Pt constantly shows 0.2% even though the deposition temperature increases. The low value of breakdown strength in BMN films on Pt compared to films deposited on Cu electrode was attributed to the increase of surface roughness by the formation of secondary phases at interface between BMN films and Pt electrodes. [J475]

"Organic photovoltaic devices with Ga-doped Zn O electrode"

The authors report two organic photovoltaic devices using a Ga-doped ZnO(GZO) film as a transparent conducting electrode. In the first structure, the conventional In2O3:Snhole-collecting anode was replaced by GZO and an efficiency of 0.35% was obtained. The second has the inverse structure where GZO was used as the electron-collecting cathode and gave a nonoptimized device efficiency of about 1.4%. Furthermore, this inverse structure of GZO devices provides a passivation layer to protect the active layer from the atmosphere. [J476]

"Erratum: "Icosahedral quasicrystals by optical interference holography" [JAppl. Phys. Lett. 89, 251111 (2006)]"

First Page of the Article [J477]

"Nanoimprinted large area heterojunction pentacene-C 60 photovoltaic device"

A pentacene-C60bilayer heterojunction organic photovoltaic device with interpenetrating donor-acceptor interface was fabricated by nanoimprinting the pentacene layer prior to C60deposition. An amorphous silicon substrate nanostructured using an excimer laser was imprinted onto the pentacene layer at high temperature and pressure, using a nanoimprinting lithography system to form a textured pentacene surface. A fivefold improvement in power conversion efficiency was observed due to increased exciton dissociation at the large area heterojunction. Using the proposed technique, highly efficient bilayer large area heterojunction photovoltaics based on small molecule organic materials can be envisaged. [J478]

"Electrical bistable behavior of an organic thin film through proton transfer"

This letter reports the synthesis of an organic molecule N,N'-bis (salicylidene)-1,6-hexanaphthenediamine (BSH) and the study of its electrical properties. Reversible electrical bistable behavior was observed both in BSH organic thin film on indium tin oxide substrate and in a crossbar device fabricated via standard integrated circuit processing with this thin film. The proton transfer model, induced by a bias higher than the switch threshold voltage, was employed to explain the electrical bistable phenomenon. This electrical bistability of BSH molecules is a key property for potential applications in organic nonvolatile memories and programable switches. [J479]

"Room-temperature oxygen sensitivity of ZnS nanobelts"

Room-temperature oxygen sensing is realized from individual ZnS nanobelts. Under UV illumination the current through ZnS nanobelt increases from 0.265to2.26nAas the oxygen pressure decreases from 1Ч105to3Ч10-3Pa. The conductance of ZnS nanobelt exhibits a logarithmic dependence on oxygen pressure, which is in agreement with theoretical prediction. The sensing is based on the enhanced modulation of ZnS nanobelts conductance by adsorbed oxygen under illumination. These results demonstrate an approach to in situ precisely detect oxygen at room temperature. [J480]

"Improved hydrogen storage properties of Li B H 4 destabilized by carbon"

The hydrogen storage properties of LiBH4ball milled with various ratios of carbon nanotubes (Cnano)were investigated. The LiBH4/Cnanomixtures showed superior dehydrogenation, hydrogen desorption starting at 250°C, and the majority of hydrogen being released below 600°C. The rehydrogenation results revealed that the Li2C2, formed during the dehydrogenation, could be reversed to LiH, in which the hydrogen capacity corresponds to 1/4of the original hydrogen content of LiBH4, and C at 10MPahydrogen pressure and 400°C. [J481]

"Coherent and intense multibeam generation by the apex of sharp nano-objects: Electron half-

circular prism"

Mutually coherent multiple electron beams (multibeam) were generated from diffraction at the apex of sharp nano-objects, especially carbon nanotubes, in a field emission projection microscope. Simulation using a simple scalar diffraction model showed that the apex of sharp nano-objects played the role of an electron half-circular prism, deflecting an electron beam through a constant angle toward the prism axis. The multibeam diffraction pattern gave a high visibility of 0.8and high intensity. [J482]

"Low-voltage-operating complementary inverters with C 60 and pentacene transistors on glass substrates"

Organic complementary inverters with C60and pentacene thin-film transistors (TFTs) have been fabricated on glass substrate. The inverter operated at low voltages of 1-5V. The C60and pentacene TFTs had high field-effect mobilities of 0.68 and 0.59cm2/Vs, and threshold voltage of 0.80 and -0.84V, respectively. The low threshold voltage enables the low voltage operation of the inverter. [J483]

"AlN air-bridge photonic crystal nanocavities demonstrating high quality factor"

The authors report an achievement of high quality AlN ultraviolet photonic crystal nanocavities. Convex AlN air-bridge structures with embedded GaN quantum dots have been formed by utilizing photoelectrochemical etching of 6H-SiCsubstrates. Room-temperature microscopic photoluminescence measurements reveal the high quality of the nanocavities. For the lowest-order cavity mode of a 150-nm-period nanocavity with seven missing holes, the highest Qfactor (2400)ever reported in nitride-based photonic crystals has been obtained. [J484]

"Surface-depletion controlled gas sensing of ZnO nanorods grown at room temperature"

The authors report on surface-depletion controlled gas sensing ZnO nanorods. These nanorods were synthesized through a simple wet chemical route at room temperature. The diameter of nanorods is about 15nm, which is close to two times of the Debye length of ZnO. In contrast to the previous report, the sensing is surface-depletion controlled rather than contact controlled and the sensitivity is up to 29.7 against 100ppmethanol. Such high sensitivity is due to an almost complete depletion of the rods in air, which is confirmed from photoluminescence spectrum and x-ray photoelectron spectroscopy. The gas sensing mechanism controlled by surface depletion provides another approach to realize high-performance gas sensors. [J485]

"Comprehensive model for fine Coulomb fission of liquid droplets charged to Rayleigh limit"

Fine Coulomb fission of liquid droplets charged to the Rayleigh limit is modeled, combining the theories for the flow-limited field-injection electrostatic spraying and the conventional electrostatic spraying. The model gives expressions for the current, flow rate, jet growth rate, and secondary droplet size in the fine Coulomb fission process. The model can explain the reported experimental results and completes the previous model on Coulomb fission. [J486]

"Monocrystalline NbN nanofilms on a 3C-Si C /Si substrate"

The authors have realized NbN (100) nanofilms on a 3C-SiC(100)/Si(100) substrate by dc reactive magnetron sputtering at 800°C. High-resolution transmission electron microscopy (HRTEM) is used to characterize the films, showing a monocrystalline structure and confirming epitaxial growth on the 3C-SiClayer. A film ranging in thickness from 3.4to4.1nmshows a superconducting transition temperature of 11.8K, which is the highest reported for NbN films of comparable thickness. The NbN nano-films on 3C-SiCoffer a promising alternative to improve terahertz detectors. For comparison, NbN nanofilms grown directly on Si substrates are also studied by HRTEM. [J487]

"Nonvolatile resistive switching memory utilizing gold nanocrystals embedded in zirconium oxide"

Resistive switching characteristics of ZrO2films containing gold nanocrystals (nc-Au) are investigated for nonvolatile memory applications. The sandwiched top electrode/ZrO2(with nc-Au embedded)/n+Si structure exhibits two stable resistance states (high-resistance state and low-resistance state). By applying proper voltage bias, resistive switching from one state to the other state can be achieved. This resistive switching behavior is reproducible and the ratio between the high and low resistances can be as high as two orders. The intentionally introduced nc-Au in ZrO2films can improve the device yield greatly. ZrO2films with gold nanocrystals embedded are promising to be used in the nonvolatile resistive switching memory devices. [J488]

"Improvement in electric and dielectric properties of nanoferrite synthesized via reverse micelle

technique"

Nano nickel zinc ferrite (Ni0.58Zn0.42Fe2O4)with fascinating dielectric properties which reveal a direction for application was synthesized by reverse micelle technique. Dielectric constant and dielectric losses are controlled up to a measurement temperature of around 473Kat higher frequency range of 9-19MHz. The dielectric loss of the sample investigated at room temperature is only 0.003 at 19MHz. The presently studied nanoferrite also exhibits a high value of dc resistivity, 108Omega cm. High resistivity and low dielectric constant and loss can be corelated to small grain size and better compositional stoichiometry obtained as a result of processing via reverse micelle technique at low sintering temperature (773K). [J489]

"Subwavelength imaging by metallic slab lens with nanoslits"

A metallic slab lens featured with specially designed nano slits is presented to realize imaging for arbitrary object and image distances. Based on the particular propagation properties of surface plasmon polaritons in nanostructures, slits perforated in silver slab are designed with variant widths to produce desired optical phase retardations. Numerical simulation of an illustrative lens is performed through finite-difference time-domain method and shows that subwavelength imaging is realized at the designed position. [J490]

"Laser direct write of silver nanoparticles from solution onto glass substrates for surface-enhanced Raman spectroscopy"

A solution based laser direct write technique for patterning of glass substrates with silver nanoparticles is presented. Photoreduction of an AgNO3solution, by nanosecond UV laser pulses, produces a source solution of silver particles. A glass substrate is then inserted into this solution and the laser is scanned over its surface. Laser-induced fragmentation of the silver particles in the solution, assisted by the melting of the glass surface, produces coatings of silver nanoparticles in the laser-irradiated regions. Strong enhancement of the Raman signal from a dilute Rhodamine 6G analyte confirmed that these substrates are suitable for surface-enhanced Raman measurements. [J491]

"Extremely high oxygen sensing of individual Zn Sn O 3 nanowires arising from grain boundary barrier modulation"

Extremely high oxygen sensing is realized from individual ZnSnO3nanowires with abundant grain boundaries. The current across one single ZnSnO3nanowire increases by about six orders of magnitude, from 1.20Ч10-7to3.78Ч10-1mu A, as the oxygen pressure decreases from 3.7Ч104to1.0Ч10-4Pa. Such a drastic sensing is ascribed to grain boundary barrier modulation. This interpretation is confirmed by the sensing experiments under UV illumination. The results demonstrate a promising approach to realize miniaturized and highly sensitive oxygen sensors. [J492]

"Quantum-well and localized state emissions in AlInGaN deep ultraviolet light-emitting diodes"

Injection current and temperature dependence of electroluminescence (EL) is investigated in AlInGaN deep untraviolet light-emitting diodes. Two EL bands with different behaviors are observed. The high-energy band (P1) shows a monotonous redshift and an amazing increase of intensity with increasing current, however, a "U"-shaped shift and a saturation of intensity at high current are measured for the low-energy band (P2). Accordingly, P1 and P2 are attributed to emissions from quantum-well and localized states, respectively, with P1 dominant at high current and high temperature and P2 the main emission mechanism under low temperature and low current. Modeled data based on the theory of random population for localized states in quantum wells taking into account self-heating effect agree well with the experimental results. [J493]

"Direct visualization of triplex DNA molecular dynamics by fluorescence resonance energy transfer and atomic force microscopy measurements"

We have detected the dynamics of 17-mer DNA triplex dissociation mechanism at the molecular level. Fluorescence resonance energy transfer (FRET) was used as an indicator of intermolecular interaction in nanometer range, whereas atomic force microscopy (AFM) was employed to address single molecule with sub-angstrom precision. The maximum rupture force of DNA triplex was found at pH4.65, consistent with macroscopic observations. These results indicated that the FRET together with an AFM detection system could be used to reveal the DNA triplex interaction in nanometer scale unambiguously. [J494]

"Realization of Pi -type attenuator using Ti(N) thin films for the fourth generation of mobile telecommunications"

The performances of 20dBand 25WPi -type attenuators prepared using Ti(N) thin film resistors on AlN substrates were investigated at applied frequencies of 3 and 6GHz. An attenuation and voltage standing wave ratio (VSWR) were significantly improved by a design of L/W(length/width) ratios of main resistor R2. The chip design with L/Wratio of 3.0 was observed as an optimal condition for the attenuators. The attenuator prepared at L/Wof 3.0 shows the attenuation tolerance of 1.10dBand VSWR of 1.21 at an applied frequency of 6GHz. [J495]

"Recording Performance Study of PMR Media With Patterned Tracks"

Discrete track recording technology offers a potential advantage in reducing adjacent track erasure/interference. As nano-imprinting technology advances, fabrication of such media has been demonstrated. In recent years, discrete track recording has generally been viewed as one of the next promising technologies for areal density advancement. In this study, we evaluated the recording performance of PMR media with patterned tracks. To accurately assess the advantage of discrete track performance and compare with current continuous media, both recording performances were measured on one single track. The head flying height is monitored on the patterned and continuous media regions. At 100-nm data track width, patterned tracks show noticeably better signal-to-noise ratio and significantly lower adjacent track erasure compared with continuous media at the same track width. Such measured performance advantages are critical to increase track density beyond 300-400 ktpi [J496]

"Biomedical Engineering and eHealth min Europe-Outcomes and Challenges of Past and Current EU Research Programs"

Biomedical engineering and information and communication technologies (ICT) for health (eHealth) areas have been funded by EU research programs during the last 20 years. During the last two Framework Programmes (1998-2006) biomedical engineering has been diffused in several programs and priorities, but the total amount of funding has not diminished and has followed the overall growth of the EU funds for research. Many good results have been achieved that have led not only to new diagnostic and treatment methods and devices but also have contributed to the growth of one of the largest industries worldwide. The current FP7 will support innovative research at the crossroads of medicine, biology, engineering, and information sciences and contribute to worldwide state-of-the-art technology through the full span of the innovation chain from foundational to applied research. The focus on the ultimate benefits to all citizens, such as improved health access to quality healthcare and the efficiency of new citizen-centered healthcare delivery systems, will put health technologies center stage for innovative research, technological assessment, and clinical validation. The synergy of areas such as medical informatics and bioinformatics will give rise to research that supports molecular- and genomics-based medicine. In the new program the traditional areas of biomedical engineering and eHealth will be expanded due to overall convergence of info-bio-nano technologies and cognitive sciences. [J497]

"A Hairpin Line Diplexer for Direct Sequence Ultra-Wideband Wireless Communications"

A high performance hairpin line diplexer for the direct sequence ultra-wideband communication is designed and implemented. This microstrip diplexer is mainly composed of two hairpin line wideband bandpass filters and a tapped open stub. The design concept is proposed in detail and has been verified by the experimental results of the fabricated diplexer, including the two isolated wideband bandwidths of 3.1-5.0 GHz and 6.02-10 GHz, low insertion loss and high isolation. Experimental results also show a good agreement with the simulated results. [J498]

"Light–Output Enhancement of Nano-Roughened GaN Laser Lift-Off Light-Emitting Diodes Formed by ICP Dry Etching"

In this paper, we report the fabrication and characteristics of nano-roughened GaN laser lift-off (LLO) light-emitting diodes (LEDs) with different scale surface roughness. The surface roughness of devices was controlled by inductively coupled plasma reactive ion etching. Using this fabrication method to form nano-scaled roughness, the electrical property was almost not degraded. Furthermore, the light-output power and wall-plug efficiency of LLO LED could be both significantly enhanced about two times using this simple method [J499]

"Exploratory study on power-efficient silicon nano-wire dynamic NMOSFET/PMESFET logic"

The latest techniques in fabricating silicon-based, vertical surrounding gate MOSFETs (SGFET) instigate the pathway towards building the next generation ultra large-scale integration (ULSI). The study shows the design and optimisation of surrounding gate n-channel MOSFETs and p-channel MESFETs used in dynamic differential domino circuits suitable for an area-efficient technology. Three-dimensional device simulations investigate the maximum device transconductance and minimum OFF current of vertical, metal-gated nano-wire NMOSFETs

and PMESFETs as a function of wire radius and doping concentration. Two-dimensional process simulations are carried out on the optimum transistor designs, and non-ideal device characteristics are measured. A family of differential dynamic circuits composed of a two-input AND (OR), and two-input XOR gates and a full adder are built to measure worst-case pre-charge and evaluate function delays, power dissipation and layout area [J500]

"Cellular wave computers for nanotera- scale technology---beyond boolean, spatial-temporal logic in million processor devices"

Cellular wave computer architecture as a spatial-temporal universal machine on flows reflects (i) the prophecies of Turing and von Neumann, (ii) physical constraints of nano-scale technology, (iii) typical constructs in neural organisation and mechanisms, and (iv) provides for a new way of algorithmic and hardware-software framework, already implemented in some new products, including visual microprocessors. A few aspects of this new kind of computer and computing are highlighted, including the `function in layout' principle, the biological relevance in retinal modelling, and the new type of spatial-temporal algorithmic thinking beyond Boolean logic [J501]

"Experimental Study on Breakdown of Mobility Universality in -Directed (110)-Oriented pMOSFETs"

This paper describes experimental determination of the value of eta in (110)-oriented SOI pMOSFETs by changing the SOI thickness and temperature. It is found for the first time that in the case of a lang100rang-directed channel, eta should be larger than unity, which implies the collapse of the mobility universality, when temperature is low or SOI thickness is ultimately thin. Possible mechanisms of the breakdown of the mobility universality are discussed [J502]

"Three-dimensional CMOL: three-dimensional integration of CMOS/nanomaterial hybrid digital circuits"

The CMOS molecular (CMOL) circuit is a promising hybrid structure incorporating the nanowire crossbar into the CMOS integrated circuit (IC) implementation. In this letter, a novel three-dimensional (3D) architecture of the CMOL circuit is introduced. This structure eliminates the special pin requirement of the original CMOL designs, providing a feasible and efficient solution to build the practical CMOL circuits. In this 3D structure, the density of the nanowire crossbar is doubled. Such a high-density implementation enables the 3D CMOL technology to leap ahead of the IC roadmap by more than three generations. [J503]

"Jc Enhancement in Nano-Si 3 N 4 Doped MgB 2 /Fe Tapes Prepared by a Short Pre-Annealing and Intermediate Rolling Process"

Using our newly developed short pre-annealing and intermediate rolling process, the property of MgB2/Fe tapes doped with nano-Si3N4particles was further improved. The highest Jcvalue at 10 T and 4.2 K reached 6310 A/cm2in the sample doped with 1% nano-Si3N4by using our new process, which was obviously higher than that of 4550 A/cm2obtained in the sample made via the conventional in situ PIT process. Furthermore, it was found that the improvement of Jcbecame smaller with increasing the doping concentration of nano-Si3N4particles. This confirmed that our new process contributed to the Jcenhancement mainly through increasing the core density and connectivity. Adding more nano-Si3N4introduced more impurities at the grain boundaries, which made our new process less effective. [J504]

"Role and Contribution of Foreign-Born Scientists and Engineers to the Public U.S. Nanoscience and Technology Research Enterprise"

Foreign-born scientists and researchers have long been a fixture in the U.S. R&D system. This paper examines a key indicator of scientific performance-individual research productivity. In a large sample of public sector researchers in nanoscience and technology, it was found that foreign-born scientists are consistently more productive than their native-born counterparts across different organizational settings and within a federal laboratory environment. The results furthermore show that male foreign-born researchers are more productive than their female peers in an unusually multidisciplinary research environment, except in the federal laboratory system. Both policy and management implications of these findings will be discussed. An open-versus closed-door immigration policy debate has historically resulted in policies that favor an open-door immigration policy for foreign-born researchers, but lately, and particularly since September 2001, the policy pendulum has started to swing in the other direction. I argue that a reasonable and sound immigration and science policy would balance the benefits of having a strong contingent of foreign-born researchers with the interests of current and future native-born researchers. Research-intensive organizations would serve their interests well by initiating or sustaining diversity and equal opportunity employment practices, which are likely to have a positive impact on research productivity. [J505]

"Spatial Resolution Assessment of Nano-SQUIDs Made by Focused Ion Beam"

The ability to reduce SQUID dimensions into the sub-micrometer or nanometer regime points the way towards novel applications, particularly in emerging fields such as quantum information processing, single-photon/particle detection, and experimental studies of nano-scale entities such as Bose-Einstein condensates. We report here on our ongoing work combining traditional thin-film and photolithographic fabrication processes with computer-aided-design software and focused ion beam milling to realize sub-micrometer superconducting structures. Their magnetic field sensitivity, noise behavior, spatial resolution, and prospects for magnetic spin detection are discussed. [J506]

"Approach for a Standardized Methodology for Multisite Processing of 300-mm Wafers at R&D Sites"

This paper describes the objectives and results of a joint European project named FLYING WAFER. The goal of the project was to provide a methodology for interlinking European R&D centers in micro and nano technologies to a distributed 300-mm CMOS R&D line. The project was carried out as a feasibility study. Therefore, the results provide a model and concept which has the potential of guaranteeing a safe and fast exchange of wafers and data between European R&D nodes to allow multisite processing. An implementation phase is planned as a second step. [J507]

"Ultrahigh Frequency Carbon Nanotube Transistor Based on a Single Nanotube"

Single-walled carbon nanotube field-effect transistors (CNT FETs) are predicted to have intrinsic cutoff frequencies approaching the THz range. Here ldquointrinsicrdquo means that the parasitic capacitance due to fringing fields is negligible compared to the gate-source capacitance required to modulate the conductance. In practice, although there are strategies proposed to mitigate this based on parallel arrays of CNT FETs, this parasitic capacitance dominates most geometries (even aligned arrays to date). In this work we show nanotube transistor performance with maximum stable gain above 1 GHz (even including the parasitics) by combining ldquoon-chiprdquo the electrical properties of 100 CNT FETs fabricated on one long nanotube. This also solves the problem of impedance matching by boosting the on current to a large (mA) value, and at the same time allows one to extract properties of each individual CNT FET, since they are identical in electrical characteristics as they are made out of the same CNT. This strategy opens the door to applications of carbon nanotube devices in the RF and microwave frequency range, a technologically relevant portion of the spectrum for both wired and wireless electronics, that has been (until now) incompatible with nanotube device technology. [J508]

"Multiscale Control for Nanoprecision Positioning Systems With Large Throughput"

A problem of continuing interest in feedback control is handling conflicting time-domain performance specifications. Semiconductor manufacturing is one of the applications of particular interest in this context with the demanding feature sizes (on the order of a few tens of nanometers) to be produced on a wafer while still requiring high throughput (greater than 100 wafers per hour). In this brief, we propose a multiscale control design method based on a reduced-order model-following scheme for the dynamic systems with such conflicting time-domain performance requirements. This method uses a dynamic reference model to make the plant output track the model output as closely as possible without increasing the overall order of the control system. Optimal proportional-integral (PI) control is used, which is essentially a modification of the conventional optimal control. A detailed analytical proof is given to show that this control scheme effectively overcomes the limitations of the conventional optimal control techniques and provides consistent performances at nano- as well as macroscale positioning with fast rise and settling times. Benefits and limitations of the proposed control scheme are described and stability and performance analyses are discussed. A six-degree-of-freedom (6-DOF) extended-range magnetically levitated (maglev) nanopositioning stage, which is open-loop unstable, is used as a test bed to demonstrate the developed control strategy. Step responses under a variety of conditions are obtained to verify the effectiveness of the proposed method. This method exhibits significantly better and robust performances in terms of transient as well as steady-state behavior compared with conventional optimal-control schemes. Furthermore, it can be applied to a general class of higher-order linear time-invariant (LTI) systems with or without open-loop instability. [J509]

"A Survey of Control Issues in Nanopositioning"

Nanotechnology is the science of understanding matter and the control of matter at dimensions of 100 nm or less. Encompassing nanoscale science, engineering, and technology, nanotechnology involves imaging, measuring, modeling, and manipulation of matter at this level of precision. An important aspect of research in nanotechnology involves precision control and manipulation of devices and materials at a nanoscale, i.e.,

nanopositioning. Nanopositioners are precision mechatronic systems designed to move objects over a small range with a resolution down to a fraction of an atomic diameter. The desired attributes of a nanopositioner are extremely high resolution, accuracy, stability, and fast response. The key to successful nanopositioning is accurate position sensing and feedback control of the motion. This paper presents an overview of nanopositioning technologies and devices emphasizing the key role of advanced control techniques in improving precision, accuracy, and speed of operation of these systems. [J510]

"Efficient field emission from Li-salt functionalized multiwall carbon nanotubes on flexible substrates"

The authors report extremely low electron field emission thresholds of 0.25V/mcmfrom lithium salt functionalized multiwall carbon nanotubes adhered to carbon fiber fabric. Crucially, these nanostructured field emitters are flexible, air stable, and produced via a low cost dip-processing method using an aqueous nanotube ink, whereupon the nanotubes spontaneously assemble onto a surface oxidized carbon fiber matrix to form dense mats. The very low emission threshold is rationalized in terms of the morphology of the nanotube mats and the relatively low work function of lithium salt derivated carbon nanotubes. [J511]

"Anomalous photoluminescence behavior from amorphous Ge quantum dots produced by buffer-layer-assisted growth"

The authors present photoluminescence results from amorphous Ge quantum dots formed using buffer-layer-assisted growth. Their sizes, shapes, and densities were controlled by varying the thickness of the Xe buffer layer, with sizes varying from 2to8nm. A relatively weak signal was observed at 3Kat 0.91eVthat was independent of size and was insensitive to laser intensity. Its temperature-dependent magnitude showed a Berthelot-type behavior that they associate with hopping of carriers between radiative tail states and shallow nonradiative states. These findings are similar to those from porous semiconductors. [J512]

"Piezoresistive Cantilever Beam for Force Sensingin Two Dimensions"

A novel two-dimensional piezoresistive nano-Newton resolution force sensing cantilever is presented. The silicon cantilever is fabricated using bulk micromachining. Two 500-nm-thick p-doped epitaxial silicon piezoresistive sensors are located on both sides of the cantilever. This structure detects both the lateral and vertical applied forces by electronic switching between two configurations of a Wheatstone bridge. A force sensitivity is measured up to 100 and 540 V/N for lateral and vertical configurations, respectively. The corresponding force resolution is estimated at 21 and 4 nN, respectively. This force-sensing cantilever can be used for measuring the contact force between manipulating tools and small objects in, e.g., living cell handling, minimally invasive surgery, and microassembly [J513]

"High-quality thin-film passivation by catalyzer-enhanced chemical vapor deposition for organic light-emitting diodes"

The thin-film passivation of organic light-emitting diodes (OLEDs) by a SiNxfilm grown by catalyzer-enhanced chemical vapor deposition was investigated. Using a tungsten catalyzer connected in series, a high-density SiNxpassivation layer was deposited on OLEDs and bare polycarbonate (PC) substrates at a substrate temperature of 50°C. Despite the low substrate temperature, the single SiNxpassivation layer, grown on the PC substrate, exhibited a low water vapor transmission rate of (2-6)Ч10-2g/m2/dayand a high transmittance of 87%. In addition, current-voltage-luminescence results of an OLED passivated with a 150-nm-thick SiNxfilm compared to nonpassivated sample were identical indicating that the performance of an OLED is not critically affected by radiation from tungsten catalyzer during the SiNxdeposition. Moreover, the lifetime to half initial luminance of an OLED passivated with the single 150-nm-thick SiNxlayer was 2.5 times longer than that of a nonpassivated sample. [J514]

"Channel width effect on the spin-orbit interaction parameter in a two-dimensional electron gas"

The spin splitting energy obtained from the Shubnikov-de Haas oscillation increases with decreasing channel width (w)of the InAs-based heterostructure. Since the surface charge concentration depends only weakly on w, the channel width dependence of the spin splitting energy is attributed to variations in the spin-orbit interaction strength. The spin-orbit interaction parameter was found to be inversely proportional to √win the range of w=2-64mcm. Our findings indicate that a strong spin-orbit interaction is induced in a narrow channel due to suppression of the spin precession length for a thin quantum well layer system. [J515]

"Electrochemical route to the synthesis of ultrathin ZnO nanorod/nanobelt arrays on zinc substrate"

An electrochemical route has been developed for the synthesis of highly ordered ZnO ultrathin nanorod and hierarchical nanobelt arrays on zinc substrate. A H2gas sensor based on the ZnO nanobelt array exhibits excellent sensitivity, rapid response, and good reproducibility even at room temperature. [J516]

"Co clustering and ferromagnetism in chemical vapor deposited Ti 1-x Co x O 2-delta thin films"

Stoichiometric Ti1-xCoxO2and oxygen-deficient Ti1-xCoxO2-delta thin films were grown on Si (001) by plasma-enhanced metal-organic chemical vapor deposition and their microstructures and ferromagnetic properties were investigated. The stoichiometric film grown at 430°Cshowed no discernable Co metal clustering or measurable coercive field. In contrast, oxygen-deficient films fabricated without supplying O2contained significant Co clusters of 10-20nm, which appeared to be the major reason for the observed room-temperature ferromagnetism. With increasing oxygen vacancies of the films, the coercive field and saturation magnetization values increased to 460Oeand 27emu/cm3(1.55mu B/Coatom) approached that for bulk cobalt, respectively. [J517]

"The Preparation of Nanocrystalline Silicon by Plasma-Enhanced Hydrogenation for the Fabrication of Light-Emitting Diodes"

The fabrication of nanocrystalline silicon light-emitting diodes is reported using a novel plasma-enhanced hydrogenation method. The fabrication process consisted of the deposition of amorphous silicon on a silicon substrate, a hydrogen plasma treatment, and subsequent annealing, and the deposition of TiO2, indium-tin oxide, and metal contact layers. The entire process was performed at temperatures below 400 degC and is compatible with standard silicon fabrication technologies. The current-voltage (I-V) characteristics of the device showed a rectifying diode behavior where electrons tunneled through the thin TiO2layer and recombined with the holes injected from the P-type silicon substrate leading to photon generation. The structure of the nanocrystalline silicon films was investigated by scanning electron and transmission electron microscopies, and the spectral distribution of the emitted light was measured by a cathodoluminescence [J518]

"High-Reflectance and Thermally Stable AgCu Alloy p-Type Reflectors for GaN-Based Light-Emitting Diodes"

We report on the formation of high-quality AgCu alloy p-type reflectors for GaN-based light-emitting diodes (LEDs). Compared with Ag contacts, the AgCu alloy reflectors produce lower specific contact resistance (7.5times10-5Omegamiddotcm2), higher light reflectance (89.5% at 400 nm), and better thermal stability (absence of interfacial voids), when annealed at 400 degC in N2 : O2(=1:1) ambient. LEDs fabricated with the AgCu reflectors show light output power better than that of LEDs with the Ag reflectors. The ohmic mechanism for the AgCu alloy reflectors is explained in terms of the formation of Ag-Ga solid solution and the presence of Cu-oxide nano-particles at the contact/GaN interface [J519]

"Analytical Models for the Insight Into the Use of Alternative Channel Materials in Ballistic nano-MOSFETs"

This paper presents new analytical derivations for the ballistic current of n-MOSFETs as a function of the transport direction, of the properties of the channel material, and of the technological parameters. The main purpose of the analytical expressions is to provide an insight into the optimization of the transistors with alternative channel materials. Our results simply explain why, for a given two-dimensional (2-D) density of states, an elliptic 2-D minimum can provide a current larger than a circular minimum if the best transport direction is selected. Furthermore, we analytically show that the use of channel materials with very small transport masses implies a tradeoff between the electron velocity and the gate drive capacitance, because of the finite capacitance of the inversion layer. This latter effect should be seriously considered in the context of the aggressive scaling of the equivalent oxide thickness enforced by the introduction of high-K dielectrics and multigate MOSFETs [J520]

"Modeling Crosstalk Effects in CNT Bus Architectures"

Carbon nanotubes (CNTs) have been widely proposed as interconnect fabric for nano and very deep submicron (silicon-based) technologies due to their robustness to electromigration. In this paper, issues associated with crosstalk among bus lines implemented by CNTs are investigated in detail. CNT-based interconnects are modeled and the effects of crosstalk on performance and correct operation are evaluated by simulation. Existing models are modified to account for geometries in bus architectures made of parallel single-walled nanotubes and a single multiwalled nanotube. New RLC equivalent circuits are proposed for these bus architectures. A novel bus architecture with low crosstalk features is also proposed. This bus architecture is made of dual-walled nanotubes arranged in parallel. In this architecture, the crosstalk-induced delay and corresponding uncertainty

(as well as crosstalk-induced peak voltage) are significantly reduced; a modest area penalty is incurred. Reductions up to 59% for the crosstalk-induced delay and up to 81% for the crosstalk-induced peak voltage are reported. These results confirm that the proposed bus arrangement noticeably improves performance and provides reliable operation [J521]

"Micro and nano structures of carbonised polymer through pyrolytic transformation from polymer structures"

Micro and nano structures of carbonised polymers resulting from the pyrolytic transformation of polymer structures are presented. Polymers have become increasingly popular as materials for micro/nano electromechanical systems (MEMS/NEMS), especially for chemical or biological application. Focus is on the transformation of polymer structures into carbonised structures using a pyrolysis process. Combination of this pyrolysis process with conventional MEMS/NEMS fabrication technology could provide various fine structures of carbonised polymer. Carbonised polymers have advantages over conventional carbon materials, with respect to compatibility with MEMS, because they can be transformed directly from a polymer structure. Three-dimensional micro and nano free-standing structures of carbonised polymer as typical MEMS/NEMS structures are reported. Micro molding process is used to demonstrate a unique polymer structure to be pyrolysed. Furthermore, EB lithography technology is employed for the patterning of polymers in addition to UV photolithography which is used by previous researches. A 100 nm wide bridge structure is designed as nano structures. In addition, the presented structures of carbonised polymer are expected to be applied to micro and nano functional devices such as electrochemical sensors by making the best use of their carbon-like features [J522]

"Nano- and Microlens Arrays Grown Using Atomic-Layer Deposition"

A method for making optical micro- and even nanosized lens arrays with 100% fill factor is reported here. Lens arrays with a wide range of diameters and pitches, from deep submicron to tens of microns, were made through conformal growth of dielectric monolayers onto prepatterned templates by using atomic-layer deposition. This method has a degree of freedom of choosing lens materials with a broad range of optical refractive indexes, as well as of controlling the curvature of the lens surface and the fill factor of the lens array. This method greatly boosts our capability to make optimal lens arrays for broad applications [J523]

"A Silicon-on-Insulator Photonic Wire Based Evanescent Field Sensor"

We demonstrate a new, highly sensitive evanescent field sensor using silicon-on-insulator (SOI) photonic wire waveguides. Theoretical analysis shows that thin SOI waveguides can provide higher sensitivity over devices based in all other common planar waveguide material systems for the probing of both thin adsorbed biomolecular layers and bulk homogeneous solutions. A Si photonic wire waveguide was incorporated into a Mach-Zehnder interferometer based sensor, configured to monitor the index change of a homogeneous solution. High effective index change of 0.31 per refractive index unit (RIU) change of the solution was measured, confirming theoretical predictions [J524]

"Power efficiency system for flight application (pesfa) mission"

The objective of this current research is to describe the design of a high performance micro sensor for small spacecraft that acts as the core of a stand-alone aerospace system. A high performance cascaded micro sensor is designed with micro-electro-mechanical systems (MEMS) and nano-scaled technology, and can be incorporated in conventional methods as well as new spacecraft system designs focused on power efficiency system for flight application (PESFA) mission, referred to herein as the PESFA mission. This research describes the behavior of high performance micro sensor design methodology with dynamic configuration. The results of the computer simulations of these micro sensors are compared for possible improvements and provide high power efficiency at very long lifetimes to be able to operate independent of an energy limitation in flight application such as spacecraft and aerospace systems [J525]

"Wafer Direct Bonding: From Advanced Substrate Engineering to Future Applications in Micro/Nanoelectronics"

Wafer direct bonding refers to the process of adhesion of two flat mirror-polished wafers without using any intermediate gluing layers in ambient air or vacuum at room temperature. The adhesion of the two wafers occurs due to attractive long range van der Waals or hydrogen bonding forces. At room temperature the bonding energy of the interface is low and higher temperature annealing of the bonded wafer pairs has to be carried out to enhance the bonding energy. In this paper, we describe the prerequisites for the wafer-bonding process to occur and the methods to prepare the suitable surfaces for wafer bonding. The characterization techniques to assess

the quality of the bonded interfaces and to measure the bonding energy are presented. Next, the applications of wafer direct bonding in the fabrication of novel engineered substrates such as "silicon-on-insulator" and other "on-insulator" substrates are detailed. These novel substrates, often called hybrid substrates, are fabricated using wafer bonding and layer splitting via a high dose hydrogen/helium implantation and subsequent annealing. The specifics of this process, also known as the smart-cut process, are introduced. Finally, the role of wafer bonding in future nanotechnology applications such as nanotransistor fabrication, three-dimensional integration for high-performance micro/nanoelectronics, nanotemplates based on twist bonding, and nano-electro-mechanical systems is discussed [J526]

"Interface configuration and Fermi-level pinning of fully silicided gate and high-K dielectric stack"

Metal-induced gap states (MIGS) theory is applied to fully silicided (FUSI) gate for the investigation of Fermi-level pinning at the interface of FUSI gate and high-Kdielectrics. Using the combination of semiempirical approach and MIGS theory, it has been found that FUSI gate has effectively MSi2configuration at the interface with gate dielectrics. The vacuum work function values of several FUSI gates have been obtained through the analysis, and it has also been found that the Fermi-level pinning behavior of FUSI gate on high-Kdielectric follows the MIGS theory well. FUSI gate on high-Kdielectric shows much weaker Fermi-level pinning compared with polysilicon gate on high Kdielectric, which is another attractive advantage of FUSI gate process. [J527]

"Statistical modeling of field-enhancement-factor distribution of nanostructured carbon films"

We measured the field-emission properties of nanostructured carbon films (NSCFs), carbon nanotubes, and carbon nanoparticles, using a microtip and a large area phosphor-screen anode. The normal distribution of turn-on electric fields which was measured using a microtip anode from 100 square cells of 30Ч30mcm2for each NSCF indicated an asymmetric distribution of field-enhancement factor beta with a large-beta tail. The direct deduction of the field-enhancement factors via fitting of current-versus-voltage curves to the simplified Fowler-Nordheim (FN) equation with a series-resistance effect confirmed the asymmetric beta distribution. Moreover, field-emission features observed using a large area phosphor screen, such as a slight curvature in the FN plots at the low voltage regime and applied-field-dependent exponential increase of emission-site densities, turned out to be consistent with the asymmetric beta distribution. [J528]

"Effects of N H 3 pulse plasma on atomic layer deposition of tungsten nitride diffusion barrier"

We deposited W-N thin films on Si and tetraethylorthosilicate (TEOS)/Si substrates at 200-400°C, synchronizing a pulse plasma only with NH3exposure cycles during atomic layer deposition (ALD) cycles of NH3and WF6. The deposition rate was about 0.3nm/cycleat 350°C, the nitrogen concentration was uniformly distributed in the W-N films, and the NH3pulse plasma did not cause wormholes at the Si surface. However, there was an incubation period to deposit the W-N film according to the ideal ALD mechanism. Rutherford backscattering spectroscopy revealed that a 22-nm-thick W-N thin film, as a diffusion barrier for the Cu interconnect, successfully prevented the Cu diffusion during the annealing at 600°Cfor 30min. [J529]

"High current field emission behavior of carbon nanofiber film: Adsorbate effects"

We report high current-density field emission from carbon nanofiber (CNF) films synthesized using electroplated Ni catalysts. High-density thick CNFs, which had many protrusions with small tip radii and a solid structure without hollow cores, were formed on gold-buffer layers. The maximum emission current of 3.67mAwas measured from the area of 4.9Ч10-3cm2, corresponding to the current density of 750mA/cm2. There was a distinctive hysteresis in emission-current versus voltage (I-V)curves corresponding to the ramping direction of bias voltage, which led us to divide I-Vcurves into three distinguishable regimes: adsorbate-enhanced, intermediate, and intrinsic emission regimes. The deviations between up- and down-sweep emission currents, and the slope change in Fowler-Nordheim curves were most prominent in intermediate emission regime. Based on systematic field emission measurements, such as variations of chamber pressure and bias-voltage sweep speed, and temporal variation of emission current at fixed bias voltages, we propose that the observed emission behavior of CNFs stemmed from the desorption and readsorption of adsorbates during emission measurements. [J530]

"Quantum size dependence of electron distribution on carbon nanotubes and its influence on field emission"

A two-dimensional model of quasi-free-electrons is used to compute the electron axial distribution on a carbon nanotube and the energy distribution of the field emitted electrons. The nature of the substrate-nanotube contact is taken into account by varying the boundary condition for the electronic wave function. In qualitative agreement with the experimental results to date, regular patterns of the axial electron density and electron accumulation on

the nanotube cap are obtained. The energy distribution of the field emitted electrons shows a multiple peak structure superimposed over a very fine distribution of maxima. Such a multiple peak structure is also qualitatively confirmed in experiments. The behavior of the distribution of the emitted electrons with the extraction voltage and with the operation temperature is investigated. [J531]

"Electrical resistivity of polycrystalline Cu interconnects with nano-scale linewidth"

The maximum electrical conductivities in polycrystalline Cu interconnects with sub-100nmlinewidth were extrapolated from the measured resistivities of the Cu interconnects with various linewidths (100-1000nm)using a Mayadas-Shatzkes (MS) model. These polycrystalline Cu interconnects with TiN cap layers were fabricated by the focused ion beam technique. The scattering parameters by the surface and grain boundary, which were needed to extrapolate the resistivities of the sub-100nmCu interconnects (using the MS model), were determined to be zero and 0.5, respectively. The result suggested that the grain boundary scattering primarily increased the resistivity of the polycrystalline Cu interconnects. We concluded that large grained Cu interconnects and ultrathin barrier layers were essential to realize low resistance nano-scale Cu interconnects in the future ultralarge scale integration devices. [J532]

"Cl 2 /O 2 -inductively coupled plasma etching of deep hole-type photonic crystals in InP"

We have developed an inductively coupled plasma etching process for fabrication of high-aspect-ratio hole-type photonic crystals in InP, which are of interest for optical devices involving the telecommunication wavelength of 1550nm. The etching was performed at 250°Cusing Cl2/O2chemistry for sidewall passivation. The process yields nearly cylindrical features with an aspect ratio larger than 10 for hole diameters near 0.25mcm. This makes them very suitable for high-quality photonic crystal patterns. [J533]

"Surface roughness of Ti :Li Nb O 3 etched by Ar /C 3 F 8 plasma and annealing effect"

We describe the reactive ion etching of Ti:LiNbO3single crystal in gas mixtures containing C3F8and Ar using neutral loop discharge plasma. The surface roughness of etched Ti:LiNbO3surface under various gas mixture conditions was analyzed by using atomic force microscopy and scanning electron microscopy. The annealing effect of an etched ridge structure waveguides was also observed. [J534]

"Physical and electrical properties of Ta-N, Mo-N, and W-N electrodes on Hf O 2 high-k gate dielectric"

The influence of various types of metal nitride gate electrodes, i.e., tantalum nitride, molybdenum nitride, and tungsten nitride, on electrical characteristics of metal-oxide-semiconductor capacitors with hafnium oxide as the gate dielectric material has been studied. The result shows that both the physical and electrical properties of the high-kgate stack are influenced by the gate electrode materials and the post-metal-annealing temperature. Both the physical thickness and equivalent oxide thickness of the gate stack increased after the high-temperature N2annealing step. The leakage current density decreased with the increase of the annealing temperature from 600to800°C. The work functions of these metal nitride electrodes decreased with the annealing temperature due to the variance of microstructure and chemical composition, as indicated by x-ray diffraction and second-ion-mass spectroscopy data. These metal nitride electrodes are suitable for n-channel metal-oxide-semiconductor device applications after 800°CN2annealing because their work functions are between 4.05 and 4.25eV. The interface state density and oxide trap density of the high-kgate stack were also reduced by the high-temperature N2annealing step. [J535]

"Formation of nanostructured cobalt wires with Chinese caterpillar type structure"

A synthetic method of cobalt wires with platelike structure similar to Chinese caterpillar fungus (cordyceps sinensis) has been developed in aqueous media. Cobalt nanoparticles as seeds were prepared by reducing cobalt chloride with NaBH4under inert atmosphere which act as nucleation sites. We added an even weaker reducing agent, hydrazine, to the growth solution, and the solution was kept undisturbed at 80°Cfor 90minto obtain our product. A mechanism that involved in the formation of cobalt wires has also been proposed. The discovered cobalt wires may be applied to the fabrication of nanocircuitry or ultrahigh-density storage media. [J536]

"Effects of Si O 2 /Si 3 N 4 hard masks on etching properties of metal gates"

Reduced etching rates of advanced metal gates (TaN, TiN, and HfN) using SiO2/Si3N4hard masks are observed in Cl2plasma. Si and O released from hard masks react with metal surfaces newly exposed to the plasma during the etching, thereby forming metal oxides. The metal oxides formed on the etched surface retard the etch rates.

The suppression of etch rates with hard mask is more obvious for TiN than for TaN and HfN, because Ti oxides are readily formed on the etched TiN surface due to their low Gibbs free energies of formation. The surface of TiN degrades with etching time with SiO2mask, because etching rates of Si oxides and Ti oxides are different in the (TiO2)1-x(SiO2)xresidues remaining on the etched surface. In contrast, a conventional poly-Si electrode does not show the mask effects on etch rates and surface roughness. [J537]

"Anisotropic high aspect ratio etch for perfluorcyclobutyl polymers with stress relief technique"

The authors have developed an anisotropic, high aspect ratio (18:1) etch for perfluorocyclobutyl (PFCB) polymers with trenches as narrow as 800nmusing a CO/O2etch chemistry in an inductively coupled plasma reactive ion etcher. Anisotropy is achieved by carbon sidewall passivation. The motivation for this etch development is to use the air trenches as very compact waveguide splitters [S. Kim etal, Opt. Eng. 45, 054602 (2006)]. The authors report a new trench widening mechanism due to tensile stress of the PFCB films and a method of avoiding this widening through the use of additional stress relief trenches on both sides of the desired trench. [J538]

"Study of overlay metrology in atomic force microscope lithography (overlaying lithography with atomic force microscope)"

Atomic force microscope (AFM) has been considered as a useful lithographic tool of the future nanofabrication. In this article, overlay metrology in AFM lithography was investigated. A method of overlay metrology with cross marks was designed and applied to write two-layer patterns. The alignment arithmetic was developed on the basis of mark-registration method of electron beam lithography. A set of vernier was designed to measure the overlay precision. Further analysis about the overlay errors was presented. Experimental results indicated that the overlay metrology can obtain overlay precision less than 30nmand a higher precision will be realized by improving the system. [J539]

"Interconnecting single nano-objects on surfaces for transport experiments"

The authors report a highly controlled approach, based on electron-beam lithography, to interconnect individual nano-objects for transport experiments. The process is based on a three-step procedure, consisting of fabrication of four alignment markers, localization of the nano-object after its immobilization onto functionalized surfaces, and interconnection of the single nanostructure by patterning two nanoelectrodes on its sides. The approach is highly reproducible and widely applicable and allows an alignment accuracy of 15-20nm. Here they demonstrate the reliability of such technique by using a thin triangular gold nanoprism as the active element and show the I-Vcharacteristics of the single nanostructure. [J540]

"Comparison of microcantilever Hg sensing behavior with thermal higher order modes for as-deposited sputtered and thermally evaporated Au films"

As-deposited sputtered and thermally evaporated Au films are studied for Hg sensing with rectangular Si microcantilevers. Microcantilever deflection and frequency shifts in the first four thermally induced flexural modes are measured for each type of Au film as a function of Hg exposure. All thermally induced higher order modes show shifts in their frequencies for Hg exposures when the Au is sputter deposited whereas typically only the third and fourth order modes show frequency shifts when the Au is thermally evaporated. A technique is employed in order to vary Au coverage along a microcantilever surface. The shifts in the thermal microcantilever modes upon Hg exposure are thus studied as a function of fractional Au coverage along the microcantilever surface. Microcantilevers having various coverages of either sputtered or thermally evaporated Au films show a distinct response to Hg exposure. From both the deflection and spectral shifts it is observed that sputtered films give better response to Hg than thermally evaporated films when the Au is coated along the entire length of the microcantilever. [J541]

"Dependence of field emission properties of carbon nanotube films on their graphitization"

The purpose of this study is to investigate the effect of graphitization of carbon nanotube (CNT) films on their field emission efficiencies. CNT films were prepared by microwave plasma-enhanced chemical vapor deposition (MPCVD) method. Transmission electron microscopy images reveal the center hollowness and multiwalled structure of a CNT. The tip-growth mechanism of the CNTs prepared by MPCVD is confirmed by the nickel particles enclosed at the tips of the CNTs. The intensity ratio of IG/(ID+IG)under the Raman spectrum was defined to characterize the degree of graphitization of the CNTs. At any methane flow ratios [CH4/(H2+CH4)], the CNT graphitization increases with the microwave power. Also, the CNT graphitization increases with the CH4flow ratio and begins to drop at the flow ratio of 15%. It is mainly attributed to the relative concentration of

carbon radicals in the hydrocarbon-based plasma. Enhancement of the graphitization of CNT emitter array leads to the decrease of the threshold field and the increase of the field-controlled current density consistently. This consistency suggests that higher concentration of sp2bonding enhances conductivity. Therefore, the field emission efficiency of the CNTs increases with the CNT graphitization. At the microwave power of 1200Wand the methane flow ratio of 15%, the graphitization intensity ratio is 0.637. The optimal threshold field and field-controlled current density at the field of 3V/mcmare 1.38V/mcmand 8.934mA/cm2, respectively. [J542]

"Comparison of high resolution negative electron beam resists"

Four high resolution negative electron beam resists are compared: TEBN-1 from Tokuyama Corp. Japan, ma-N 2401XP and mr-L 6000.1XP from microresist technology GmbH Germany, and SU-8 2000 series from MicroChem Corp., USA. Narrow linewidth high density patterns are defined by 100kVelectron beam lithography, and the pattern is transferred into silicon by a highly anisotropic SF6/O2/CHF3based reactive ion etch process with a selectivity between silicon and the investigated resists of approximately 2. 20nmhalf-pitch lines and 10nmlines with a pitch down to 60nmare written and transferred into silicon. [J543]

"Erratum "Effects of NH 3 pulse plasma on atomic layer deposition of tungsten nitride diffusion barrier [JJ. Vac. Sci. Technol. B 24, 1432 (2006)]""

First Page of the Article [J544]

"Study of nanoimprint pattern transfer on hydrogen silsesquioxane"

The effects of process parameters on pattern embossing into hydrogen silsesquioxane films and the pattern degradation of hydrogen silsesquioxane were investigated. Methylisobutylketone (MIBK) was used to dilute hydrogen silsesquioxane, and NX-1000 (Nanonex) was used to imprint hydrogen silsesquioxane embossed with a Si grating mold at 25°-180°Cunder 2-2.5MPa. The imprint results were observed by scanning electron microscopy and correlated to the analysis results of Fourier transform infrared spectroscopy (FTIR) and nanoindentation. The FTIR results show that network-type bonding was promoted by dilution with MIBK and increasing baking temperatures from 50°Cto180°C. High-temperature thermal-cycle heat treatment can promote the formation of network bonds, which make hydrogen silsesquioxane film undergo plastic deformation more easily. In contrast, low-temperature thermal-cycle heat treatment can result in hydrogen silsesquioxane having a highly viscous response and high time-dependent deformation behavior. The diluted hydrogen silsesquioxane film under prebaking at 150°Cfor 3minand imprinting at 180°Cfor 2minunder 2.5MParesulted in a high-fidelity pattern replication without pattern degradation after aging at room temperature for 20days. [J545]

"Removal of Aerosol by Magnetic Separation"

We concluded high gradient magnetic separation experiments of iron (ferromagnetic) nano-particles with a nominal diameter of 50 nm by using a superconducting magnet. In the experiment, we fabricated fine iron particles using a thermal reactive plasma method in argon and hydrogen mixed gas and sent them directly to the magnetic separator. We present the experimental results, functions of the capture ratio on the magnetic flux density, and velocity of flow. We conclude that high gradient magnetic separation can separate nano-particles and is useful for nano-technology [J546]

"Nature of the abnormal band gap narrowing in highly crystalline Zn 1-x Co x O nanorods"

Highly crystalline Zn1-xCoxOnanorods were prepared using a hydrothermal method. With increasing Co2+dopant concentration, the lattice volume enlarged considerably, which is associated with the enhanced repulsive interactions of defect dipole moments on the wall surfaces. This lattice modification produced a significant decrease in band gap energies with its magnitude that followed the relationship, Delta Eg=Delta E0·(e-x B -1), where xand Bare Co2+dopant concentration and a constant, respectively. The abnormal band gap energies were indicated to originate from the sp-dexchange interactions that are proportional to the square of lattice volume. [J547]

"AlGaN solar-blind Schottky photodiodes fabricated on 4H-SiC"

Solar-blind AlGaN-based Schottky photodiodes grown on 4H-SiC substrate are reported. The fabricated devices demonstrate dark current density as low as 2.2times10-10A/cm2at a reverse bias of 5 V. A zero-bias peak responsivity of 44 mA/W was achieved at 256 nm, corresponding to an external quantum efficiency of 21%. Under a low illumination power density of 10 nW/cm2, a rejection ratio of more than two orders of magnitude was observed in the wavelength range from 270 to 310 nm. A room-temperature solar-blind detectivity of 7.9times1014cmmiddotHz1/2W-1was estimated at 256 nm under zero bias [J548]

"Nanofabrication based on MEMS technology"

In this paper, a novel nanofabrication method that develops from the traditional microelectromechanical system (MEMS) technology of anisotropic etching, deep reaction ion etching, and sacrificial layer process has been reviewed based on our work. With such a technology, nano tips, nano wires, nano beams even nano devices can be fabricated in a batch process. Beams with thickness of only 12 nm, a nano tip with a heater on the beam, and a nano wire whose width and thickness is only 50 nm are demonstrated. The scale effect of the Young's modulus of silicon has been observed and the nano-electronic-mechanical data storage has been presented [J549]

"Field-effect transistor based on β-SiC nanowire"

β-SiC nanowires were synthesized by the way of high-frequency induction with diameter range between 10 to 25 nm and the length was up to 10 μm. Field-effect transistor was fabricated with those synthesized β-SiC nanowires. The carrier mobilities of the n-type SiCFETs were 6.4 and 15.9 cm2/V·s when Vdsis 0.01 and 0.05 V at room temperature, respectively. At high temperature, the drain current increased by one order of magnitude than it did at room temperature. The carrier mobility versus 1000/T agreed well with the Arrhenius function. The SiCFETs in this letter would be used as electrical devices operated in high temperatures because of their superior properties. [J550]

"Electrical breakthrough effect for end pointing in 90 and 45 nm node circuit edit"

The interaction between high-energy Ga+ions and condensed matter is studied for circuit edit applications. A new "electrical breakthrough effect" due to charging of, and Ga+penetration/doping into, dielectrics is discovered. This new effect is proposed for end pointing in 90 and 45nmnode circuit edits where integrated circuit device dimensions are of a few hundred nanometers. This new end point approach is very sensitive, reliable, and precise. Most importantly, it is not sensitive to device dimensions. A series of circuit edits involving milling holes of high aspect ratio (5-30) and small cross-section area (0.01-0.25mcm2)on real chips has been successfully performed using the electrical breakthrough effect as the end point method. [J551]

"In 2 O 3 nanowires grown from Au /In film on glass"

Two kinds of In2O3nanowires (NWs), i.e., straight and tapered ones, are grown from 20-nm-thick Au/300-nm-thick In and 20-nm-thick Au/1-mcm-thick In films on glass at 400°Cby a one-step annealing method, respectively. All the NWs are single crystalline. The growth of the NWs is initiated by Au catalyst particles via vapor-liquid-solid growth mechanism, and an additional side growth might be responsible for the nonuniform diameters of the tapered NWs. It is revealed that a certain content of oxygen in the In film facilitates the large-scale growth of the In2O3NWs. The field-emission studies show that the In2O3NWs on glass have a low turn-on electric field of about 4.3V/mcm. Our growth method has potential applications in the in situ fabrication and integration of the In2O3NWs-based devices, especially with glass as substrates. [J552]

"Effective spin injection in Au film from Permalloy"

The electrical injection of spin current in the lateral Permalloy/Au/Permalloy spin valve devices was investigated. Clear spin valve effects were found in nonlocal spin valve measurements. The spin diffusion length of Au was evaluated to be 168nm. High spin injection polarization of 26% at 15Kwas achieved from our samples with low interface resistance. The observed spin injection reveals the highest polarization among the reported values. This work demonstrates the high spin injection polarization through clean interface with low interface resistance. [J553]

"Active microfluidic mixer chip"

We report the design and fabrication of a chaotic mixer based on the electrorheological (ER) fluid-controlled valves. The flow in the main channel is perturbed by liquid flow in orthogonal side channels, driven by hydrodynamic pulsating pumps. Each pulsating pump consists of a chamber with diaphragm plus two out-of-phase ER valves operating in a push-pull mode. All the valves, pumps, and mixing channels are integrated in one polydimethylsioxane chip. Mixing characteristics in the main channel are controlled by the strength and frequency of external electric fields applied on the ER fluid. [J554]

"Comparison of structural and optical properties of InAs quantum dots grown by migration-enhanced molecular-beam epitaxy and conventional molecular-beam epitaxy"

We strongly support Guryanov's speculation-that a thinner wetting layer is expected with quantum dots (QDs) grown by migration-enhanced epitaxy-with structural and optical measurements. InAs QDs grown by migration-enhanced molecular-beam epitaxy showed a larger size, lower density, 40%enhanced uniformity, 2times larger aspect ratio, and a measurement temperature insensitivity of the photoluminescence linewidth compared to QDs grown by conventional molecular-beam epitaxy. The thickness of the wetting layer for the migration-enhanced epitaxial InAs QD (2.1nm)was thinner than that of the counterpart (4.0nm). [J555]

"Individual beta -Ga 2 O 3 nanowires as solar-blind photodetectors"

Individual beta -Ga2O3nanowires as solar-blind photodetectors are investigated. The detectors show encouraging advantages to 254nmlight. The dark current is on the order of pA. The conductance of the nanowire increases by about three orders of magnitude under 254nmultraviolet illumination. The upper limits of the response and recovery time are 0.22 and 0.09s, respectively. These results indicate that beta -Ga2O3nanowires have potential applications in realizing future miniaturized solar-blind photodetectors. [J556]

"Overview on electrostatic discharge protection designs for mixed-voltage I/O interfaces: design concept and circuit implementations"

Electrostatic discharge (ESD) protection design for mixed-voltage I/O interfaces has been one of the key challenges of system-on-a-chip (SOC) implementation in nano-scale CMOS processes. The on-chip ESD protection circuit for mixed-voltage I/O interfaces should meet the gate-oxide reliability constraints and prevent the undesired leakage current paths. This paper presents an overview on the design concept and circuit implementations of the ESD protection designs for mixed-voltage I/O interfaces without using the additional thick gate-oxide process. The ESD design constraints in mixed-voltage I/O interfaces, the classification and analysis of ESD protection designs for mixed-voltage I/O interfaces, and the designs of high-voltage-tolerant power-rail ESD clamp circuit are presented and discussed. [J557]

"Control of the color contrast of a polychromatic light-emitting device with CdSe-ZnS nano-crystals on an InGaN-GaN quantum-well structure"

Blue-red polychromatic light-emitting devices are fabricated by attaching red-emitting CdSe-ZnS nano-crystals on a blue-emitting InGaN-GaN multiple-quantum-well (MQW) structure. To improve the red/blue intensity contrast, holes of different diameters are fabricated for increasing the direct contact area between the MQW active regions and CdSe-ZnS nano-crystals. By comparing the devices of 10-, 50-, 60-, and 70-mum hole diameters, and a reference device of no hole, it is found that the hole diameter of 60 mum represents an optimized condition from the viewpoint of maintaining high quantum efficiency. However, the device of 10-mum holes has the highest red/blue intensity ratio, which corresponds to a 36% increase. This result is attributed to its largest side-wall area in the holes among various samples [J558]

"Special issue on dynamics & control of micro and nano scale systems"

{no data available} [J559]

"A Modulating retro-reflector for free-space optical communication"

We present modeling of a modulating retro-reflector for free-space optical communication, composed of a reflective resonant-cavity modulator and a corner cube. Although resonant-cavity modulators are sensitive to the angle of incidence of the light beam, we show that with the right geometrical arrangement, the field of view can be more than ten-fold that of the modulator. The modeling is validated by experimental data using a corner cube and a 14 Ч 14 mm2multiple quantum-well modulator. [J560]

"Helical wave-front laser beam generated with a microelectromechanical systems (MEMS)-based device"

We report a novel helical wave-front laser beam generator based on microelectromechanical systems (MEMS) technology. The device consists of a circular array of micromirrors; each can be electrostatically actuated to move perpendicular to the substrate to modulate the phase of an incident laser beam. A prototype device has been developed using the polysilicon multiuser MEMS processes. The ability of the device to transform a plane wave into an l=3 helical wave-front laser beam has been experimentally demonstrated. Additionally, the device is faster by two orders of magnitude or more than conventional liquid crystal spatial light modulators. In combination with a rapid optical beam steering system, the proposed device might provide new capabilities for fast-scanned optical tweezer arrays, allowing them to combine optical vortices and conventional traps together to trap, guide, and rotate a wide variety of particles. [J561]

"Nanofluidic channels fabrication and manipulation of DNA molecules"

Nanofluidic channel arrays, which have a width of about 40 nm, depth of 60 nm and length of 50 μm, were created using a focused-ion-beam milling instrument on a silicon nitride film swiftly and exactly, as is necessary. Stained λ-DNA molecules were put inside these sub-100 nm conduits by capillary force and they were stretched and transferred along these conduits, which were dealt with activating reagent Brij aqueous solution in advance. The movements of DNA molecules in these channels were discussed. These nano-structure channels may be useful in the study and analysis of the statics as well as the dynamics of single biomolecules. [J562]

"Design and fabrication of a photosensing nanodevice structure with CdSe and Au nanoparticles on a silicon chip"

A newly developed four-layered photosensing nanodevice was fabricated by integrating nanoparticles (NPs) on a silicon substrate. Through ionic interaction, negatively charged Au NPs (15 nm) were assembled in alternate layers with positively charged CdSe NPs (5 nm) on the silicon oxide surface between the two Al electrodes. The silicon oxide surface after each step of the fabrication process was observed and evaluated by images obtained from the scanning electron microscope. By applying voltage biases across the electrodes, the currents were measured in the dark and under illumination using a 375-nm laser. It was found that a constant photocurrent increment can be obtained for different voltage biases, and the nanodevice structure with a longer length had less conductivity but a larger increment of photocurrent after illumination. In addition, the efficiency rate of photocurrent generation is much higher in comparison to that obtained from CdSe thin film. The fabrication process integrated a newly developed model of a diode-resistor array of semiconductor-metal junctions between CdSe and Au NPs (nano-Schottky-diode structures), which can successfully explain the measured results. While nanotechnology has unprecedented advantages over the traditional silicon electronics, its technology presents physical challenges. However, the success of the fabrication of the multilayered photosensing nanodevice directly on the silicon chip paves the way for further applications and research. [J563]

"Nano-Net 2006: 1st International Conference on Nano-Networks"

{no data available} [J564]

"Nano-Watt silicon-on-sapphire ADC using 2C-1C capacitor chain"

An analogue-to-digital converter (ADC) in a 0.5 μm silicon-on-sapphire CMOS technology is reported. This innovative ADC uses a 2C-1C capacitor chain and a switched capacitor comparator. The ADC is capable of sampling at 409 kS/s, consuming 900 nW at 1.1 V power supply and 1.35 μW at 1.5 V. It uses an active area of 300Ч700 μm2and 640Ч1070 μm2with pads. [J565]

"Study and characterization on the nanocomposite underfill for flip chip applications"

The nanosilica filled composite is a promising material for the no-flow underfill in flip-chip application. However, as the filler size decreases into the nano length scale, the rheological, mechanical, and thermal mechanical properties of the composite change significantly. The filler-filler and filler-polymer interactions have a profound impact on the material properties. The purpose of this paper is to achieve an in-depth understanding of the effect of the filler size and surface treatment on material properties and therefore to design a nanocomposite formulation with desirable material properties for no-flow underfill applications. Mono-dispersed nanosilica filler of 100nm in size were used in this study. An epoxy/anhydride mixture was used as the base resin formulation. The nanosilica fillers were incorporated into the resin mixture to different filler loadings from 5wt% to 40wt% with or without silane coupling agents as the surface treatment. UV-Visible spectroscopy showed that the underfills with nano-size filler were transparent in the visible region even at high filler loading. The curing behavior and the Tg of the nanocomposite were studied using a modulated differential scanning calorimerter. It was found that the presence of the nanosilica could hinder the curing reaction, especially at the late stage of cure. The Tgs of the nanocomposites with untreated silica were found to decrease with the increasing filler loading. The measurement of the dynamic moduli from dynamic mechanical analyzer indicated that there was a secondary relaxation related to the filler-polymer interface. The coefficient of thermal expansion of the nanocomposite was measured using a thermal mechanical analyzer. The rheology of the nanocomposite was studied using a stress rheometer. It was found that the filler treatment could significantly reduce the viscosity of the nanocomposite and improve the processing capability of the underfill. Density measurements and moisture absorption experiments both indicated that the addition of nanosilica could increase the free volume of materials. The dispersion of the nanosilica in the cured composite materials was observed using scanning electron microscopy. Control samples with micron-size silica fillers were formulated and characterized f- or comparison. [J566]

"A novel high-performance and robust sense amplifier using independent gate control in sub-50-nm double-gate MOSFET"

Double-gate (DG) transistor has emerged as one of the most promising devices for nano-scale circuit design. In this paper, we propose a high-performance and robust sense-amplifier design using independent gate control in symmetric and asymmetric DG devices for sub-50-nm technologies. The proposed sense amplifier has better performance (30%-35% less sensing delay) and robustness (60%-80% less minimum input bit-differential for correct operation considering 10% worst case silicon thickness mismatch) compared to the connected gate design. Hence, the proposed design successfully demonstrates the benefit of using independent gate control in DG devices for efficient circuit design in sub-50-nm regime. [J567]

"Nonlinear characteristics of the Fowler-Nordheim plot for field emission from In 2 O 3 nanowires grown on InAs substrate"

Nonlinear characteristics of the Fowler-Nordheim (F-N) plot for field emission from In2O3nanowires (NWs) is investigated. The field emission from the aligned and nonaligned In2O3NWs are measured and a stable emission with fluctuations less than 10% was obtained for the aligned In2O3NWs. It is found that the nonaligned In2O3NWs with a longer length have higher turn-on and threshold electric fields. Their F-N plots, showing pronounced nonlinear characteristics, are divided into several regions based on physical origins. Field penetration competes with surface states in influencing the field emission of the In2O3NWs with increasing the electric field, which is responsible for the nonlinear characteristics of the F-N plots. [J568]

"Hydrogen-induced ferromagnetism in ZnCoO"

We have investigated experimentally the effects of n-type impurities such as Al and H on the magnetic properties of ZnCoO. The carrier density changes slightly upon the introduction of hydrogen but increases significantly in the case of Al. A measurement of magnetic circular dichroism indicates that, of the two impurities, only H induces ferromagnetism in ZnCoO. Our experimental data suggest that, unlike Al, H plays an important role in the enhancement of ferromagnetic spin-spin interactions that goes much beyond a carrier-mediated effect. [J569]

"Realization of optical periodic quasicrystals using holographic lithography"

We have fabricated three-dimensional periodic quasicrystals exhibiting quasiperiodicity of the Penrose structure in the x-yplane and periodic along the zaxis using ten-beam visible light holographic lithography. The quasicrystals show photonic band gaps in the visible range. The band gaps are found to follow a simple relation as a function of periodicity and polymeric volume fraction, in accord with the Bragg's diffraction relation. [J570]

"Enhancement of hole mobility and carrier density in Ge quantum well of SiGe heterostructure via implementation of double-side modulation doping"

A significant improvement of transport properties of two-dimensional hole gas (2DHG) in the strained Ge quantum well (QW) of SiGe heterostructure was obtained via implementation of double-side modulation doping from bottom and top sides of Ge QW. Around two times enhancement of 2DHG Hall mobility up to 30000cm2V-1s-1and sheet carrier density up to 1.9Ч1012cm-2were obtained at 3K. By employing this way of modulation doping hole's wave function was moved away from the interface towards the center of Ge QW that allowed enhancement of hole mobility due to reduction of interface roughness scattering. [J571]

"Hydrogen plasma dry etching method for field emission application"

The ability to fabricate large-area, uniform emitters is an important factor in many vacuum microelectronics applications, especially for field emission displays. In this letter, we measured the field emission properties of uniform silicon nanowire emitters prepared by hydrogen plasma etching using in situ high-resolution scanning electron microscopy and a tungsten anode of 1mcmdiameter. Our results indicate that the field emission properties are improved upon increasing the etching time; this process sharpens the nanowires' geometry and lowers their work function. These highly uniform (with respect to length, diameter, and distribution) nanowires display great potential for application within many field emission nanoelectronics devices. [J572]

"Nanotechnology-Enabled Wireless Sensor Networks: From a Device Perspective"

The advancement of wireless communications and integrated circuit technology has enabled the development of low-cost sensor networks. The sensor networks can be used for various application areas (disaster recovery, health, military, homeland security, environment, home, etc.). For each application area, there are different

technical issues that researchers are currently resolving. However, many of them are trying to tackle the limitations of this field from a network perspective. Sometimes, the effectiveness of some proposed approaches must be complemented by the supports of hardware design. This article points out the possibilities of overcoming the same problem set from a device perspective by taking advantage of the merits of nanotechnologies. At the same time, open research issues and challenges are identified to spark new interests and developments in this field [J573]

"Junction Temperature-Controlled Spectrum in a Two-Color InGaN–GaN Quantum-Well Light-Emitting Diode"

We demonstrate the dependence of the output spectrum on the Ohmic-contact thickness in a blue/green two-color InGaN-GaN quantum-well (QW) light-emitting diode. By decreasing the metal thickness of the p-type Ohmic contact on the device, the contact resistance is increased and hence the junction temperature is raised. With the junction temperature raised, the probability for the hole to escape from the first QW (green emitting) and be captured by the next QWs is increased for more effective emission of blue light such that the blue/green intensity ratio can be adjusted. The conclusion of higher junction temperature in a sample of a thinner p-type metal layer is consistent with the measurement results of output power versus injection current and current versus applied voltage. The measurement based on the transmission-line method also shows the increasing trend of contact resistance in decreasing the p-type metal thickness [J574]

"Electrically Injected Quantum-Dot Photonic Crystal Microcavity Light-Emitting Arrays With Air-Bridge Contacts"

We demonstrate direct electrical carrier injection into membrane photonic crystal (PC) microcavities with quantum-dot radiating elements via metallic air-bridges. The bridges are 300 nm tall, 200-400 nm wide, 3-13 mum long, and have surface contact width ~200-300 nm. We demonstrate arrays of electrically injected membrane PC microcavities interconnected by nano-bridges. The technology demonstrated here represents an attractive route to fabricate densely packed electrically injected PC light sources [J575]

"Challenges Related to Reliability in Nano Electronics"

Abs [J576]

"Experimental and Simulation Study to Identify Current-Confined Path in Cu–Al Space Layer for CPP-GMR Spin-Valve Applications"

To understand the mechanism of current-confined-path formation for the current-perpendicular-to-plane type of giant magnetoresistive devices, we have investigated the evolution of an Al monolayer on the Cu (111) surface both by in situ scanning tunneling microscopy and by molecular dynamics simulation. Ultrathin Al nano-clusters were formed on the plateaus and step (or plateau) edges of the Cu surface in the as-deposited state. Upon annealing at 300degC, Al atoms migrated toward the step edges by surface diffusion. As a consequence, nanometer-sized Cu channels not covered by Al clusters can be formed. These channels could serve as current-confined paths if subsequent mild Al oxidation is provided [J577]

"A Novel Reference Scheme for Reading Passive Resistive Crossbar Memories"

A great effort today is concentrated on the development of resistive hysteretic materials and their related memory architecture. Resistive memories have a promising future to replace all current memory technologies to present an all-in-one memory solution. Passive resistive memories are of a special importance, since they can be scaled into the nanometer range without losing their functionality. This work is concerned with a novel scheme for generating reference voltages for the read operation. The scheme can be used with any passive crossbar based memory, regardless of the materials used for the implementation of the memory elements [J578]

"Deterministic nanowire fanout and interconnect without any critical translational alignment"

Interfacing the nanoworld with the microworld represents a critical challenge to fully integrated nanosystems. Solutions to this problem have generally required either nanoprecision alignment or stochastic assembly. A design is presented that allows complete and deterministic fanout of regular arrays of wires from the nano- to the microworld without the need for any critical translational alignment steps. For example, deterministically connecting 10-nm wires directly to 3-mum wires would require a translational alignment to within only about 6 mum. The design also allows for nanowire interconnect and is independent of the technology used to fabricate the nanowires, enabling technologies for which alignment remains very challenging. The impact of potential fabrication errors is analyzed and a structure is fabricated that demonstrates the feasibility of such a design

[J579]

"Instrumentation and analytical methods of an x-ray photoelectron spectroscopy-scanning tunneling microscopy surface analysis system for studying nanostructured materials"

The design and performance of an x-ray photoelectron spectroscopy (XPS)-scanning tunneling microscopy (STM) surface analysis system for studying nanostructured materials are described. The analysis system features electron spectroscopy methods (XPS and Auger electron spectroscopy) in addition to a variable temperature STM. With the analytical methods of the system, surface chemical analysis as well as surface morphology down to atomic resolution can be obtained. The system also provides facilities for sample cleaning, annealing, gas dosing, depth profiling, and surface modifications by sputtering and evaporation. Controlled gas exposures from ultrahigh vacuum to atmospheric pressures in the adjustable temperature range of 120-1100Kcan be carried out in different chambers. A fast entry air lock allows the transfer of samples and STM tips into the system without air exposures. The surface analysis system uses a common sample holder in all five chambers which are independently pumped and separated from each other by gate valves. Thus, it is possible to make all sample preparations and experiments in situ under well-defined conditions as illustrated by the formation and characterization of strained, self-assembled nano-oxides on Cu(100). [J580]

"Electronic transport characteristics through individual Zn Sn O 3 nanowires"

Composite ZnSnO3nanowires are synthesized via a one-step thermal evaporation method. The nanowires are of core-shell structures with the presence of grain boundary and out-of-phase boundaries. Transport through individual nanowires shows nonlinear current-voltage (I-V)characteristics in the range of the voltage from -3to3V. Such a behavior can be attributed to the presence of the barrier at the grain boundary, and the effective barrier height is estimated to be about 0.22eVby analyzing the I-Vcurves at various temperatures. The current at -3Vjumps from 0.12to6.0mu Awithin 30sat 300Kas exposed to UV illumination. Such jump can be well explained in terms of effective barrier height and depletion width. [J581]

"Phonon-assisted stimulated emission from single CdS nanoribbons at room temperature"

We report room-temperature stimulated emission in single CdS nanoribbons obtained through Au-catalyzed physical evaporation route. These ribbons have single-crystal structures and uniform rectangular cross sections and grow along the [100] direction. The ribbons show good waveguide/cavity properties under local optical excitation. The stimulated emissions from the single ribbons were observed with both nanosecond and femtosecond laser pumpings. The results show that the CdS nanoribbons produce stimulated emission by bipolaronic excitons (two-longitudinal-optical phonon coupled free excitons) at room temperature. [J582]

"Electrorheological fluid-actuated flexible platform"

The design, fabrication, and performance of an electrorheological (ER) fluid-actuated flexible platform integrated on a microfluidic chip are reported in this letter. The digitally regulated ER microvalves control the four diaphragms on which a platform is sustained. With electrical input signals, the platform can perform vibrations at tunable frequencies as well as generate complex leveling modes. The flexible platform can potentially act as a microdamper when its inputs are generated from a sensor, in combination with a feedback control system. [J583]

"In situ synthesis of In 2 O 3 nanowires with different diameters from indium film"

Several kinds of In2O3nanowires (NWs) with different shapes and diameters were in situ synthesized from indium films with different thicknesses at a low temperature of 400°C. The NWs had screw structures, and they grew along each axial screw direction by vapor-solid growth mechanism. The thin NWs were synthesized with low indium vapor supersaturation. Two-dimensional nucleation and radial growth trends occurred when the supersaturation increased. The field emission results showed that the turn-on and threshold fields of the thick conical In2O3NWs were lower than those of the thin ones. [J584]

"A New Approach in Measuring Cu–EMC Adhesion Strength by AFM"

Copper-epoxy molding compound (Cu-EMC) interface is known to be one of the weakest interfaces in an electronic package exhibiting delamination during reliability test. Thiol compound which bonds readily and forms a self-assembly monolayer (SAM) with copper is proposed to improve interfacial adhesion between copper and EMC. Conventional adhesion evaluation involves force measurement in macro-scale. However, inconclusive or even contradictive results are common in those tests because of uncontrollable surface conditions such as contamination and, in particular, roughness. To eliminate the roughness effect and reflect the true chemical bonding condition, an Si wafer was used as a substrate in the experiments. This study involves the use of an

atomic force microscope (AFM) in characterizing the nanoscale adhesion force in a Cu-SAM-EMC system. Findings were used as the criteria in selecting a SAM candidate. A thiol compound having a carbonyl group is shown to be the best adhesion promoter from the measurement. The nanoscale AFM results are shown to be consistent with the result of macroscopic shear tests. It has been demonstrated, with SAM treatment on a cleaned copper surface, that the fracture force between Cu-EMC samples is improved from 119 to 195N [J585]

"Hydrogen and calcium ion electrochemical detecting systems using microfluidic technology"

First Page of the Article [J586]

"In situ and real time determination of metallic and semiconducting single-walled carbon nanotubes in suspension via dielectrophoresis"

We report an alternative method combining dielectrophoresis and impedance spectroscopy to provide rapid, accurate measurement of dielectrophoretic collection of single-walled carbon nanotubes (SWNTs) in real time. We analyzed a Triton X-100 suspension of mixed SWNTs to measure their precise dielectrophoretic collection behavior. Results indicate that our sample contains 21.5% of metallic and 78.5% of semiconducting carbon nanotubes before separation, and that the range of 1-15MHzis ideal to collect only the metallic ones. Optical absorption was used to confirm these proportions. We discuss the possible errors associated with using purely a Raman technique to validate the type of SWNTs collected in suspension. [J587]

"Secondary emission of strain-induced dopant contrast in the source/drain regions of metal-oxide-semiconductor devices"

Secondary electron (SE) imaging with scanning electron microscopy has been used for two-dimensional dopant profiling. However, the mechanism of dopant contrast is still not yet understood. Here we propose another significant contribution from interface strain for the source/drain regions in p- and n-type metal-oxide-semiconductor (MOS) devices. The results show that the width of the dopant profile by SE imaging agrees well with the strain profile by dark-field technique with transmission electron microscopy. We demonstrate that the dopant contrast of the p-MOS device by SE imaging is higher than a test wafer by 45%. The enhanced SE signals for both p-MOS and n-MOS devices are caused by band bending through CoSi2-induced strain. [J588]

"Comment on "A transparent metal: Nb-doped anatase Ti O 2 " [JAppl. Phys. Lett. 86, 252101 (2005)]"

First Page of the Article [J589]

"Wetting-induced electrorheological effect"

We demonstrate the role of particle-fluid wetting in inducing the electrorheological (ER) effect. Nanoparticles of barium titanyl oxalate coated with urea (BTRU) were suspended in either silicone oil or hydrocarbon oil. In the former, a high yield stress of more than 250kPacan be attained at an electric field of 5kV/mm, while for the latter no measurable ER effect can be obtained. The two suspensions exhibit completely different appearances. Whereas the silicone oil suspension has the consistency of light cream, in the case of hydrocarbon oil with the same solid concentration the appearance is that of a lumpy paste. This clear visual distinction is attributed to the wetting characteristic between the solid BTRU particles and the suspending oil. We found that by adding a controlled, small amount of surfactant additive to the hydrocarbon oil suspension (oleic acid), the consistency can change drastically to resemble that of the silicone oil suspension, with a yield stress of 260kPaattained at an electric field of 3kV/mm. We give a simple physical picture of wetting-induced giant electrorheological effect. [J590]

"Extremely stable field emission from AlZnO nanowire arrays"

Extremely stable electric field emission from well-aligned AlZnO nanowire arrays is realized. The emission current density is up to 6.5mA/cm2, and no current saturation is observed. The turn-on field is 2.9V/mcmas d(distance between the nanowire emitters and anode) is 0.64mm. After aging for two days, the emission current is extremely stable with the fluctuations of±0.4%. The high stability arises from the high crystal quality with few surface states of the nanowires and the in situ fabrication of cathodes. The field emission behaviors are in excellent agreement with Fowler-Nordheim theory, and the relationship between the field enhancement factor beta and dfollows a universal equation. Our results imply that AlZnO nanowire arrays are promising candidates for field emission displays. [J591]

"Electrostatically gated Si devices: Coulomb blockade and barrier capacitance"

Using a device resembling a nano-charge-coupled-device and measuring the Coulomb blockade, we show how the Coulomb blockade degrades with increasing barrier conductance. To explain this behavior, we identify a new parameter, the "barrier capacitance." This parameter can be used to elucidate information about the energy barrier under a gate with a size of a few tens of nanometers. [J592]

"High temperature Hall effect sensors based on Al Ga N /Ga N heterojunctions"

We report on AlGaN/GaNheterojunction structures for use in Hall effect sensors working over a wide range of temperatures. Room temperature current-related magnetic sensitivity of 55V/ATat a sheet resistance below 300Omega /sqand very low temperature cross sensitivity of 103ppm/°Cup to 300°Cwere obtained for a square-shaped Hall effect sensor. The active layer of the Hall effect sensor is the two-dimensional electron gas formed at the Al0.3Ga0.7Nand GaN heterointerface caused by the gradient in the total polarization between the AlGaN barrier and the GaN buffer layer, which results in the positive polarization induced interface charge attracting free electrons. The temperature-dependent transport properties of the heterojunction were analyzed by Hall measurement. The drop of its electron mobility from room temperature to 300°Cis mainly due to the enhanced polar optical scattering, while the very stable sheet carrier density contributes to the excellent temperature cross sensitivity of the Hall effect sensor. [J593]

"Influence of thermal annealing on the bulk scattering in giant-magnetoresistance spin-valve with nano-oxide layers"

Based upon a bulk scattering model, we investigated the variation of giant magnetoresistance (GMR) behavior after thermal annealing at Ta=250°Cas a function of the top free layer thickness of a GMR spin valve with nano-oxide layers (NOLs). It was found that the enhancement of GMR ratio after thermal annealing is explained qualitatively in terms of the increase of active GMR region in the free layer and, simultaneously, the increase of intrinsic spin-scattering ratio. These effects are likely due to the improved specular reflection at the well-formed interface of NOL. Furthermore, we developed a modified phenomenological model for sheet conductance change (Delta G)in terms of the top free layer thickness. This modified model was found to be useful in the quantitative analysis of the variation of the active GMR region and the intrinsic spin-scattering properties. The two physical parameters were found to change consistently with the effects of thermal annealing on NOL. [J594]

"ac conductivity analysis for a metal core-silver orthosilicate shell nanostructure"

Nanocomposites containing silver particles of diameter of 20nmwith silver orthosilicate crystals forming the shell with thickness around 21nmclosely packed in a silicate glass were prepared. The ac conductivity of samples subjected to different heat treatments were measured over the frequency range of 100Hzto6MHzin the temperature range of 500-570K. The data were analyzed by the Macdonald model based on Kohlrausch-related frequency response formalism designated as CK0. The reference system was taken as the glass-crystal composite containing a lithium orthosilicate crystalline phase. The shape parameter beta ofor the reference system was found to be 0.33, whereas that for the nanocomposites was extracted to be 0.46. The former implied a one-dimensional lithium ion motion along the grain boundaries of the orthosilicate crystals, whereas the latter indicated that there was a one-dimensional silver ion motion in an effective two-dimensional structure in the shell surface because of a high stress condition along the radial direction of the core-shell composite. [J595]

"Al composition dependent properties of quaternary AlInGaN Schottky diodes"

Pd Schottky barrier diodes were fabricated on undoped AlxIn0.02Ga0.98-xN/GaNwith xless than 20%. The material properties, which were characterized by photoluminescence, x-ray diffraction, and atomic force microscopy, indicated that the quaternary samples were coherently grown on GaN template with high crystalline quality. The flatband barrier height obtained by capacitance-voltage (C-V)measurement increased with increasing Al mole fraction (increasing the band gap of the quaternary) up to 2.06eV, in agreement with the predictions of the Schottky-Mott theory. However, current-voltage (I-V)measurements revealed that the barrier height decreased from 1.32to1.12eV, which was accompanied by an increase in ideality factor from 1.04 to 1.73. The large difference of barrier height between I-Vand C-Vmeasurements could not be quantitatively explained by the traditional electron transport mechanisms of Schottky diode, such as tunneling effect, image force effect, and barrier inhomogeneity theory. Strong polarization effect in strained AlxIn0.02Ga0.98-xN/GaNheterostructure was proposed to account for the experimental results, since similar phenomena had been observed extensively in strained AlyGa1-yN/GaNheterojunction structures. [J596]

"Application of carbon nanotubes to human breath dynamics characterization"

The carbon nanotube composite material and its fabrication techniques are introduced to construct a chip-based electrode system for human breath dynamics characterization. The application of 10Vdc bias can generate electric field high enough to effectively collect the charged particles in the human breath. Without using breath collecting tubes, the field tests in the open air exhibit that the system is technologically promising for long-time and noncontact human breath dynamics monitoring, due to its high stability, sensitivity, and safety operation performance with power consumption in the order of 10-5W. [J597]

"Linear ethanol sensing of Sn O 2 nanorods with extremely high sensitivity"

The SnO2nanorods with a diameter down to 3nmare synthesized through a hydrothermal route and their sensing properties are investigated. The small size is confirmed by the results of x-ray diffraction, transmission electron microscope and Raman scattering spectrum. The sensitivity is up to 83.8 as the nanorod sensor is exposed to 300ppmethanol vapor in air. Moreover, the linear dependence of the sensitivity on the ethanol concentration is observed for each of the 20 sensors. Compared with the measured results of 80-180nmtin oxide particles, such linear dependence is related to the small size effect. [J598]

"Self-synchronized voltage pulse application for dynamic force microscope nano-oxidation"

A self-synchronized voltage pulse application method was demonstrated as an effective control of the nano-oxidation using a dynamic force microscope. By creating a cyclic water meniscus using the large oscillation amplitude, self-synchronized voltage pulses can be realized during application of a continuous voltage to the sample. The modification of the probe-sample distance was equal to the change in the applied voltage pulse duration on the order of submicroseconds. This method realized the ultrastable control of the water meniscus formation. [J599]

"White-light-emitting CdSe quantum dots synthesized at room temperature"

White-light-emitting CdSequantum dots (QDs) were synthesized at room temperature (RT, 23°C) using an organometallic colloidal growth process. These QDs are characterized by high and reproducible quantum yields (Phi PL 0.4)as well as by unusual spectral broadening [full width at half maximum (FWHM) 150nm) despite of their observed size monodispersity. Surface functionalization of these quantum dots using mercaptosuccinic acid made them soluble in water. A change of color together with an enhancement in Phi PLwas observed upon surface functionalization. [J600]

"Laser-nanostructured Ag films as substrates for surface-enhanced Raman spectroscopy"

Pulsed-laser (248nm)irradiation of Ag thin films was employed to produce nanostructured Ag/SiO2substrates. By tailoring the laser fluence, it was possible to controllably adjust the mean diameter of the resultant near-spherical Ag droplets. Thin films of tetrahedral amorphous carbon (ta-C) were subsequently deposited onto the nanostructured substrates. Visible Raman measurements were performed on the ta-C films, where it was observed that the intensity of the Raman signal was increased by nearly two orders of magnitude, when compared with ta-C films grown on nonstructured substrates. The use of laser annealing as a method of preparing substrates, at low macroscopic temperatures, for surface-enhanced Raman spectroscopy on subnanometer-thick films is discussed. [J601]

"In situ electrode manipulation for three terminal field emission characterization of individual carbon nanotubes"

In situ three terminal electron field emission characterization of an isolated multiwalled carbon nanotube has been performed, where both anode and gate electrodes are attached to high precision piezodrivers. All measurements are performed in a scanning electron microscope allowing accurate knowledge of the local environment of the nanotube to be obtained. It is shown that the presence of the grounded gate electrode screens the applied field by approximately 32%. This technique in positioning the gate and anode electrodes allows for an estimate of the gate transparency factor and demonstrates characterization of individual carbon nanotubes without the need for fabrication of arrays of emitters. [J602]

"Wide band gap photonic structures in dichromate gelatin emulsions"

The authors report the fabrication of wide band gap photonic crystals with planar structures in dichromate gelatin emulsions using a two-beam holographic method. By exploiting the differential swelling of the gelatin, planar structures with gradient spacing are fabricated. The crystals exhibit high efficiencies and wide band gaps in the visible range. The authors model the planar gelatin system by an effective medium approach and use transfer matrix to calculate the reflectance and transmittance. Good agreement is obtained between theory and

experiment. [J603]

"Structural and magnetic properties of manganese and phosphorus codoped ZnO films on (0001) sapphire substrates"

ZnO films doped with manganese (Mn) and phosphorus (P) are grown on (0001) sapphire substrates by pulsed laser deposition at different temperatures and oxygen pressures. The structural and magnetic properties of the codoped ZnO films are carefully investigated. Experimental results demonstrate that p-type conduction is necessary for the observation of ferromagnetism in Mn+Pcodoped ZnO films at room temperature. A distinct aging effect is observed, which is likely due to the instability of p-type conduction of Mn+Pcodoped ZnO films. [J604]

"Rectification of current for tunneling through metallic nano-particles"

Double tunnel barrier structures were obtained by using a scanning tunneling microscope and samples composed of metallic nanoparticles deposited onto an oxidized bottom electrode. The nanoparticles were formed by evaporating subpercolation thin metallic layers. Due to the small size of the particles their energy spectrum is discrete, which is evidenced by the measured quantized current-voltage characteristics. Current rectification ratios of 100-1000 for tunneling through such quantum dots are demonstrated at room temperature. [J605]

"Icosahedral quasicrystals by optical interference holography"

Optical interference holography has been proven to be a useful technique in fabricating periodic photonic crystals in which electromagnetic waves are forbidden in certain frequency band gaps. Compared to periodic crystals, quasicrystals, having higher point group symmetry, are more favorable in achieving complete band gaps. In this letter, we propose two seven-beam optical interference configurations based on the reciprocal vector space representation to fabricate icosahedral quasicrystals. Interference simulations for the quasicrystals exhibit the full symmetry of an icosahedron. The result paves the way for the fabrication of photonic quasicrystals using holographic lithography. [J606]

"Universal approach to accurate resistivity measurement for a single nanowire: Theory and application"

A universal four-contact method is proposed to accurately determine the resistivity of a single nanowire and other nanostructures. Unlike the conventional four-contact method or two-contact method, the present scheme does not require nonrectifying (Ohmic) contacts to the nanowire and can completely eliminate the systematic error resulting from the contact resistance or the resistance difference between the contacts. The present method has been applied to copper nanowire and can be used as a universal resistivity measurement scheme for all nanowires and other nanostructures. [J607]

"Intrinsic crystalline-to-amorphous transition above 400 °C in plasma-deposited Si thin films"

There has been long debate concerning why microcrystalline Si formation is disrupted at a deposition temperature above around 400°C: is it due to the loss of surface hydrogen coverage or to the incorporation of oxygen impurities? The authors reduced the atmospheric concentration of such impurities as O, C, and N in this work by using an ultraclean plasma deposition apparatus and demonstrate that microcrystalline Si films showed improved crystallinity at a deposition temperature of 350°C, resulting in a mobility of 5. As the deposition temperature was raised to 450°C, however, the Raman spectrum shows an amorphous structure of the film under such clean conditions. According to secondary ion mass spectrometry, the O, C, and N concentrations in this film were as low as 1017, 1016, and 1017cm-3, respectively, demonstrating that the crystalline-to-amorphous transition around 400°Cshould be intrinsic under the present conditions and may be correlated with thermal hydrogen desorption on a film-growing surface. [J608]

"Highly sensitive ethanol sensors based on {100}-bounded In 2 O 3 nanocrystals due to face contact"

The authors report the fabrication and characterization of ethanol sensors with extremely high sensitivity using In2O3nanocrystals bounded by {100} facets as the sensing materials. The sensitivity of the sensors is about 10to1ppmethanol, and increases nearly linearly up to about 200 as the ethanol concentration is raised to 100ppm. In the sensing film, the nanocrystals contact each other mainly through face contacts, most of which contribute to the gas sensing. This is the basis for the highly sensitive ethanol sensing. [J609]

"Publisher's Note: "Application of carbon nanotubes to human breath dynamics characterization" [JAppl. Phys. Lett. 89, 053105 (2006)]"

First Page of the Article [J610]

"Highly efficient GaN-based light emitting diodes with micropits"

Light emitting diodes (LEDs) on GaN templates with high-density V-shaped micropits have been grown and characterized by transmission electron microscopy, scanning electron microscopy, and photoluminescence. Higher emission efficiency has been obtained for the fabricated LEDs compared with those without V-shaped pits. The high efficiency of the LEDs is mainly attributed to the increase in light extraction efficiency due to the light extraction from the sidewalls of the V-shaped pits. The improved internal quantum efficiency of the device resulting from the reduction of the dislocation density in the light emitting area also contributes to the high efficiency of the LEDs. [J611]

"Silver-nanoparticle-decorated carbon nanoscaffolds: Application as a sensing platform"

Cluster-assembled nanostructured carbon with a fractal morphology is employed as a large-area surface scaffold for metal decoration. By depositing silver by pulsed laser ablation densely packed, distributions of metal nanoparticles are produced. The authors show, using the surface-enhanced Raman effect and the modification of fluorescence quantum yields near metallic surfaces, that silver-coated nanostructured carbon can be used to sense low concentrations of biomolecules. [J612]

"Exchange biased spin polarizer with an embedded nano-oxide layer for a substantially lower switching current density"

The authors demonstrate that the spin polarizer in the form of an exchange biased ferromagnetic lead with an embedded nano-oxide layer can greatly enhance the spin transfer torque for the current induced magnetization switching. By applying it in spin valves, the switching current density (4Ч106A/cm2)is one order lower and the resistance change (2.78mOmega mcm2)is three times higher than those gotten by using a simple spin polarizer. This spin torque enhancement is attributed to the exchange bias pinning acting on the polarizer (the fixed layer) with effective support of the nano-oxide layer, which together lead to a much higher current spin polarization. [J613]

"Microfluxgate sensor with amorphous cobalt (Co-Nb-Zr) soft magnetic core for electronic compass"

A silicon based microfluxgate sensor with a cobalt based amorphous soft magnetic core for electronic compass is presented in this paper. A sputtered Co85Nb12Zr3magnetic core having a rectangular ring shape is combined with microcopper solenoid coils for excitation and pickup, which were wound alternately around the core to increase the number of coil turns. The Co85Nb12Zr3as a core material is adopted for improving properties of the magnetic core and easy integration with micromachining processes to achieve a small size of the sensor. The sputtered Co85Nb12Zr3showed dc effective permeability of 10000and an extremely low coercivity of 0.03Oewith the thickness of 1mcm. The Co85Nb12Zr3as a thin film core with high permeability and low coercivity was easily saturated by a low excitation magnetic field, enhancing the sensitivity and linearity of the microfluxgate sensor. Finally, the sensor showed excellent linearity response over the range of -300to 300mu Twith sensitivity of 60V/Tat the excitation condition of 3.0Vp-pand 5.0 MHz square wave form. The sensor size excluding pad region is about 0.55Ч1.4mm2. [J614]

"Characterization of room temperature ferromagnetic Mn-Si compound synthesized on SiC substrate"

Manganese silicide (Mn-Si) related compound with a Curie temperature (TC)of 300Kwas synthesized on a 4H-SiChomoepitaxial wafer. Thin Mn layer was deposited on the SiC wafer, and then annealing was performed to diffuse the Mn atoms into the SiC epitaxial layer. Transmission magnetic circular dichroism spectra reflected that of the SiC wafer, although the structural investigations suggested that the dominant phase of the synthesized layer was paramagnetic Mn5Si2. At this stage, two possible explanations are considered the origin of the observed ferromagnetism. One is that a small amount of carbon (C) incorporated into the Mn5Si2host induced the ferromagnetic order in Mn5Si2. On the other hand, the partial formation of a ferromagnetic SiC-related component at the vicinity of the lower side of the interface between SiC and Mn5Si2layers is considered the other possible explanation. [J615]

"Electrical spin injection and accumulation in ferromagnetic/Au/ferromagnetic lateral spin valves"

Spin injection and accumulation have been investigated for Ni81Fe19/Au/Ni81Fe19lateral spin valves with various separations between spin injector and detector. The spin valve has been studied by using two distinct measurement configurations: the local and nonlocal measurement configurations. For both configurations, a spin valve signal has been found in the wide temperature range from 15to300K, and the magnitude of the spin valve signal decreases as the temperature increases. Based on the nonlocal spin valve signals, we estimate that the spin-diffusion length of a Au film is 85nmand that the spin-injection efficiency is 73% at T=15K. [J616]

"Fe 3 O 4+delta films prepared by "one-liquid" spin spray ferrite plating for gigahertz-range noise suppressors"

We have developed a simple type of ferrite film preparation technique, which we call "one-liquid" spin spraying method. Only one aqueous solution composed of dextran+FeCl2+CH3COOK+NaNO2is sprayed onto spinning substrates, while, in our previous method, a reaction solution of FeCl2(source) and an oxidizing solution of CH3COOK(pHbuffer)+NaNO2(oxidizer)were sprayed simultaneously. Dextran [(C6H12O6)n, n=1100-1700] suppresses iron hydroxides from precipitating in the aqueous solution. On optimized conditions, we deposited Fe3O4+delta films to the thickness of 1.6mcmfor 30min, obtaining film deposition rate of 52nm/min. The films exhibited good performance of conducted noise suppression; we obtained loss parameter Delta Plossof 33% at 10GHzof Fe3O4+delta films, which was approximately equal to that obtained for the commercialized noise suppression of composite sheet type, and reflection loss parameter S11, less than -10dB. Thus one-liquid method as well will provide a method to prepare the noise suppressors of Fe3O4+delta films workable in the gigahertz range. [J617]

"Optical characterizations of iodine molecular wires formed inside the one-dimensional channels of an AlPO 4 -5 single crystal"

A uniform array of one-dimensional molecular iodine wires is fabricated by introducing iodine molecules into the channels of AFI zeolite crystals through the vapor phase. The only possible wire structures are formed by linking individual iodine molecules along intramolecular bond axis into a single line. Polarization dependence of Raman intensity at modes of iodine species indicates that the wires are aligned perfectly along the caxis of AFI crystal. Polarized optical absorption as well as resonant Raman scattering reveal two wire species inside the channels of AFI zeolite: In-and (I2)nwires. [J618]

"Extremely high quantum efficiency of donor-acceptor-pair emission in N-and-B-doped 6H-Si C"

High-efficiency visible light emission in N-and-B-doped 6H-SiCepilayers was observed in photoluminescence measurements at room temperature. The orange-yellow light emission due to the recombination of donor-acceptor pairs (DAPs) has a broad spectrum with a peak wavelength of 576nmand a full width at half maximum of 110nmat 250K. The high B concentration of more than 1018cm-3improves the emission efficiency of the DAP recombination at a high temperature. Compared with the photoluminescence spectrum of GaN at 10K, a high quantum efficiency of 95% was estimated for the highly B-doped sample. From time-resolved photoluminescence measurements, a DAP recombination time of 5.0mswas obtained, which is in good agreement with the calculated value by the rate equation with the assumption of a 95% internal quantum efficiency. This is quite promising as a light-emitting medium by optical pumping, as well as monolithic light sources combined with nitride-based light-emitting diodes grown on the DA-doped SiC epilayer. [J619]

"Effect of nano-patterning on anisotropy of Cu /Ni /Cu nanolines"

Cu/Ni/Cufilms grown epitaxially on Si have shown perpendicular magnetic anisotropy over a wide range of Ni thicknesses. Using interferometric lithography and ion milling, epitaxial and polycrystalline Cu/Ni/Cufilms were patterned into large area arrays of parallel lines with widths of 100 and 200nm. The effect of patterning on the anisotropy of Cu/Ni/Cuwith tNi=6.9and 20.6nmwas determined from M-Hloops measured by vibrating sample magnetometry. The nanolines show significantly reduced tendency toward perpendicular magnetization and increased energy favoring magnetization across the linewidth. These results are interpreted in terms of magnetoelastic energy changes due to relaxation of misfit strain upon patterning and shape anisotropy. [J620]

"Transverse thermal conductivity of porous materials made from aligned nano- and microcylindrical pores"

Nanoporous and microporous materials made from aligned cylindrical pores play important roles in present technologies and will play even bigger roles in future technologies. The insight into the phonon thermal conductivity of these materials is important and relevant in many technologies and applications. Since the mean

free path of phonons can be comparable to the pore size and interpore distance, diffusion-approximation based effective medium models cannot be used to predict the thermal conductivity of these materials. Strictly speaking, the Boltzmann transport equation (BTE) must be solved to capture the ballistic nature of thermal transport; however, solving BTE in such a complex network of pores is impractical. As an alternative, we propose an approximate ballistic-diffusive microscopic effective medium model for predicting the thermal conductivity of phonons in two-dimensional nanoporous and microporous materials made from aligned cylindrical pores. The model captures the size effects due to the pore diameter and the interpore distance and reduces to diffusion-approximation based models for macroporous materials. The results are in good agreement with experimental data. [J621]

"Enhancement of drain current density by inserting 3 nm Al layer in the gate of Al Ga N /Ga N high-electron-mobility transistors on 4 in. silicon"

AlGaN/GaNhigh-electron-mobility transistors (HEMTs) on 4in.Si were fabricated by inserting 3nmof Al metal as a gate prior to the deposition of Pd/Ti/Au. The increase of drain current (IDSmax)density and decrease of extrinsic transconductance (gmmax)have been observed in the Al-gated AlGaN/GaNHEMTs. The increase of IDmaxis due to the increase of two-dimensional electron gas sheet carrier density, which was confirmed by capacitance-voltage (C-V)measurements. Moreover, the Al layer inserted-gate HEMT exhibited negative threshold voltage (Vth)shift. The Al and AlGaN interface shows Al-based oxide layer which was confirmed by Auger electron spectrum and x-ray photoelectron spectrum. [J622]

"Comment on "Low resistivity p-Zn O films fabricated by sol-gel spin coating" [JAppl. Phys. Lett. 88, 251116 (2006)]"

In a recent letter, Cao etal [Appl. Phys. Lett. 88, 251116 (2006)] reported the growth of In+Ncodoped p-type ZnO films with a low resistivity of 1.58Ч10-1Omega cmby a simple sol-gel spin coating method. Unfortunately, this low resistivity value is doubtful based on Hall effect measurement analysis. If the values of carrier concentration and Hall mobility are correct in their experiment, the resistivity value should be 10.62Omega cm, but not 1.58Ч10-1Omega cm. [J623]

"Electrical transport through individual nanowires with transverse grain boundaries"

V2O4·0.25H2Onanowires are synthesized via hydrothermal route. The nanowires are of metastable phase, and transverse grain boundaries are observed in their microstructures. Transport through individual V2O4·0.25H2Onanowires shows nonlinear current-voltage (I-V)characteristics in the bias range of -3to3V. The resistance rapidly decreases from 2.54to0.5MOmega as the bias is raised from 0to1V. Such behaviors can be attributed to the presence of the barrier at the transverse grain boundary. By analyzing the I-Vcurves at various temperatures, the effective barrier height is estimated to be about 0.13eV. Our results provide important information about how the microstructure mismatch affects the electrical properties. [J624]

"Semiconducting phase of amorphous carbon-nickel composite films"

Amorphous carbon-nickel composite films, which constitute a homogeneously mixed phase of carbon and 10% nickel, are prepared by UV pulsed laser ablation. From the low temperature conductivity study of these films, a nearly activated conduction followed by conductivity saturation below a temperature of 25Khas been identified. This is very different from undoped diamond-like carbon (DLC) films. The presence of additional density of states at the Fermi level observed in these samples when compared with DLC films, is directly confirmed using valence band spectroscopy. [J625]

"Interpenetrating multiwall carbon nanotube electrodes for organic solar cells"

Low concentrations of multiwall carbon nanotubes (MWCNTs) (1wt%)uniformly distributed within the donor layer of a heterojunction organic solar cell are shown to be an effective means of greatly reducing cell series resistance without compromising cell shunt resistance, resulting in an increase in cell fill factor of 50-60%. By chemically functionalizing MWCNTs with polar surface moieties, it is also possible to manipulate device open circuit voltage. The results of this study demonstrate that MWCNTs have excellent potential as a versatile interpenetrating electrode material for organic solar cells. [J626]

"Water-soluble multiwall-carbon-nanotube-polythiophene composite for bilayer photovoltaics"

A water-soluble acid oxidized multiwall carbon nanotube (o-MWCNTs)-polythiophene composite for bilayer photovoltaics is reported. Discrete heterojunction photovoltaic cells utilizing this nanocomposite material as the donor layer exhibit a 20%increase in fill factor and commensurate increase in power conversion efficiency as

compared to cells without o-MWCNTs. Crucially o-MWCNTs are incorporated into the cell structure using an environmentally compatible solvent without complicating the process of device fabrication. [J627]

"Magnetotransport properties of Ge channels with extremely high compressive strain"

Ge channel structures with extremely high compressive strain up to 2.8% were fabricated and their magnetotransport properties were evaluated. It was found that at the same hole density the sample with the higher strain showed the lower hole effective mass and that the compressive strain effectively reduced the effective mass. The Dingle ratios obtained were very high (5)for all samples, indicating that remote impurity scattering was a dominant scattering mechanism rather than high angle scatterings caused by degradation of the channel layers. This result strongly suggests that Ge channels with extremely high strain are very promising for high performance complementary-metal-oxide-semiconductor applications. [J628]

"Thermal conductivity contrast measurement of fused silica exposed to low-energy femtosecond laser pulses"

Femtosecond laser irradiation has various noticeable effects on fused silica. Of particular interest, pulses with energy levels below the ablation threshold can locally increase the refractive index and the material etching selectivity to hydrofluoric acid. The mechanism responsible for these effects is not yet fully understood. In this letter, the authors report on local thermal conductivity mapping of laser-affected zones. It is found that these zones exhibit a lower thermal conductivity at room temperature. [J629]

"Lithium doping of pentacene for electrochemical hydrogen storage"

This study reports in detail the practical realization of electrochemical hydrogen storage in porous metal-incorporated nanostructured organic compounds, Li-doped pentacene, which has been synthesized by potentiostatic electrolysis and characterized by x-ray diffraction, Fourier transform infrared spectra analysis, and galvanostatic current charge-discharge measurements. Although the lithium doping is at a very low level the conductivity of pentacene increases considerably after the doping, which makes the ordered layer-stacked Li-doped pentacene very promising as electrode material for electrochemical hydrogen storage, and a discharge capacity of ca. 239mAh/g(corresponding to 0.89wt%hydrogen storage) has been achieved for the Li-doped pentacene electrode. [J630]

"Realization of a high capacitance density in Bi 2 Mg 2/3 Nb 4/3 O 7 pyrochlore thin films deposited directly on polymer substrates for embedded capacitor applications"

Bi2Mg2/3Nb4/3O7(BMN) thin films were deposited on copper clad laminate substrates at temperatures below 150°Cfor embedded capacitor applications by pulsed laser deposition. The BMN films deposited at temperatures below 150°Cshowed smooth surface morphologies having root mean square roughness of approximately 3.0nm. 130-nm-thick films deposited at 150°Cexhibit a dielectric constant of 47, a capacitance density of approximately 302nF/cm2, and breakdown strength of 0.7MV/cm. The origin exhibiting high dielectric constant in BMN films deposited at low temperatures was attributed to the nanocrystallines having grain sizes of approximately 4.0nmin the films. The low temperature processed-BMN films are suitable candidate for capacitor applications embodied directly on printed circuit board substrates. [J631]

"Microstructure of epitaxial lateral overgrown AlN on trench-patterned AlN template by high-temperature metal-organic vapor phase epitaxy"

A high-quality thick AlN layer without cracks was grown on sapphire by the combination of the high-temperature metal-organic vapor phase epitaxial growth and epitaxial lateral overgrowth methods. The dislocation behavior and growth mode of AlN are investigated in detail. The dislocation density of the AlN layer thus grown was less than 107cm-2. [J632]

"Electrorheological fluid-actuated microfluidic pump"

The authors report the design and implementation of an electrorheological (ER) fluid-actuated microfluidic pump, with programmable digital control. Our microfluidic pump has a multilayered structure fabricated on polydimethylsiloxane by soft-lithographic technique. The ER microfluidic pump exhibits good performance at high pumping frequencies and uniform liquid flow characteristics. It can be easily integrated with other microfluidic components. The programmable control also gives the device flexibility in its operations. [J633]

"Effects of N 2, O 2, and Ar plasma treatments on the removal of crystallized HfO 2 film"

The effects of plasma treatment using Ar, N2, and O2on the removal of crystallized HfO2films in a dilute HF solution were studied. The resulting damage in source and drain regions, and recess in isolation regions were also investigated. It was found that plasma nitridation with an ion energy of several hundred electron volts can lower the wet etch resistance of crystallized HfO2films up to 70Ethick through the generation of Hf-N bonds. However, thermal nitridation did not introduce sufficient nitrogen into bulk crystallized HfO2films to lower wet etch resistance. Plasma nitridation without bias power introduced nitrogen to the crystallized HfO2in the region only within 10Eof the surface. The enhancement of the etch rate of crystallized HfO2in dilute HF and the amount of recess in the active and isolation regions using N2, O2, and Ar plasma treatment have been evaluated. Results show that N2plasma treatment is the most effective in enhancing the removal rate of crystallized HfO2in dilute HF and minimizing recess on substrate among the plasmas studied. [J634]

"Effect of hydrogenation on the memory properties of Si nanocrystals obtained by inductively coupled plasma chemical vapor deposition"

Effect of hydrogenation on memory properties has been studied for metal-oxide-semiconductor (MOS) structures with Si nanocrystals fabricated using inductively coupled plasma chemical vapor deposition and subsequent annealing. Hydrogenation induces a drastic increase of a dip in the quasistatic capacitance-voltage (C-V)curve of the MOS capacitor, caused by the reduction of the interface states due to hydrogen passivation. This is consistent with high-frequency C-Vmeasurements showing more well-defined curves with less distortion in hydrogenated samples. After hydrogenation, the MOS device shows a significantly larger decrease of flatband voltage shift in electron charging than in hole charging, indicating more effective passivation of the defect states related to the electron charging. A longer retention time is found for electron charging after hydrogenation, but almost no change of charge loss rate for hole charging. These results suggest that an asymmetry exists in the effect of hydrogenation between electron and hole storage. [J635]

"Strong resonant luminescence from Ge quantum dots in photonic crystal microcavity at room temperature"

Freestanding hexagonal two-dimensional photonic crystal (PhC) microcavities with Ge self-assembled quantum dots were fabricated on silicon-on-insulator substrates. Strong photoluminescence associated with Ge quantum dots was observed in the wavelength region of 1.2-1.6mcmat room temperature. Sharp peaks dominated the spectrum, showing strong optical resonance inside the cavity. A resonant peak with a quality factor of 560 was observed at 1.58mcmalong with a significant enhancement of the luminescence in the microphotoluminescence spectrum. The peaks were also observed to reasonably shift when the structural parameter of PhC was changed. [J636]

"Ionization gas sensing in a microelectrode system with carbon nanotubes"

An efficient technology for manufacturing high-performance ionization gas sensors using carbon nanotubes as electrode materials that identify gases in some short sampling distance is developed in this letter. The microarray with five sensor units of different gap sizes (S≈6, 7, 8, 10, and 12mcm) can break down gases at distinct threshold voltages and currents depending on the gap size and gas species. The quite low operation voltage, high accuracy, and chip-based nature may be considered as significant improvements in ionization gas sensors. [J637]

"Continuous ultraviolet roll nanoimprinting process for replicating large-scale nano- and micropatterns"

With the increasing demand for large-scale nano- and micropatterns in the field of digital displays, nano- and micropattern replication technology has become a research priority. In this study, a continuous ultraviolet (UV) roll nanoimprinting process using a pattern roll stamper for the replication of large-scale nano- and micropatterns was designed and constructed. Several flexible nano- and micropatterns with large areas were fabricated and analyzed as tests of this continuous UV imprinting process. [J638]

"Science and technology of thin films and interfacial layers in ferroelectric and high-dielectric constant heterostructures and application to devices"

The fabrication of the next generation of complex oxide thin film-based micro and nanoscale devices, such as, for example, low and high density nonvolatile ferroelectric random access memories (FeRAMS), high-dielectric constant (K) high-frequency devices, and the next generation of complimentary metal oxide semiconductor (CMOS) nanoscale devices based on high-K dielectrics, require understanding and control of film growth and interface processes as well as development of materials integration strategies with atomic scale control. In recent

years, we developed and applied a unique combination of integrated film synthesis / in situ characterization and ex situ analytical techniques capable of providing information about thin film surface and interface processes at the atomic scale as required for the development of the devices mentioned above. These techniques are also useful for establishing composition-microstructure-property relationships critical for the integration of oxide thin films with semiconductor device platforms for the development of a whole new generation of micro and nanodevices based on film technologies beyond semiconductors and specifically silicon. Our recent work has been focused on developing diffusion barrier layers and heterostructured bottom electrodes that play a critical role in high-density FeRAM integration. We demonstrated that TiAllayers can be used as a material with a double diffusion barrier/bottom electrode functionality for integration of ferroelectric capacitors CMOS devices for fabrication of FeRAMs. We also demonstrated that control of interfaces is critical to the integration of high-K dielectric films with appropriate substrates for the fabrication of high-performance high-frequency devices, and here again a diffusion barrier such as the TiAllayer developed by our group is critical for such integration. These studies revealed that when properly oxidized, nano- scale thick amorphous Ti-Al-Olayers exhibit properties that make them strong candidates for application as gate dielectric in the next generation of nanoscale CMOS devices. We discuss here results from systematic studies designed to understand film growth and interface processes and their effect on materials integrations and composition-microstructure-property relationships and oxidation processes using sputter-deposition in conjunction with complementary in situ atomic layer-resolution mass spectroscopy of recoil ion (MSRI) and surface sensitive x-ray photoelectron spectroscopy (XPS) and ex situ transmission electron microscopy and electrical characterization. The unique combination of films synthesis and in situ/ex situ analytical techniques provides a powerful platform for the fundamental and applied materials science needed for the development of the next generation of multifunctional micro and nanoscale devices. A common theme in this article is the science and technology a TiAllayer that exhibit multifunctional characteristics as diffusion barrier and bottom electrode for integration of ferroelectric and high-dielectric constant (K) thing films with appropriate platform substrates for FeRAMs and high-frequency devices, and as a promising high-K dielectric layer for the next generation of nanoscale CMOS gates, flash memories, and other micro and nanodevices that require high-K layers in the device architecture. [J639]

"One-step solution fabrication of magnetic chains consisting of jingle-bell-shaped cobalt mesospheres"

Using a one-step solution phase approach, the authors have synthesized uniform jingle bell-shaped cobalt mesopheres (550-750nm)and assembled the mesospheres into long magnetic chains (20-30mcm). All of the cobalt spheres are hollow with 40nmthick shells but each contains an 200nmdiameter solid ball. The nano- to mesoscale structures were realized via reaction of $CoCl_2 \cdot 6H_2O$and $N_2H_4 \cdot H_2O$in the presence of polyvinylpyrrolidone (PVP) in an ethylene glycol solution. Magnetic measurements show a coercivity of about 75Oewith a remnance of 9.6emu/gat 300K. We propose a possible mechanism for the formation of the nanoto mesoscale structures. [J640]

"Polymer supported carbon nanotube arrays for field emission and sensor devices"

The authors report a simple method for providing a polymer support structure for carbon nanotube (CNT) arrays for device applications. This method has a twofold effect: firstly it secures the nanotubes to the substrate and secondly it significantly decreases the threshold field for field emission from 26.2to9.7V/mcm. This method ensures that the main body and tips of the CNTs are polymer-free and therefore can also be applied to CNT sensor array device fabrication. [J641]

"Thermal conductivity of composites of aligned nanoscale and microscale wires and pores"

Two-dimensional composite materials made from aligned nano- and microwires hold great promise for various applications such as thermoelectric device. Similarly, two-dimensional composites made from aligned nanoscale pores are also very important for various technologies. Phonon transport along such composites primarily involves three nondimensional parameters based on the phonon mean paths in the host medium and the wire. The first of these is the ratio of interwire distance to the phonon mean free path in the host medium, the second is the ratio of the diameter of the wire to the phonon mean free path in the host medium, and the third is the ratio of the diameter of the wire to the phonon mean free path in the wire. We develop an analytical model for the thermal conductivity in the longitudinal direction of these composites by solving the phonon Boltzmann transport equation. The analytical model includes the dependences of all three parameters and is in excellent agreement with a recently reported numerical model [Yang etal, Phys. Rev. B 72, 125418 (2005)]. Our solution shows that the scattering of phonons in the host medium at the wire interface reduces the thermal conductivity of the host medium. [J642]

"Electromagnetic noise suppression characteristics of a coplanar waveguide transmission line

integrated with a magnetic thin film"

Integrated-type electromagnetic noise suppressors based on a coplanar waveguide transmission line, incorporated with a SiO2dielectric and a nanogranular Co-Fe-Al-O magnetic thin film with excellent high frequency soft magnetic properties, are reported. A systematic study on the frequency dependences of scattering parameters, power loss, and phases of transmitted and reflected signals as a function of the length and width of the magnetic thin film indicates that the main loss mechanism of the integrated devices is the L-Cresonance. Excellent noise suppression characteristics, combined with a resonance frequency of several gigahertz, are achieved in the present integrated devices. [J643]

"Nano- and microscale adhesion energy measurement for Au-Au contacts in microswitch structures"

This paper presents a study of adhesion energies that are relevant to Au-Au microswitch contacts at the nano- and micronscales. Adhesion measurements are obtained from cantilevered Au microelectromechanical system (MEMS) microswitch structures with varying lengths. Scanning electron microscopy measurements of the microbeam profiles are combined with fracture mechanics model for the estimation of the adhesion energy. Adhesion contact and pull-off experiments are combined with theoretical models for the extraction of adhesion energies associated with Au-coated atomic force microscopy tips and Au microswitch substrates. Finite element method simulation was also performed to account for crack-tip shielding contributions from asperities in contact between Au-Au microscale cantilevered MEMS structure. The estimates of adhesion energies obtained for micron-scale contacts are shown to be in good agreement with those obtained for nanoscale contacts when appropriate "crack-tip shielding" corrections are used to account for the effects of the surface roughness of "crack-tip" shielding due to contact between micron-scale Au-Au surfaces. [J644]

"Tunable electromagnetic noise suppressor integrated with a magnetic thin film"

A tunable electromagnetic noise suppressor based on a coplanar waveguide transmission line integrated with a magnetic thin film is presented. High resonance frequencies (above 10GHz) and good signal attenuation characteristics are observed in the device, making it suitable for high frequency noise suppressors. The main mechanism of the loss generation is found to be the L-Cresonance, not ferromagnetic resonance observed in previous similar devices. With the inclusion of a magnetic material, the resonance frequency can be tuned during the operation with an applied magnetic field. [J645]

"Achieving fast oxygen response in individual beta -Ga 2 O 3 nanowires by ultraviolet illumination"

The authors report a route to realize very quick oxygen response and demonstrate it by using individual beta -Ga2O3nanowires. The current across the nanowire is at a low level and varies slightly with changing the oxygen pressure. In contrast, under 254nmultraviolet illumination, the current increases rapidly to a value that reflects the level of the oxygen pressure around the nanowire. The illumination gives rise to the oxygen sensing. This optically driven oxygen sensing is the origin of the fast response. The results demonstrate a promising approach to realize fast-response gas sensors. [J646]

"Electron mobility enhancement in Al N /Ga N /Al N heterostructures with InGaN nanogrooves"

The authors show that the electron mobility can be strongly enhanced in AlN/GaN/AlNheterostructures with the shallow InxGa1-xNchannel-nanogroove-in the middle of the potential well. The modified heterostructure has the room-temperature electron mobility, which is five times larger than that in conventional quantum wells. The maximum mobility enhancement is achieved for In content x≈0.05, which is sufficient to weaken the intersubband electron scattering without leading to the substantial electron-interface-phonon scattering. The mobility enhancement is pronounced for a wide range of the carrier densities (1011-1013cm-2), which is important for GaN technology. [J647]

"Vertically aligned tin-doped indium oxide nanowire arrays: Epitaxial growth and electron field emission properties"

Vertically aligned tin-doped indium oxide (ITO) single-crystalline nanowire arrays are epitaxially grown on ITO/yttrium stabilized zirconia substrates by vapor transport method. Vacuum electron field emission properties of the aligned ITO nanowires are investigated. The turn-on electrical field at a current density of 1mu A/cm2is about 2.0V/mcm, and the lowest vacuum for an obvious emission is 1Ч10-1Pa. The good performance of field emission is attributed to the vertically aligned morphology, which has a stronger local electric field due to their orientation parallel to the electric-field direction. [J648]

"Spin transport in polycrystalline Sb films"

Spin transport in polycrystalline Sb films has been studied by using NiFe/Sb/NiFelateral spin valve devices. A clear spin valve effect was detected in the magnetoresistance measurements, which were carried out using a conventional four-terminal geometry. The observation of a memory effect in these results indicates that the spin valve signal originates from spin injection and detection determined by the magnetization orientations of the two ferromagnetic electrodes in the NiFe/Sb/NiFedevice. From our analysis of the spin valve signals, the authors estimate that the spin diffusion length in the Sb film is 2.3mcm, with an injected spin polarization across the NiFe/Sbinterface of 0.8% at 20K. [J649]

"Secondary ion mass spectrometry depth profiling of amorphous polymer multilayers using O 2 + and Cs + ion bombardment with a magnetic sector instrument"

Thin planar polymer films are model systems in a number of fields, including nano- and biotechnology. In contrast to reciprocal space techniques such as reflectivity or diffraction, secondary ion mass spectrometry (SIMS) can provide depth profiles of tracer labeled polymers in real space directly with sufficient depth resolution to characterize many important aspects in these systems. Yet, continued improvements in characterization methods are highly desirable in order to optimize the trade-offs between depth resolution, mass resolution, detection sensitivity, data acquisition time, and artifacts. In this context, the utility of a magnetic sector SIMS instrument for amorphous polymer film analysis was evaluated using model polymer bilayer systems of polystyrene (PS) with poly(methyl methacrylate) (PMMA), PS with poly(2-vinylpyridine), and poly(cyclohexyl methacrylate) (PCHMA) with PMMA. Deuterium-labeled polystyrene embedded in PS or PCHMA at concentrations ranging from 5% to 20%(v/v)was used as tracer polymer. Analysis conditions for a magnetic sector SIMS instrument (CAMECA IMS-6f) were varied to achieve a depth resolution of 10nm, high signal/noise ratios, and high sensitivity, while minimizing matrix effects and sample charging. Use of Cs+and O2+primary ions with detection of negative and positive secondary ions, respectively, has been explored. Primary beam impact energy and primary ion species have been shown to affect matrix secondary ion yields. Sputtering rates have been determined for PS and PMMA using both primary ion species and referenced to values for intrinsic (100) silicon (Si) under identical analysis conditions. [J650]

"Punchthrough effects on the electrostatic discharge robustness of ultrathin silicon films on insulator devices"

Physical mechanisms that dominate the electrostatic discharge (ESD) robustness of silicon-on-insulator (SOI) devices are theoretically and experimentally investigated here. The authors experimentally find that the ESD robustness depends strongly on the device geometry correlated turn on mechanism. Moreover, the punchthrough mechanism is theoretically demonstrated to be the unsuitable turn on mechanism that causes a nonuniform current distribution and a low ESD strength. The punchthrough mechanism, according to their theoretical analysis, will occur in scaled down structure and reduce the benefits arising from sizing down. Therefore, optimization of a device structure is necessary to prevent nanoscaled SOI devices from the punchthrough induced ESD robustness degradation. [J651]

"Study of the size dependence of exchange bias using in situ magnetoresistance measurements"

Due to the general trend towards miniaturization of magnetic devices, it is important to understand the size dependence of exchange bias. An exchange bias spin valve structure of the form Ta/NiFe/Cu/NiFe/IrMn/Tawas used with the IrMn exchange bias layer at the top, which enabled in situ magnetoresistance measurements to be carried out as the antiferromagnetic (AFM) layer was gradually milled away in an argon ion miller. The MR decreased when the thickness was reduced below 3 nm. Optical and focused ion beam (FIB) lithography were used to micro and nano pattern wire arrays in the IrMn layer. [J652]

"Understanding quasi-ballistic transport in nano-MOSFETs: part II-Technology scaling along the ITRS"

The on-current and its ballistic limit for MOSFETs designed according to the 2003 International Technology Roadmap for Semiconductors down to the 45-nm node, are evaluated by using the full-band, self-consistent Monte Carlo simulator with quantum-mechanical corrections described in Part I. Our results show that quasi-ballistic transport increases for LGbelow approximately 50 nm and contributes most part of the IONimprovements related to scaling. Thanks to a lower vertical electric field, double-gate silicon-on-insulator MOSFETs with ultrathin body and low channel doping achieve performance closer to the ballistic limit than the bulk counterparts. [J653]

"Enhancement of magnetoresistance with low interlayer coupling by insertion of a nano-oxide layer into a free magnetic layer"

We studied the interlayer coupling strength (Hin)and GMR ratio of a spin-valve with the top free layer, separated by a nano-oxide layer (NOL). With the total thickness of the top free layer being fixed at 60E, the physical properties of the NOL spin-valve were studied with the thickness (tf)of the free layer under the inserted NOL and compared with those of the normal spin-valve with the same thickness as tf. It was found that the spin-valve with NOL has a higher GMR ratio than that of the normal spin-valve at the optimal condition (tf=40E)after thermal annealing at T=250°C. The NOL spin-valve also shows a lower Hinthan that of the optimal normal spin-valve with tf=40E, which is comparable to that of the normal spin-valve with tf=60E. This indicates that the enhancement of GMR, while keeping the Hinto be low, can be achieved by inserting a NOL into the top free layer. [J654]

"Stress reduction in sputter deposited films using nanostructured compliant layers by high working-gas pressures"

We present a strategy of stress reduction in sputter deposited films by a nano-compliant layer at the substrate using physically self-assembled nanostructures obtained at high working-gas pressures prior to the deposition of a continuous film. This technique is all in situ, and the nanostructures are made of the same material as the deposited thin film and requires no lithography process. This nanostructured layer has a lower material density and can act as a compliant layer to reduce the stress of the subsequently deposited continuous film grown under low gas pressure. By using this approach we were able to reduce stress values significantly in sputter deposited tungsten films and the strategy of alternating high and low Ar gas pressures leads to the growth of much thicker films without delamination. [J655]

"Investigation of etching properties of metal nitride/high-k gate stacks using inductively coupled plasma"

Etching properties of metal nitrides (TaN, TiN, and HfN)/high dielectric constant material (HfO2)gate stacks in Cl2and HBr were investigated using inductively coupled plasma. The linear dependence of etch rates on the square root of bias voltage indicates the dominance of ion-induced etch mechanism of the metal nitrides. This phenomenon is well explained by internal binding energy of substrate, evaporation temperature, and Gibb's free energy (Delta Gf°)of formation of byproducts. The addition of O2in Cl2and HBr decreased etch rates of the metal nitrides and HfO2; however, for O2concentration lower than 1.5% in Cl2, a slight increase in etch rates of the metal nitrides was observed. X-ray photoelectron spectroscopy revealed that residues remain more on the sidewalls of gate stacks than the bottom of spaces between gates. The addition of O2and the use of a SiO2mask to increase etch selectivity of metal nitrides with respect to high-kdielectric increased surface roughness and formed micromasks on the etched surface. The optical emission signals from N, Cl, and Ta-Cl byproducts were sensitive enough to control the etch endpoints of the TaN/HfO2stack structures. [J656]

"Simulation of transmission characteristics of nanometric bend circuits with open-type surface-plasmon gap waveguides"

The transmission characteristics of nanometric bend circuits consisting of open-type surface plasmon polariton gap waveguides (o-SPGWs) are investigated by three-dimensional numerical simulation. The polygonal bend was used as a polygonal approximation of a circular bend. The scattering problem for this model is described by a volume integral equation and solved by an iterative technique based on the generalized minimum residual (GMRES) method and fast Fourier transform (FFT). The radiation loss from the o-SPGW polygonal bend structure is shown to be small compared to the propagation loss, and o-SPGWs are demonstrated to be useful as nanometric optical wire interconnects in nanometric optical circuits. [J657]

"Design of a bidirectional actuator for a nanopositioning system with a permanent magnet and an electromagnet"

A precision bidirectional linear actuator for ultraprecision systems is proposed and designed in this article. The actuator is composed of a symmetric structure with a force generation unit and a guide mechanism. The force generation part consists of a permanent magnet and an electromagnet, which generate a permanent and a reversible flux, respectively. The combination of permanent and reversible fluxes makes various flux densities in its air gaps between the moving part and the fixed yokes. The difference between flux densities in the lower and upper gaps creates forces for bidirectional linear motions of hundreds of micrometers. As a guide mechanism, two circular plates and one shaft are used. Reducing other forces generated by motions, except the z-directional motion, these circular plates in the form of a flexure endow the actuator with smooth motion, freedom from wear,

and a high stiffness for a rapid settling time. The function of the shaft is to transfer motion to an object. Finally, the total body has a symmetric structure enabling it to be stable in terms of thermal error. The actuator is designed with the software tools MAXWELL™2Dand PRO-MECHANICA™. The designed actuator is evaluated with a linear current amplifier, a laser Doppler vibrometer for nanometer resolution, a dynamic signal analyzer for frequency responses of the proposed actuator, and a simple proportional-integral-derivative controller for its tracking performance. [J658]

"Reduction in critical current of current-induced switching in exchange-biased spin valves"

The current-induced magnetization reversal (CIMR) effect in nanosized exchange-biased spin valves (EBS) of IrMn/Co1/Cu/Co2is investigated. The CIMR is studied at RT. With our EBS structure, the critical current can be lowered to 7.5Ч106A/cm2, which is rather smaller than that in the conventional simple spin valves (SS) Co1/Cu/Co2. This effect can be attributed to the enhancement of spin transfer efficiency by using antiferromagnetic pinning layer in that structure. However, the absolute change in total resistance of EBS, in comparison to that of SS with similar layer thickness, is not increased, as the nearly unpatterned fixed Co layer is pinned. The results are discussed in terms of current induced spin transfer and current induced thermal activation. [J659]

"Electric-field-aligned vertical growth and field emission properties of In 2 O 3 nanowires"

Vertically aligned In2O3nanowires are grown on InAs substrates by an electric field in the plasma sheath. The In2O3nanowires are single crystalline with diameters less than 10nm. Field emission results show that the aligned In2O3nanowires have lower turn-on and threshold electric fields than nonaligned ones. This is discussed in terms of orientation, emitter shapes, and density of the In2O3nanowires. [J660]

"Surface enhanced infrared absorption by coupling phonon and plasmon resonance"

A gold and silicon carbide particle matrix is presented that concentrates light to its surface using a combination of phonon and plasmon resonance mechanisms. The enhanced infrared absorption spectrum of absorbed molecules is used to probe the coupled phonon and plasmon surface resonances. Sensitive molecular detection is achieved by measuring the enhanced infrared absorption or the frequency shift in the surface modes of the coated matrix. This work demonstrates that hybrid polariton resonance structures using metallic and polar dielectric materials are feasible for applications in near-field microscopy, nano-optical devices, and trace chemical sensing. [J661]

"Compressive strain dependence of hole mobility in strained Ge channels"

The strain dependence of the hole mobility was systematically investigated in the compressively strained Ge channel modulation-doped structure. It was clearly observed that the mobility increases with increasing compressive strain until the strain as high as 1.9%. The highest mobility of 20 800 and 2000cm2/Vsat 8 K and room temperature, respectively, was obtained for the Ge channel structure grown on the relaxed SiGe buffer layers with Ge composition of 53%. The origins of this mobility increase are speculated to be the reduction of effective mass, suppression of interband phonon scattering, and the increased confinement of the holes in the channel layer. [J662]

"Self-assembled monolayer cleaning methods: Towards fabrication of clean high-temperature superconductor nanostructures"

Although extensive amounts of research have been carried out on superconductor-normal metal-superconductor (SNS) electronic devices, the fabrication of superconductor SNS devices still remains difficult. Surface modification of high-temperature superconductors could be a way to control the interface of SNS electronic device fabrication. Here, we developed a cleaning method for thin films of high-temperature superconductor surface based on self-assembled monolayers. High-quality c-axis orientated YBa2Cu3O7-delta (i.e., YBCO) and Y0.6Ca0.4Ba1.6La0.4Cu3O7-delta (i.e., TX-YBCO) thin films were deposited by standard laser ablation methods. YBCO/Au/YBCO and TX-YBCO/Au/TX-YBCO planar type junctions were fabricated by photolithography, focused-ion-beam milling, and ex situ sputter depositions. A 40-50nmnanotrench was ion milled on the thin film by FIB, and a thin gold layer was deposited by an ex situ method on the nanotrench to connect the two separated high-temperature superconductor electrodes. SEM, AFM, and Rvs Tresistivity measurements were used to compare the corrosion layer formed in the interface of the SNS junctions with the SAM cleaned SNS junction. Evidence here suggests that the SAM cleaning method can be used to remove the degradation layer on the surface of cuprate superconductors. The obtained contact resistivity value, (10-8Omega cm2)for a SNS junction with SAM treatment is comparable with that of SNS junctions fabricated by the in situ methods. [J663]

"Electron field emission from a single carbon nanotube: Effects of anode location"

Electron field emission from an isolated carbon nanotube (CNT) was performed in situ in a modified scanning electron microscope, over a range of anode to CNT tip separations, D, of 1-60mcm. The threshold field required for an emission current of 100 nA was seen to decrease from a value of 42Vmcm-1at an anode to CNT tip separation of 1mcm, asymptotically, to approach 4Vmcm-1at a separation of 60mcm. It is proposed that at low D, the electric field enhancement factor (beta)reduces as the anode electrode approaches the CNT mimicking a parallel plate configuration. Under "far field" conditions, where D 3h, where his the CNT height, the CNT enhancement factor is no longer dependant on D, as shown by the asymptotic behavior of the threshold field, and is purely a factor of the CNT height and radius. For each CNT to tip separation, measured emission current data together with the threshold field and enhancement, are consistent with a Fowler-Nordheim analysis for the far field conditions, and dispels the need for a novel emission mechanism to explain the results as has been proposed recently. [J664]

"Parallel-field electrorheological clutch: Enhanced high shear rate performance"

We present an electrorheological (ER) fluid cylindrical clutch which achieves stable shear stress at high shear rate, and demonstrates superior performance compared with the traditional ER clutches. The design is realized by employing alternate-stripe electrodes on the inner cylinder, with either dielectric or metallic outer rotor. The alternate stripe electrodes generate electric fields with a component parallel to the shearing direction, so that ER particles can form chain structures parallel to shear and thereby bring significant enhanced device performance at a high shear rate. Differences due to the use of dielectric or metallic outer rotor are shown to be compatible with expectations based on simulated electric-field patterns. [J665]

"Enhanced electroluminescence and color purity in conjugated polymer with nano-porous morphology"

The luminescent properties of conjugated polymers are seriously affected by concentration of the conjugated chains and the degree of polymer chain packing. We examined the effect of nanoporous morphology in the emitting layer of poly[2-methoxy-5-(2'-ethylhexyloxy)-1,4-phenylene vinylene] to hope that it would prevent polymer chain packing so that effectively decrease interchain interaction caused by interchain species and aggregates. High luminance is obtained at relatively low current density since the annihilation of singlet excitons is decreased. Redshifted emission due to the interchain aggregates and excimers are also suppressed, so that the color purity of the devices is greatly improved. [J666]

"Line and two-dimensional fractal analysis of micrographs obtained by atomic force microscopy of surface-immobilized oligonucleotide nano-aggregates"

This study reports on the evaluation of the nanotopographies of DNA functionalized polymer surfaces, i.e., cyclo-olefine copolymer (COC) and polycarbonate (PC) using line, "Zmax" and two dimensional fractal dimension methods, i.e., power spectrum density algorithm (PSDA) and perimeter-area relationship (PAR), applied to atomic force microscopy (AFM) scans. A decrease in the fractal dimension after the immobilization of oligonucleotides suggests the prevalence of a vertical assembly of oligonucleotides, more significantly on COC than on PC. [J667]

"Synthesis and ethanol sensing characteristics of single crystalline SnO 2 nanorods"

In a basic water-alcohol mixing solution without any other toxically organic solvents, the single crystalline SnO2nanorods with diameters of 4-15 nm and lengths of 100-200 nm were synthesized using SnCl4as a precursor. The sensors fabricated from the nanorods exhibited the sensitivity of 31.4 for 300 ppm of ethanol. Both the response and recovery time are short, around 1 s. Moreover, a linear dependence of the sensitivity on the ethanol concentration was observed. These behaviors were well explained by considering the high surface-to-volume ratio of the nanorods. [J668]

"Approach to nonphotoperturbed differential capacitance measurements: A front-wing cantilever"

We have developed a front-wing (FW) cantilever structure that can significantly suppress photoperturbation effects during scanning capacitance microscopy (SCM) and scanning capacitance spectroscopy (SCS) measurements. The FW cantilever provides an effective shadow area that fully covers the scan region, allowing us to synchronously obtain SCM images and the corresponding topographic images without photoperturbation problems. Nonphotoperturbed differential capacitance characteristics versus tip biases were also obtained for SCS by the use of these FW cantilevers. This means that nonphotoperturbed SCM and SCS measurements can

be carried out during the typical SCM operations. [J669]

"Interface engineering for lattice-matched epitaxy of ZnO on (La ,Sr)(Al ,Ta)O 3 (111) substrate"

ZnO/(La,Sr)(Al,Ta)O3(LSAT)heterointerface is engineered to control the crystallographic orientation of ZnO films grown by plasmas-assisted molecular beam epitaxy. Lattice-matched in-plane alignment of [1120]ZnO||[112]LSAThas been realized using Mg modification of the substrate surface, which is confirmed with in situ reflection high-energy electron diffraction observation, and ex situ characterization of x-ray diffraction and transmission electron microscopy. The low-temperature deposition and high-temperature treatment of the Mg layer on the oxygen-terminated LSAT(111) surface results in selective nucleation of a MgO interface layer which serves as a template for single-domain epitaxy of ZnO. Oxygen-polar ZnO film with an atomically smooth surface has been obtained, which is favorable for metal-ZnO Schottky contact with high barrier height. [J670]

"Contact-controlled sensing properties of flowerlike ZnO nanostructures"

Contact-controlled sensing is realized from flowerlike ZnO structures composed of rods. The rods are around 150 nm in diameter and up to a few micrometers in length. When they are exposed to air, a depletion region formed below the surface of the rods arising from the adsorption of oxygen. Surface depletion does not greatly reduce either the carrier density or the mobility in the rods but significantly modify the potential barrier of the contacts between the rods. Both the large diameter and the long length result in a low sensor resistance down to 104kOmega in air at 300 °C. The exponential increase of the tunneling rate with the thickness and height of the contact barrier leads to a high sensitivity up to 14.6 for 100 ppm ethanol. These results indicate that contact-controlled sensing can be used to fabricate high-performance sensors with both high sensitivity and low resistance. [J671]

"CdS nanobelts as photoconductors"

Mass production of single-crystalline CdS nanobelts is achieved by thermal evaporation of CdS powders with the presence of Au catalyst. The as-synthesized CdS nanobelts are usually hundreds of nanometers to tens of micrometers in width, tens of nanometers in thickness, and several hundreds of micrometers in length. CdS nanobelts have a pronounced increase in conductance of up to four orders of magnitude upon exposure to white light, and also very fast response time about 1-3 s. The photoconductivity mechanism of CdS nanobelts is discussed. The results demonstrate the potential of fabricating nanosized photoconductors and optical switches using the integrity of a single CdS nanobelt. [J672]

"Integration of metal oxide nanobelts with microsystems for nerve agent detection"

We have assembled tin dioxide nanobelts with low-power microheaters for detecting dimethyl methylphosphonate (DMMP), a nerve agent simulant. The electrical conductance of a heated nanobelt increased for 5% upon exposure to 78 parts per billion DMMP in air. The nanobelt conductance recovered fully quickly after the DMMP was shut off, suggesting that the single-crystal nanobelt was not subject to poisoning often observed in polycrystalline metal oxide sensors. While the sensitivity can be improved via doping nanobelts with catalytic additives, directed assembly or growth of nanobelts on microsystems will potentially allow for the large-scale fabrication of nanosensor arrays. [J673]

"Abnormal temperature dependence of conductance of single Cd-doped ZnO nanowires"

Positive temperature coefficient of resistance is observed on single Cd-doped ZnO nanowires. The current along the nanowire increases linearly with the bias and saturates at large biases. The conductance is greatly enhanced either by ultraviolet illumination or infrared illumination. However, the conductance decreases with increasing temperature, in contrast to the reported temperature behavior either for ZnO nanostructures or for CdO nanoneedles. The increase of the conductance under illumination is related to surface effect and the decrease with increasing temperature to bulk effect. These results show that Cd doping does not change surface effect but affects bulk effect. Such a bulk effect could be used to realize on-chip temperature-independent varistors. [J674]

"Electrochemical lithium doping of a pentacene molecule semiconductor"

Li-doped pentacene has been developed by using an electrochemical approach; that is, constant-potential electrolysis. Li-doped pentacene was characterized by Raman spectrometry and x-ray diffraction measurements. Lithium doping introduces a modification of the C-H vibrational modes located at the end of pentacene molecules. A low doping level has been observed for electrochemical synthesis of Li-doped pentacene, and lithium species are supposed to be intercalated between the two-dimensional pentacene layers. The lithium-

doped pentacene exhibits a conductivity of 6Ч10-3Scm-1. [J675]

"Instability of 0.4 nm carbon nanotubes in a zeolite template under ultraviolet laser irradiation"

The stability of 0.4 nm carbon nanotubes within a zeolite matrix under laser irradiation has been investigated using photoluminescence (PL) spectroscopy. It was found that in the weak excitation power regime the PL spectra have similar line shapes at different excitation wavelengths. When the excitation power is high for ultraviolet light at 325 nm, the PL spectral shape undergoes an irreversible change. This is in contrast to the case with 488 nm laser irradiation and indicates a permanent chemical change in the sample, probably due to photochemical effects. [J676]

"Organic field-effect transistors with single and double pentacene layers"

We report the characterization of field-effect transistors fabricated within individual grains of single and double pentacene layers grown on silicon oxide. Field-effect mobilities are found to increase with increasing gate voltage and exhibit a thermally activated form for the temperature dependence. These characteristics can be explained by the multiple trapping and release model. The mobilities of double-layer devices are one order of magnitude higher than those of single-layer devices. Possible origins of the traps are discussed. The geometry of these ultrathin devices makes them suitable for sensing applications. [J677]

"Thin-film InGaN multiple-quantum-well light-emitting diodes transferred from Si (111) substrate onto copper carrier by selective lift-off"

Crack-free thin-film InGaN multiple-quantum-well light-emitting diodes (LEDs) were successfully transferred from the original Si (111) substrate onto copper carrier by means of metal-to-metal bonding and the selective lift-off (SLO) technique using wet-chemical etching. Crystalline quality was investigated by x-ray diffraction and photoluminescence measurements. No deterioration was found in the thin film after substrate removal due to the fact that the SLO technique minimizes the residual strain relaxation. Substrate removal eliminates not only the substrate absorption but also the large band offset between the AlN buffer layer and substrate. In conjunction with inserting a metal reflector between the LED structure and the copper carrier, the performances of the LED fabricated on the substrate removal region were significantly improved. The operating voltage at 20mAand the series resistance was 3.6Vand 27Omega, respectively. The optical power revealed an increase of 49% compared to the LED before substrate removal. [J678]

"Visible electroluminescence from silicon nanocrystals embedded in amorphous silicon nitride matrix"

Visible electroluminescence from silicon nanocrystals (Si-NCs) embedded in amorphous silicon nitride (a-SiNx)films has been observed. The Si-NC/a-SiNxfilms were deposited by evaporating silicon from electron gun into the inductively coupled plasma of nitrogen. The density of Si-NCs in the a-SiNxmatrix was around 1012cm-2. Strong room temperature photoluminescence was observed in 2.8 and 3.0eV, different from literature values. The electroluminescence (EL) devices were fabricated with Si-NCs/a-SiNxfilm as the active layer using the Al or Ca/Agcathode and the indium tin oxide anode. Through tunneling, the electrons and holes were respectively injected from the cathode and anode into Si-NCs and confined within Si-NCs for light emission by the high band gap a-SiNxmatrix. For the device with Ca/Agcathode, the turn-on voltage was as low as 10Vand the EL efficiency was about 1.6Ч10-1Cd/A. The EL spectra consisted of two broad peaks centered around 2.5 and 2.8eV. Our results demonstrate that Si-NCs/a-SiNxnanocomposite films have potentials to be fabricated into electroluminescence devices using the low work f--unction cathode. [J679]

"Optoelectronic characteristics of single CdS nanobelts"

Optoelectronic properties of single CdS nanobelts are investigated by performing transport measurements with different laser ON/OFF circles. The current increases linearly with the bias voltage in the dark, and superlinearly under illumination. The superlinear increase can be related to the enhanced mobility due to the partial release of surface adsorbates under illumination. The current jumps up by five orders of magnitude upon turning on the laser with an intensity of 0.3W/cm2within 91msand decreases by five orders 6msjust after turning off the laser. The high sensitivity and fast response in the visible range indicate potential applications of CdS nanobelts in realizing optoelectronic switches. [J680]

"Enhanced coercive field of cobalt film deposited on noodle-like porous silicon substrates"

Cobalt films were deposited on special porous silicon substrate composing of nanosized noodle-like channels with large length-to-axis ratio. Modulation effects due to the substrate on microstructure, domain structures, and

magnetic properties of the Co films were studied. Magnetic images and hysteresis loops indicate that a large uniaxial in-plane shape anisotropy is induced in the magnetic cobalt films. Accordingly, the magnetization of the magnetic cobalt films lies in the film plane, along the noodle direction. The coercivity of the cobalt films is enhanced as compared to reference cobalt film that was grown on a flat silicon substrate. [J681]

"Synthesis and ethanol sensing properties of ZnSnO 3 nanowires"

ZnSnO3nanowires in mass production have been synthesized via thermal evaporation of ZnO, SnO, and graphite mixture powders. X-ray powder diffraction results show that these nanowires are of ZnSnO3crystal structure. These nanowires have diameters ranging from 20 to 90 nm and lengths of several ten micrometers. Gas sensors fabricated from these ZnSnO3nanowires show a very high sensitivity to ethanol gas and the sensitivity is up to about 42 against 500 ppm ethanol gas at the operating temperature of 300 °C. Both the response and the recovery time are about 1 s. Mass production and good sensitivities of the nanowires indicate their potential applications in sensor technology at the industry level. [J682]

"Demonstration of undoped quaternary Al In Ga N /Ga N heterostructure field-effect transistor on sapphire substrate"

Undoped AlInGaN/GaNheterostructure field-effect transistors (HFETs) have been demonstrated on sapphire substrate. The maximum drain current of 758mA/mmand extrinsic transconductance of 123mS/mmwere obtained from the device with 2mcmgate length and 15mcmgate width. Such performance was comparable to that of a conventional modulation-doped (MOD) AlGaN/GaNHFET fabricated at same the condition. In spite of the high-density two-dimentional electron gas formed at the heterointerface, the AlInGaN/GaNHFET structure showed relatively low Hall mobility (689cm2/Vsat 300K), which was due to the high concentration background doping in the undoped AlInGaN barrier region. Encouragingly, both the gate leakage current and drain current collapse showed lower values than that of the MOD-AlGaN/GaNHFET, which implied the potential application of quaternary AlInGaN to high-power and high-frequency devices. [J683]

"C O 2 detection using carbon nanotube networks and micromachined resonant transducers"

A CO2sensor using single-walled carbon nanotubes (CNT) and a microelectromechanical system (MEMS) resonator is demonstrated. The MEMS transducer comprises a membrane driven into transverse vibrations by means of Lorentz forces. A downshift in the resonant frequency of the device is measured by a laser vibrometer when changes in the stress state of the CNT film/membrane structure are caused by adsorption of CO2onto the nanotubes. The sensor has shown excellent sensitivity, linearity, and recovery over a broad range of concentrations (0-15vol%). In comparison to resistive, dielectric, and gravimetric CNT transducers, this sensor displayed remarkable intrinsic selectivity in the presence of interferences. [J684]

"Thermal transport due to transverse phonons in nano and micro particulate media"

This paper deals with the calculation of the thermal transport cross section and phase function of transverse phonons for scattering by nano and micro particles. Thermal transport cross section is different than the scattering cross section due to the anisotropic nature of scattering. Exact formulation of the phase function is given for the Rayleigh scattering. This paper also proposes an approximate method to calculate the thermal transport cross section for low contrast scatterer. It is also shown that for SH (horizontally shear) phonons the scattering and transport cross sections are proportional to omega 8rather than the well accepted value of omega 4in the Rayleigh regime where omega is the frequency of the SH phonons. The formulations developed in this paper will be useful for the predictive modeling of thermal conductivity of practical systems such as nano composites, nano-micro particle laden systems etc. [J685]

"Perpendicular magnetic properties of CoCr films on GaAs"

CoCr films were deposited on three types of GaAs substrates, GaAs(001), GaAs(111), and Al oxide/GaAs(001). The perpendicular magnetic properties were investigated by magneto-optical Kerr-effect measurements. The direct deposition of the CoCr film on the GaAs substrate did not show any perpendicular magnetic properties. This fact indicates that the lattice distortion influenced by the GaAs lattice suppresses the perpendicular magnetism. The CoCr film on the Al oxide layer showed a tilted squarelike hysteresis loop. The thickness dependence of the hysteresis loop and the magnetic force microscopy showed that the onset thickness of ferromagnetism was 6.5nm. The domain size of the CoCr films monotonously decreases with the increasing thickness (6.5-75nm). [J686]

"Low resistance AL 2 O 3 magnetic tunnel junctions optimized through in situ conductance

measurements"

In situ electrical conductance is used to monitor the growth and natural oxidation of aluminum on top of a CoFe electrode. Light oxidation is found to enhance the electron specular scattering of the CoFe/vacuum interface. Aluminum deposited onto CoFe intermixes to a depth of a few atomic layers, however, subsequent natural oxidation tends to reverse this interdiffusion through oxygen-driven A1 segregation. At the right A1 thickness, natural oxidation creates a clean and specular CoFe/AlOxinterface very similar to the best achievable CoFe/vacuum interface. For thicker A1, natural oxidation leaves behind underoxidized AlOxand most importantly an interdiffused CoFe/Alinterface. Using 2TorrЧ150-snatural oxidation, we have fabricated magnetic tunnel junctions (MTJs) with a peak tunnel magnetoresistance (TMR) of 18% for a resistance area product of 7Omega mcm2, at the A1 metal thickness of 6 E. With the same oxidation process TMR drops to only 8% when A1 is increased to 9 E. Contrary to the accepted view, we do not attribute this TMR drop to A1 underoxidation, but primarily to the interdiffusion at the CoFe/Alinterface. This assertion is strongly supported by a second set of MTJs differing only by the insertion of a nano-oxide layer (NOL) on top of CoFe. In this case when Al is increased from 6 to 9 E, the TMR does not drop but increases from 16% to 27%. This is significant because NOL is found to effectively prevent Al diffusion into CoFe. NOL is also found to act as a reservoir of oxygen, which is subsequently consumed by Al. [J687]

"Adsorption and desorption of oxygen probed from ZnO nanowire films by photocurrent measurements"

Sensing mechanisms of ZnO nanowire films are investigated by performing transient photocurrent measurements. The current jumps upon ultraviolet or green laser illumination. The amplitude in the jump is strongly dependent on the ambient atmosphere. The decay rate is much more sensitive to the ambient atmosphere than the rise rate. The fast rise is due to rapid photogenerated carriers and the slow decay is controlled by slow surface process. Our experimental results indicate that the oxygen physisorption rate is slower than the chemisorption rate. [J688]

"Fabrication and optical investigation of a high-density GaN nanowire array"

A high-density GaN nanowire array has been successfully fabricated through self-organized nanometer-sized holes as mask appearing in InGaN layer. The self-organized nanometer-sized holes are naturally formed during InGaN epitaxial growth using metalorganic chemical vapor deposition technology by modifying growth parameters. Scanning electron microcopy and atomic force microcopy have been used to characterize them. Optical investigation was carried out by room-temperature photoluminescence, which indicated that strong emission from an n-GaN nanowire array was observed at 367 nm, the near-band edge emission wavelength for n-type GaN. The results show that excellent optical properties of the GaN nanowire array can be obtained by this technique. It is important to point out that GaN-based nanolaser or nano-light-emitting diodes with different emission wavelengths can be potentially achieved using this technology. [J689]

"Film growth model of atomic layer deposition for multicomponent thin films"

Atomic layer deposition (ALD) has become an essential technique for fabricating nano-scale thin films in the microelectronics industry, and its applications have been extended to multicomponent thin films, as well as to single metal oxide and nitride films. A mathematical film growth model for ALD is proposed to predict the deposition characteristics of multicomponent thin films grown mainly in the transient regime, where the film thickness varies nonlinearly with the number of cycles. The nonlinear behavior of the growth rate and the composition of multicomponent thin films deposited by ALD depend on the precursor used and adsorbing surface. Hence, the equations to describe the change of surface coverage with precursor adsorption and the surface reaction are derived. The area reduction ratio is introduced as a parameter related to the number of adsorbed precursor molecules per unit area. The proposed model was applied to the deposition of Sr-Ti-O thin films to confirm its validity. SrO and TiO2films were grown separately to investigate their ALD characteristics and to extract model parameters. As a result, it was shown that the thickness and composition of Sr-Ti-O films follow the trend predicted by the proposed model. [J690]

"Magneto-optical enhancement by surface plasmon resonance in magnetic "nano-onions" with multicore-shell structures"

Calculations based on the Maxwell-Garnett theory revealed a remarkable enhancement of the magneto-optical effect due to surface plasmon resonance excited in nanometer sized magnetic particles ("nano-onions") with n-fold core-shell structures consisting of shell(s) and/or a core of noble metals such as Auand Ag. The Kerr effect was found to be greatly enhanced in a composite containing nano-onions of threefold Fe(orCoFe2O4)(core)/dielectric(shell)/Ag(shell)structure and also in a composite containing twofold Bi-

YIG(core)/Ag(shell)nano-onions. In the latter case, the Kerr rotation angle as large as 13.5°was obtained with a figure of merit, theta K√R=62°, (Ris the reflectivity) at ħomega =2.6eV, which is much larger than the highest values of theta K=19°and theta K√R=1.1°, reported for PtMnSb. [J691]

"Enhanced Hall voltage in a gate-controlled InSb Hall device"

We present an enhanced Hall voltage from the gate-controlled Hall device incorporating a micron-scaled InSb semiconductor cross junction and a single ferromagnetic element. Magnetic fringe field at an edge of the ferrogmanetic element gives rise to the Hall voltage, which shows hysteretic behavior upon magnetic-field sweep. The Hall effect is amplified by a factor of 40%when a gate voltage of -25Vis applied. The increase is largely attributed to the reduction of carrier density affected by the gate confinement effect. The InSb Hall device controlled by gate voltage demonstrates a possible application for active nonvolatile memory cells and logic gate. [J692]

"Spin transport in an InAs based two-dimensional electron gas nanochannel"

A spin device composed of two ferromagnetic electrodes and InAs two-dimensional electron gas was fabricated. Submicron spin channels were defined to enhance spin transport characteristics. Electrical transport measurement was performed to detect spin-polarized electrons. In potentiometric geometry a voltage change, Delta V=0.17mV, sensed by a ferromagnetic electrode was obtained at 5 and 77K. In the nonlocal method Delta V=0.057mV, which resulted from accumulated spin-polarized electrons, was obtained at 77K. The main reason for theses large signals is that the short and narrow spin channels increase the possibility for spin-polarized electrons to arrive at the spin detector. [J693]

"Nanostructure formation during deposition of TiN /SiN x nanomultilayer films by reactive dual magnetron sputtering"

Multilayer thin films consisting of titanium nitride (TiN) and silicon nitride (SiNx)layers with compositional modulation periodicities between 3.7 and 101.7 nm have been grown on silicon wafers using reactive magnetron sputtering. The TiN and SiNxlayer thicknesses were varied between 2-100 nm and 0.1-2.8 nm, respectively. Electron microscopy and x-ray diffraction studies showed that the layering is flat with distinct interfaces. The deposited TiN layers were crystalline and exhibited a preferred 002 orientation for layer thicknesses of 4.5 nm and below. For larger TiN layer thicknesses, a mixed 111/002preferred orientation was present as the competitive growth favored 111 texture in monolithic TiN films. SiNxlayers exhibited an amorphous structure for layer thicknesses ≥0.8nm; however, cubic crystalline silicon nitride phase was observed for layer thicknesses ≤0.3nm. The formation of this metastable SiNxphase is explained by epitaxial stabilization to TiN. The microstructure of the multilayers displayed a columnar growth within the TiN layers with intermittent TiN renucleation after each SiNxlayer. A nano-brick-wall structure was thus demonstrated over a range of periodicities. As-deposited films exhibited relatively constant residual stress levels of 1.3±0.7GPa(compressive), independent of the layering. Nanoindentation was used to determine the hardness of the films, and the measurements showed an increase in hardness for the multilayered films compared to those for the monolithic SiNxand TiN films. The hardn- ess results varied between 18 GPa for the monolithic TiN film up to 32 GPa for the hardest multilayer, which corresponds to the presence of cubic SiNx. For larger wavelengths, ≥20nm, the observed hardness correlated to the layer thickness similar to a Hall-Petch dependence, but with a generalized power of 0.4. Sources of the hardness increase for shorter wavelengths are discussed, e.g., epitaxial stabilization of metastable cubic SiNx, coherency stress, and impeded dislocation activity. [J694]

"Growth and field emission properties of vertically aligned carbon nanofibers"

Vertically aligned carbon nanofibers (VACNFs) were synthesized on Ni-coated Si substrates using a dc plasma-enhanced chemical-vapor deposition system. The size of the Ni islands used as catalyst to grow the VACNFs was formed by both thermal annealing and laser processing on thin metal layers. It was observed that the diameter of the carbon nanofibers is strongly dependent on the initial Ni island dimension. By varying the laser power from 228 to 279mJ/cm2, the size of these Ni islands can be controlled independent of the initial Ni film thickness. Electron field-emission results show that the emission threshold field is dependent on both the height and radius of these VACNFs and also field shielding effects. Threshold fields as low as 2V/mcmwas obtained from the sample with the largest height over radius ratio. [J695]

"Thickness dependence of properties of excimer laser crystallized nano-polycrystalline silicon"

Excimer laser crystallization is used to produce layered nanocrystalline silicon from hydrogenated amorphous silicon, using a partial melting process. Three types of hydrogenated amorphous silicon samples, 100, 300, and 500 nm thick, were laser treated in order to investigate the changes to the structural, optical, and electrical

properties as a function of amorphous silicon thickness with excimer laser crystallization. The resulting nanocrystalline thin films were characterized using Raman spectroscopy, optical absorption measurements, atomic force microscopy, forward recoil spectrometry, and current-voltage measurements. The relationship of crystalline volume and laser energy density was established, along with the behavior of the optical gap and its relationship to hydrogen content. Surface roughness effects are discussed in the context of photovoltaic applications. The effect of increased mobility on photoconductivity after excimer laser crystallization is also examined. [J696]

"Enhancement of breakdown voltage by AlN buffer layer thickness in Al Ga N /Ga N high-electron-mobility transistors on 4 in. diameter silicon"

Enhancement of breakdown voltage (BV) with the increase of AlN buffer layer thickness was observed in AlGaN/GaNhigh-electron-mobility transistors (HEMTs) grown by metalorganic chemical vapor deposition on 4in.Si. The enhancement of device performance with AlN buffer thickness (200 and 300nm) is due to the reduction of electrically active defects from Si substrate. The reduction of defects from Si with the increase of AlN thickness was confirmed by x-ray rocking curve measurements. Not much change has been observed in ON-state BV (BV:ON) values except in devices with 500-nm-thick buffer layer. About 46% enhancement in OFF-state BV (BV:OFF) was observed on 200mcmwide HEMTs with 300nmthick AlN buffer layer when compared to HEMTs with 8nmthick AlN buffer layer. The location of junction breakdown in the device was identified as GaN/AlN/Siinterface. The measured specific on-resistance (Ron)values for 200 and 400mcmwide HEMTs with 300nmthick buffer layers were 0.28 and 0.33mOmega cm2, respectively. About an order of low Ronwas observed when compared with the reported values. The AlGaN/GaNHEMTs on 4in.Si with thicker AlN buffer--layers are suitable for high-power applications. [J697]

"Anomalous electrorheological behavior of ZnO nanowires"

We observe an anomalous electrorheological (ER) behavior of suspensions composed of ZnO nanowires and silicone oil. In contrast to the usual ER behavior, a decrease in viscosity of the suspensions is observed. Such an anomalous behavior results from the migration of ZnO nanowires to the electrodes under a dc electric field. The migration leads to a relatively pure silicone oil zone between the electrodes, as confirmed by optical microscope observations. The occurrence of the electrophoresis is proposed as the origin of the decrease in shear stress. [J698]

"Probing a molecular interface in a functioning organic diode"

The effect of hole-polaron charging at a hole-injection/hole-transport interface within a functioning organic diode was investigated by single molecule spectroscopy and associated modeling. Efficient quenching of both singlet and triplet excitons by hole polarons is observed at high forward bias due to a buildup of interfacial polaron density. Additionally, for some diodes, an unexpected quenching process was observed at reverse bias, which is ascribed to hole charging of the interface due to the leakage current. [J699]

"Enhanced light emission from InAs quantum dots in single-defect photonic crystal microcavities at room temperature"

The optical properties of InAs quantum dots with photonic crystal microcavity emitting near 1.3mcmwere investigated at room temperature. The photoluminescence (PL) intensity for quantum dots in cavity was enhanced by two orders of magnitude. The large PL enhancement was attributed to the effects combining the improved extraction efficiency and the enhanced spontaneous emission rate due to the Purcell effect. A threefold Purcell enhancement is observed at room temperature, which is predominantly achieved by the very small mode volume of the photonic crystal microcavity. [J700]

"Reduction of threading dislocations in AlGaN layers grown on AlN /sapphire templates using high-temperature GaN interlayer"

Crack-free AlGaN layers were grown on AlN/sapphiretemplates by low-pressure metalorganic chemical vapor deposition. Reduction of threading-dislocation (TD) density is achieved by inserting a high-temperature GaN interlayer between the AlGaN and AlN layers. Structural characterization reveals that such an interlayer can efficiently block the TDs propagating from the underlying AlN layer, and reduce the TD density in the subsequent AlGaN layer by one order of magnitude with an optimum thickness of 25 nm. It is also clarified that the decrease of edge TDs is the dominant contribution to this reduction. [J701]

"Deployment of titanium thermal barrier for low-temperature carbon nanotube growth"

Chemical vapor-synthesized carbon nanotubes are typically grown at temperatures around 600°C. We report on the deployment of a titanium layer to help elevate the constraints on the substrate temperature during plasma-assisted growth. The growth is possible through the lowering of the hydrocarbon content used in the deposition, with the only source of heat provided by the plasma. The nanotubes synthesized have a small diameter distribution, which deviates from the usual trend that the diameter is determined by the thickness of the catalyst film. Simple thermodynamic simulations also show that the quantity of heat, that can be distributed, is determined by the thickness of the titanium layer. Despite the lower synthesis temperature, it is shown that this technique allows for high growth rates as well as better quality nanotubes. [J702]

"Study of the current stressing in nanomanipulated three-dimensional carbon nanotube structures"

We report the fabrication of free-standing carbon nanotube structures. The welding of individual carbon nanotubes to other nanotubes and metal substrates has been performed, on a selective basis, to produce joints of both good electrical conductivity and mechanical integrity, without the need for a joining material. As a result of this unique process, we study the damage to the microstructure of the nanotube as a function of current. When the current densities are in excess of 2Ч106A/cm2, particular care must be taken with regard to the quality of the nanotube and the heat dissipation. This is crucial for the use and application of nanotubes in any future device structure for it gives the upper limits to the "average" current density calculations. This process now allows for the fabrication of bespoke carbon nanotube devices for the prototyping of device performance. [J703]

"In situ growth of nanowire on the tip of a carbon nanotube under strong electric field"

We present experimental evidence of in situ growth of carbon nanowires on the tip of a carbon nanotube under an applied voltage of 150 V. The grown nanowires with the well-defined geometry and diameter less than ten nanometers are structurally amorphous in nature and result in the solid carbon nanotube-nanowire junction with minimum junction size. The as-generated carbon nanotube-nanowire junction with a distinctive morphology clearly shows evidence of the bonding between the carbon atoms at the tip of carbon tube. The carbon nanotube could be used as a template for in situ growth of the carbonate nanowires under a strong electric field. The measured current-voltage (I-V)characteristic of the nanotube-nanowire contact shows a nonlinear relation between the current and applied bias voltage due to the saturated sp3bonds formed at the junction. The detected I-Vbehavior suggests the formation of the metal/insulator/metal structure at the nanotube-nanowire junction. [J704]

"Electroreflectance studies of InAs quantum dots with In x Ga 1-x As capping layer grown by metalorganic chemical vapor deposition"

Electroreflectance spectroscopy was used to study the effect of InxGa1-xAscapping layer on InAs quantum dots grown by metalorganic chemical vapor deposition. The optical transitions of the quantum dots and the InxGa1-xAscapping layer were well resolved. The energy shifts in the InxGa1-xAscapping layer show a different trend as compared to a series of referent InxGa1-xAsquantum wells. These results support the concept of strain-driven alloy decomposition during the InxGa1-xAslayer overgrowth. [J705]

"Erratum: "Anomalous relationship between hardness and wear properties of a superelastic nickel-titanium alloy" [JAppl. Phys. Lett. 84, 1076 (2004)]"

{no data available} [J706]

"Low-loss percolative dielectric composite"

In this letter, we report a modified percolative polymer composite that has a low dielectric loss (tandelta 0.02@10KHz, comparable to that of the polymer matrix), a high dielectric constant (k 100@10KHz, about 30 times higher than that of the polymer matrix), and a low frequency dependence. This high-kpolymer hybrid is filled with self-passivated micro- and nano-aluminum particles. The self-passivation of an aluminum particle results in dense nanoscale insulating Al2O3shells outside of the metallic spheres, which allows the electrons in the metallic core to tunnel through it, and thereby the aluminum/polymer composites exhibit a high dielectric constant as a percolation system; on the other hand, the insulating oxide layer restricts the electron transfer between aluminum particles, thus leading to a very low loss of the composites. [J707]

"Enhanced photocatalytic activity of ZnO nanotetrapods"

The photocatalytic characteristics of the tetrapod-branched ZnO nanostructures synthesized by thermal evaporation method are investigated. The fitting of absorbance maximum plot versus time indicates an

exponential decay, suggesting the photodegradation of Rhodamine B catalyzed by the ZnO nanotetrapod is a pseudo first-order reaction. These results demonstrate that the photocatalytic activity of ZnO nanotetrapod is much better than that of P25 TiO2and ZnO powders. The slow electron/hole recombine rate due to the abundant surface states, as well as the high surface-to-volume ratio will effectively enhance the photocatalytic activity of the ZnO nanotetrapod. [J708]

"Erratum: "Continuous liquid crystal pretilt control through textured substrates" [JAppl. Phys. Lett. 85, 5556 (2004)]"

{no data available} [J709]

"Understanding quasi-ballistic transport in nano-MOSFETs: part I-scattering in the channel and in the drain"

In this paper, and in Part II, Monte Carlo (MC) simulations including quantum corrections to the potential and calibrated scattering models are used to study electronic transport in bulk and double-gate silicon-on-insulator MOSFETs with LGdown to 14-nm designed according to the 2003 International Technology Roadmap for Semiconductors. Simulations with and without scattering are used to assess the influence of quasi-ballistic transport on the MOSFET on-current. We analyze in detail the flux of back-scattered carriers. The role of scattering in different parts of the device is clarified and the MC results are compared to simple models for quasi-ballistic transport presented in the literature. [J710]

"T-Engine: Japan's ubiquitous computing architecture is ready for prime time"

Japan is quietly positioning itself for the next phase in digital technology: ubiquitous computing. A sign of things to come is T-Engine, arguably the most advanced ubiquitous computing platform in the world. T-Engine enables the distribution of software resources, including middleware developed on T-Kernel, its compact, real-time operating system. The platform also features standardized hardware and tamper-resistant network security. T-Engine enables developers to rapidly build ubiquitous computing solutions by using off-the-shelf components. Among them are four standard T-Engine boards of varying dimensions for different application areas: Standard T-Engine, Micro T-Engine, Nano T-Engine, and Pico T-Engine. [J711]

"Influence of mechanical stress on electron field emission of multiwalled carbon nanotube-polymer composites"

Field emission properties of carbon nanotubes under mechanical stress have been investigated. The emission threshold fields initially decrease from 2.3to0.6V/mcmbefore rising back to 3.1V/mcmwith increasing mechanical stress applied externally to the film. This behavior from nanotube composites has not been reported and is believed to be associated with modification to the work function of the nanotubes. This work suggests a possible application for these composite films as electromechanical high power switches. [J712]

"InP bonded membrane photonics components and circuits: toward 2.5 dimensional micro-nano-photonics"

The general objective of this presentation is to demonstrate the great potential of III-V semiconductor - membrane photonic devices, with a special emphasis on InP and related materials in the prospect of new developments in the field of micro-nano-photonics. Various classes devices will be presented, which will have the communality of being based on the use of high index contrast structuration of semiconductor materials. The structuration is achieved vertically for the first class, by forming thin semiconductor membranes surrounded by low optical index material, or laterally for the second class via a two-dimensional (2-D) lateral structuration of the membranes (thus, resulting in 2-D photonic crystal (PC) structures); both structurations are also combined, according to a "2.5-dimensional" approach, which should broaden considerably the combinations of functionality beyond those presently contemplated with the two first classes. The general technological scheme of the membrane approach is fully compatible with planar technology which is widely in use in the world of silicon microelectronics and with heterogeneous integration of III-V active microphotonic devices with silicon microphotonics and microelectronics (e.g., molecular bonding of InP active membranes on silica on silicon substrate). A variety of devices will be presented, featuring micro-lasers based on 2-D PC micro-cavities as well as on 2-D Bloch modes (2-D distributed-feed-back micro-laser) for in plane and surface emission. [J713]

"Millisecond microwave annealing: Driving microelectronics nano"

The efficient deposition of high frequency microwave energy into the top several microns of a semiconducting

material was experimentally demonstrated as a highly effective mechanism for rapid thermal annealing. Simulations show that absorbed power densities of 4 and 32kW/cm2produce average Si heating rates of 325 000 and 10000000°C/sup to 1300°C. Conduction of thermal energy from the absorption region into the bulk substrate yields peak cooling rates that exceed 1000000°C/safter the microwave pulse subsides. At the peak temperature, thermal gradients of 5 and 20°C/mcmexist for the aforementioned power densities of 4 and 32kW/cm2. The application of a 4.5ms, 6kW/cm2pulse of 110GHzradiation resulted in an experimentally measured Si heating rate of 275000°C/s. Applying this millisecond microwave anneal technology to ultrarapid annealing for shallow implanted dopants resulted in ultrashallow junctions that were 14-16nmdeep with sheet resistances between 500 and 700Omega /squareand an estimated active dopant concentration of 1020/cm3-2Ч1020/cm3. [J714]

"Characterization of nano-size YVO 4 :Eu and (Y ,Gd)VO 4 :Eu phosphors by low voltage cathodo- and photoluminescence"

Low voltage cathodoluminescence (LVCL) and photoluminescence measurement were carried out to better understand the role of Gd in (Y,Gd)VO4:Euphosphor and to compare two different synthesis methods (solid-state reaction, coprecipitation reaction) and their preparing conditions. From the analysis of LVCL measurement, it is understood that the luminescence of YVO4:Euand (Y,Gd)VO4:Euphosphors might be interpreted as originating from a two-level system and for reasons of enhanced luminescence intensity of (Y,Gd)VO4:Euphosphor, the effect of Gd on the symmetry of Eu sites dominates over that of interaction between Gd and Eu. It is also found that nano-size phosphor of YVO4:Eusynthesized by coprecipitation reaction shows lower quantum yield in comparison with that synthesized by solid-state reaction due to the presence of secondary phase produced after heat treatment. [J715]

"Effect of electric field on chemical bonds of carbon-doped silicon oxide as evidenced by in situ Fourier transform infrared spectroscopy"

In this study, we use in situ Fourier transform infrared (FTIR) spectroscopy on a carbon-doped silicon oxide (SiOCH) to determine the origins of its lower breakdown strength (compared to SiO2) and the precursors of dielectric breakdown. While subjecting the SiOCH film to externally applied electric fields, the FTIR spectra are recorded. Changes in peak area ratios and intensities are determined and correlated to field-induced perturbation of chemical bonds in SiOCH. This is a potentially powerful technique which provides new insights into the dielectric degradation and breakdown phenomena. [J716]

"Selective growth of InAs quantum dots on patterned GaAs"

We report selective growth of InAs self-assembled quantum dots (QDs) on nano-ridges (30-50nm)formed by wet chemical etching and epitaxial growth processes. The QDs formed on the ridges exhibit distinctive characteristics from those on the planar region between the ridges in terms of physical shape as well as optical property. The QDs, which align one by one on the top of the ridges, are of an asymmetric shape along the [011] and [01_1]directions. By defining the width of ridge and the monolayers of QDs, we are able to control the height and the width of these QDs. Compared to the QDs on the planar region between the ridges, the luminescence from QDs on the ridges exhibits a shorter wavelength, which is attributed to higher compressive strain in these QDs. [J717]

"Low temperature crystallization of high permittivity Ta oxide using an Nb oxide thin film for metal/insulator/metal capacitors in dynamic random access memory applications"

(Ta1-xNbx)2O5as the dielectric for metal/insulator/metal capacitors with Ru electrodes were investigated. Deposition was performed by ALD using tantalum ethoxide, niobium ethoxide, and ozone as source materials. The high-kappa dielectric layer was synthesized from a binary layer (Ta2O5/Nb2O5)with self-diffusion of the seed layer, Nb2O5. The seed layer becomes effective at a thickness of over 60 E. The dielectric deposited with 60 E Nb2O5crystallized at 575 °C, the lowest processing temperature required to achieve good step-coverage (86%) for future generation dynamic random access memory. A capacitance density of about 23.0fF/mcm2was observed for seed layers of 20 and 35 E. Capacitors with a Nb2O5seed layer of 60 E achieved a capacitance density as high as 44.2fF/mcm2. The reason for this disparity is that the thicker insulator crystallizes at a post-annealing temperature of 575 °C. The leakage current measured at 1 V was moderately low, near 1Ч10-7A/cm2. [J718]

"Performance of nanomanipulator fabricated on glass capillary by focused-ion-beam chemical vapor deposition"

An electrostatic 3D nanomanipulator that can perform inclusion of nano parts and cell operation has been

developed by focused-ion-beam chemical vapor deposition (FIB-CVD). This 3D nanomanipulator has 4 fingers in order to catch the target of various shapes firmly. The movable principle is that an electric charge is accumulated in the structure by applying voltage to 4 fingers structure and it moves by repulsion of the electric charge. Furthermore, we succeeded to catch the microsphere (polystyrene latex with a diameter of 1mcm) by using this 3D nanomanipulator with 4 fingers. [J719]

"Reduction of plasma-induced damage in SiO 2 films during pulse-time-modulated plasma irradiation"

Use of a pulse-time-modulated (TM) plasma is an effective way to reduce vacuum ultra-violet (VUV) radiation damage in SiO2films because such a plasma can reduce the quantity of high-energy electrons while maintaining the electron density during the off time of the TM plasma. To understand the effects of VUV radiation, we measured the VUV-induced current in SiO2films using a simple on-wafer monitoring technique. We found that the plasma-induced-current in the SiO2films strongly depended on the VUV photon energy. Under the same conditions, the density of E'centers in SiO2films also depended on the photon energy. That is, the plasma-induced currents in the SiO2films detected by on-wafer monitoring corresponded to the density of E'centers (dangling bonds) in the films. By using a TM plasma, the plasma-induced current and the E'center density in SiO2films can be reduced during the plasma-off time. Consequently, use of a TM plasma can eliminate VUV radiation damage. These results also confirm that our developed on-wafer monitor can predict plasma-induced damage. [J720]

"Fabrication of a nanosized current-driven spin valve device using proximity correction in electron-beam lithography"

Nanosized junctions of 100Ч200nm2size were successfully fabricated on magnetic metallic multilayers in a current-driven spin-valve device by the suitable choice of the electron-beam resist, as well as careful control of back-scattering effects in electron-beam lithography. ZEP520A was chosen as an e-beam sensitive resist because its dry-etching resistance is high enough to act as an etching mask during the ion milling. The severe back-scattering effect from the underlying metallic multilayers was reasonably modified by employing the doughnut-pattern method. The doughnut-pattern method gave a set of proximity parameters (alpha ,beta, and eta) with which we did the simulation to obtain the effective dose factors of each segment of the pattern. The magnetotransport signals from our devices were quite comparable to previous results from those made by different methods of other research groups. Consequently, the fabrication of nanosized current driven spin valves can be performed less complicatedly by using ZEP520A as an etching mask. [J721]

"Fundamental study of the removal mechanisms of nano-sized particles using brush scrubber cleaning"

To ensure high device yields, wafer surface contamination and defects must be monitored and controlled during the entire process of semiconductor manufacturing. Particle surface concentrations on the wafers, mostly related to chemical mechanical polishing (CMP) processes, must be kept at the lowest possible levels. Brush scrubber cleaning has the potential to achieve this goal. However, the particle removal mechanisms are still under discussion especially the removal of nano-sized particles. This paper investigates the interactions between the particle, the brush and the wafer surface and explores the potential and limitations of the brush scrubbing technique. Furthermore the effect of the various brush/wafer parameters on the particle removal efficiency (PRE) is studied. From a mechanistic viewpoint it is shown that brush scrubbing acts in a mixed lubrication regime. From an extensive analysis of the relevant forces and moments it can be concluded that in the hydrodynamic lubrication regime, particles are removed by rolling under the dominant hydrodynamic drag force. In the boundary lubrication regime, particles can be removed by both rolling and lifting, mainly by the brush/particle van der Waals forces. The pHand the ionic strength of the cleaning fluid can influence the PRE. The chemical composition determines the electrostatic interactions of the particle once it is "kicked off " from the wafer surface: either the surface of the particles and the wafer carry the same charge and the particles remain in solution or the surface of the particles and the wafer has an opposite charge resulting in redeposition. [J722]

"Effect of film thickness on the ferroelectric properties of Pb (Zr 0.2 Ti 0.8)O 3 thin films for nano-data storage applications"

Epitaxial Pb(Zr0.2Ti0.8)O3(PZT) films with various thicknesses were prepared on an epitaxial SrRuO3(SRO) bottom electrode grown on SrTiO3(STO) with atomically flat surface. The PZT films with a rms roughness of 0.2-0.3 nm exhibit a typical square-shaped P-Ehysteresis loop, which has the Prof approximately 60mu C/cm2. The leakage current density of the films increases with decreasing film thickness and the 22-nm-thick PZT films have a leakage current density of approximately 10-5A/cm2at -1V. [J723]

"Erratum: "Effect of imprinting pressure on residual layer thickness in UV nano-imprint lithography" [JJ. Vac. Sci. Technol. B 23, 1102 (2005)]"

{no data available} [J724]

"Magnetoresistance of patterned NiFe thin films with structures modified by atomic force microscope nanolithography"

Surfaces of patterned NiFe strip-shaped thin films of 15-30nmthickness were modified by nanowires of NiFe oxide. The NiFe oxide was fabricated by the atomic force microscopy (AFM) nano-oxidation technique. The anisotropy magnetoresistance was measured in order to study the effect of the nanowires in the magnetization reversal process. The domain wall was pinned at the nanowires of the NiFe oxide. It was indicated that the propagation of domain wall could be controlled by the AFM nanolithography. [J725]

"Self-assembled tungsten nanocrystals in high-k dielectric for nonvolatile memory application"

Discrete midgap tungsten nanocrystals (W-NCs) embedded in atomic layer deposited hafnium aluminate (HfAlO) film were fabricated by a self-assembly method using sputtering followed by rapid thermal annealing and integrated into transistors for nonvolatile memory application. Transmission electron microscopy and single electron diffraction analysis revealed the formation of crystalline W-NCs (5nm)embedded in an amorphous HfAlO matrix. Effects of deposition of thin Al2O3on the formation of W-NCs were investigated. Al2O3was found to be effective to retain the amorphous property of the underlying HfAlO, assisting to form uniformly distributed and small W-NCs. Electrical characterization of the Si/HfAlO/W-NCs/HfAlOstructure based memory device showed that clear memory effects (1.8 V memory window at operating bias of 7 V) and good retention properties (50mV/decthreshold voltage decay rate) originate from the charge storage of electrons in W-NDs and deep quantum well of W-NDs embedded in the HfAlO+Al2O3high-kstructure. [J726]

"Growth of high quality Ge /Si 1-x Ge x on nano-scale patterned Si structures"

Heteroepitaxial growth of thick (6mcm)Ge/3mcmSixGe1-xlayers on nano-scale patterned Si substrates has been investigated. These nm scale structures are fabricated using interferometric lithography with reactive ion and wet-chemical etching techniques. The quality of the growth on the nanopatterned substrates was compared to growth on planar substrates. The quality of the epitaxial layers was characterized using scanning electron microscopy, transmission electron microscopy, high-resolution x-ray diffraction and etch pit density measurements. We demonstrated the nanopatterned structures produce significantly superior quality heteroepitaxial epilayers in comparison with unpatterned Si surfaces. The dislocation density of Ge epilayers on the nanopatterned Si was three orders magnitude lower than on planar Si. Growth on nanopatterned surfaces also reduced surface roughness and eliminated crosshatch patterns characterstic of planar surfaces. [J727]

"Multi-axis retarder arrays by masked oblique deposition"

We report a technique for single-deposition production of arrays with differently oriented nano-structured elements, which we optimize for application to form-birefringent retarder arrays. The technique involves masking of oblique physical vapor deposition, manipulating the local availability of vapor angles to create spatially variant properties in the structured coating. We have designed a variety of retarder arrays using symmetry considerations, and constructed a selection based on suitability for spatially multiplexed complete-Stokes polarimetry. In particular, we emphasize square lattice designs with a two-by-two repeat unit, consisting of three retarders with azimuths at 0°, 45° and 90° and a zero-retardation element. The silicon retarder arrays were tested using visible-wavelength transmission techniques which confirm the success of the method. Finally, we discuss some considerations for application of the technique to microlithography, and we infer a lateral resolution limit related to the coating thickness. [J728]

"Site-controlled InAs quantum dots on GaAs patterned using self-organized nano-channel alumina template"

Nano-pore arrays on GaAs by templated anodization of GaAs through a nano-channel alumina (NCA) membrane are reported for the first time. The NCA is formed by anodization of single-crystal aluminum grown epitaxially on a GaAs substrate. The anodization is continued into the GaAs underneath the NCA, which is anodized only at the pore bottoms of the NCA. After removal of the NCA, the nanostructured GaAs obtained is studied using scanning electron microscopy. The obtained nano-pores are 30-50 nm deep and spaced 100nmapart. Site-controlled InAs self-assembled quantum dots are demonstrated by regrowth on this nanostructured GaAs. [J729]

"Thermal excitation effects of photoluminescence of annealed Ga In N As /Ga As quantum-well laser structures grown by plasma-assisted molecular-beam epitaxy"

GaInNAs/GaAsquantum well laser structures have been grown by plasma-assisted molecular beam epitaxy. Rapid thermal annealing was applied to suppress the nitrogen-related localized states in the material. These nitrogen-related localized states significantly quench the photoluminescence due to its low radiative recombination efficiency, compared to band-to-band transitions. Further, the thermal excitation processes of carriers from localized states to extended states result in the high temperature-sensitivity of light emission, which may lead to a low characteristic temperature if such structures are used in a laser diode. Our experiments have shown that annealing at 760°Cfor 120sis insufficient to totally eliminate the nitrogen-related localized states, which may require a higher temperature anneal process. [J730]

"Structural characterization of strained AlGaN layers in different Al content Al Ga N /Ga N heterostructures and its effect on two-dimensional electron transport properties"

Different Al content AlGaN/GaNtwo-dimensional-electron-gas (2DEG) structures were grown on 100-mm-diam sapphire substrates by metalorganic vapor phase epitaxy (MOVPE). The structural properties of AlGaN layers, such as alloy composition, layer thickness, tensile strain, in-plane stress, crystal quality, and band gap energy, were investigated in detail mainly by x-ray diffraction and spectroscopic ellipsometry. Correspondingly, the electron transport properties of these epilayers were theoretically as well as experimentally studied, taking into account the structural characterization results. Hall effect measurements showed that 2DEG density linearly increases with increasing Al content and that low-temperature 2DEG mobility largely decreases with the increase of Al content. The calculated results demonstrated that interface roughness scattering is largely enhanced with increasing Al content and has a strong impact on low-temperature 2DEG mobilities in high Al content samples. This is because the roughness of the interface between GaN and AlGaN layers increases with Al content. This calculated result is consistent with the experimental result that the surface of MOVPE-grown samples exhibited poor qualities with increasing Al content. The degradation of the surface and/or interface is associated with the increased strain in AlGaN layers. [J731]

"Impact of buried capping layer on electrical stability of advanced interconnects"

Electrical leakage and breakdown of low-dielectric constant (low-k) dielectrics are increasingly becoming major reliability issues as inter-metal spacings in interconnects scale towards the 0.1mcmtechnology node. In Cu damascene structures, these issues are greatly alleviated by the retention of a thin layer of hardmask, which is also known as buried capping layer (BCL), after chemical-mechanical polishing. It is found that a BCL of 100Ethickness in Cu/SiOCinterdigitated comb structures effectively reduces the leakage current by one order of magnitude and improves breakdown strength by a factor of 1.5-2. In addition, the BCL is able to prevent the formation of process-induced traps in the low-kdielectric. These findings can have important and positive reliability considerations for Cu/low-kintegration schemes. [J732]

"Polymer long-period raised rib waveguide gratings using nano-imprint lithography"

This letter presents the fabrication and demonstration of a long-period raised rib waveguide grating using nano-imprint lithography. The device consists of a lower UV15 cladding, where relief-gratings are implemented, and an NOA73 raised rib core waveguide. Spectral transmission reveals a resonance at 1585 nm with about 10-dB rejection and 12-nm linewidth. [J733]

"Emerging biomedical technologies at the micro and nano levels"

High-throughput cell imaging and nanotechnology are emerging technologies that exhibit great potential for disease diagnosis, prognosis, and treatment. This paper briefly introduces these emerging technologies and discusses challenging open research issues to fully realize the potentials of these new tools. [J734]

"Nonthermal plasma bio-active liquid micro and nano-xerography"

Method of biochemical patterning which allows for micro- and nano-scale resolution on nonplanar substrates is presented. Utilizing this method, bio-molecules (including DNA, proteins, and enzymes) can be delivered to charged locations on surfaces by charged water buffer droplets. Charging of water droplets is accomplished using dielectric barrier discharge (DBD) plasma. DBD was effectively stabilized in the presence of high concentration of micron-size water droplets. The concepts of the proposed method, as well as first experimental results supporting the idea are discussed in this paper. [J735]

"Embedded slanted grating for vertical coupling between fibers and silicon-on-insulator planar waveguides"

We propose a compact and efficient grating coupler for vertical coupling between optical fibers and planar waveguides. A grating with a parallelogram shape is designed to be etched through the entire high-index waveguide core. The coupler is optimized using a microgenetic algorithm coupled with a two-dimensional finite-difference time-domain method. Simulations show that up to 75.8% coupling efficiency can be obtained between a single-mode fiber and a 240-nm-thick silicon-on-insulator planar waveguide. [J736]

"Optical piezoelectric transducer for nano-ultrasonics"

Piezoelectric semiconductor strained layers can be treated as piezoelectric transducers to generate nanometer-wavelength and THz-frequency acoustic waves. The mechanism of nano-acoustic wave (NAW) generation in strained piezoelectric layers, induced by femtosecond optical pulses, can be modeled by a macroscopic elastic continuum theory. The optical absorption change of the strained layers modulated by NAW through quantum-confined Franz-Keldysh (QCFK) effects allows optical detection of the propagating NAW. Based on these piezoelectric-based optical principles, we have designed an optical piezoelectric transducer (OPT) to generate NAW. The optically generated NAW is then applied to one-dimensional (1-D) ultrasonic scan for thickness measurement, which is the first step toward multidimensional nano-ultrasonic imaging. By launching a NAW pulse and resolving the returned acoustic echo signal with femtosecond optical pulses, the thickness of the studied layer can be measured with [J737]

"Special issue on dynamics & control of micro and nano scale systems"

{no data available} [J738]

"Jc enhancement in YBa2 Cu3 Ox thin films by introduction of one-dimensional artificial pinning centers"

A novel technology to introduce artificial pinning centers (APCs) into YBa2Cu3O7-δ(YBCO) thin films prepared by pulsed laser deposition (PLD) was investigated for a drastic improvement of Jcin the films. Linear-like defects (one-dimensional APCs) were introduced perpendicular to the surface of the c-axis oriented films during the deposition process by using distributed Y2O3nano-islands on substrates. The density of nano-islands was varied within 0.8-1.2Ч1010/cm2by PLD. A normalized resistivity as a function of temperature in magnetic fields shows a sharper resistivity drop for the film with APC, compared to pure YBCO film. Jcof the film with APC was also increased to 0.12 MA/cm2(77 K, B//c, 5 T), which was about two times higher than that of the pure YBCO film. The film had a very large Jcpeak when the field was applied close to the c-axis. The peak Jcincreased with the number density of Y2O3nano-islands. This indicates that strong APCs parallel to the c-axis were incorporated into the YBCO film. [J739]

"An integrated micro HTS system for energy storage and attitude control for three-axis stabilized nanosatellites"

This paper presents the development of an integrated micro high-temperature superconductor system for energy storage and attitude control of three-axis stabilized nano satellites. The micro HTS system consists of a flywheel/rotor, motor/generator, motor electronics, and a cooling system. The flywheel/rotor has been fabricated by using sintered NdFeB and the stator for motor/generator has been fabricated by micro fabrication technology. An alternative stator has been fabricated by cutting a 50 micron-thick copper film for comparison. A servo amplifier to drive the DC brushless motor of the integrated HTS system has been developed and successfully tested. A cooling system has been developed to test the system. It has been observed that the micro fabricated stator can make the flywheel rotate at a constant velocity of up to 12,000 rpm whereas the other stator generates a constant velocity of up to 2,500 rpm. Experiments show that the micro fabricated stator can significantly reduce the motor/generator losses. [J740]

"Researchers work on transistor successor"

A team of Hewlett-Packard scientists has developed a technique that, they say, could potentially replace the transistor. With their crossbar-latch technology, the researchers have built very small junctions of platinum wires that can perform switching and Boolean logic functions now handled by transistors. HP, like other companies, is working on the challenges chip makers face in trying to improve processor performance by reducing the size of transistors and circuitry. A crossbar latch, consisting of two switches, can handle three functions a transistor must perform to do calculations using Boolean logic: signal restoration, which keeps a signal functioning and

thereby avoids data corruption; signal inversion, which enables the "not" Boolean logic function; and logical latch functionality, which lets a system store results of one operation for use in another. HP makes crossbar latches via nano-imprint-lithography, a common approach that let companies employ existing manufacturing techniques but that has not been used previously on such a small scale. [J741]

"Study of the heterogeneous nucleation of 211-particle by the addition of CeO2 precursor with different sizes"

The microstructure and superconducting properties of air-processed melt-textured grown Y-Ba-Cu-O samples with the addition of CeO2precursor of different sizes, e.g. micro-scale and nano-scale were studied. Samples with micro-scale CeO2addition exhibit an enhanced Jc, which were attributed to the refinement of 211-particles. The mechanism for refining the 211-particles was proposed to be the formation of new nuclei sites from the reaction of CeO2and Y2-1-1 matrix in the melt-grown process. By reducing the CeO2precursors to nano-scale from micro-scale, significantly more heterogeneous nucleation site will be introduced with the same amounts of CeO2additions. And the Jcwill be enhanced with the refining of 211 particles. But in this study, it shows the opposite results. The higher Jcvalue is enhanced by doping micro-scale CeO2. Pinning forces vs. magnetic field studies indicated that both the nano- and micro- CeO2samples have the same pinning mechanisms as compared with that of the un-doped sample. [J742]

"Fabrication of fine and homogeneous MgB2 nano powders by spray pyrolysis"

Homogeneous nano-sized spherical MgB2powders were fabricated by spray pyrolysis. The influence of solution concentration, furnace reaction temperature and mass flow of carrier gas on morphology and average particle size were investigated. MgB2powders were synthesized with or without further heat treatment. For adequate preparation conditions, it has mostly spherical, solid and narrow particle size distribution. Average particle size (X50) distribution was below 100 nm. The critical temperature for the synthesized MgB2was around 36 K. [J743]

"The effect of nano-powder additions on the superconducting properties of MgB2"

To investigate the effect of Ag or SiC nano-powder additions on the superconducting properties of MgB2, a series of superconducting (Ag)(x)wt.-%(MgB2)(100-x)wt.-%(Agx-MgB2) and (SiC)(x)wt.-%(MgB2)(100-x)wt.-%((SiC)x-MgB2)(0≤x≤20), containing Ag and SiC nano-powders, respectively, of different diameters (30 nm and 130 nm), were prepared by a simple solid-state reaction route, cold-pressed into a pellet form and investigated. To maintain the same environment of MgB2/stainless-steel tapes/wires, Agx-MgB2and (SiC)x-MgB2pellets made out of the mixed powders were put inside stainless steel tubes and then sintered at 900°C for two hours in Ar atmosphere. Characterization performed included both X-ray diffraction and magnetization. No impurity phase was identified for as-rolled samples. However, both the Agx-MgB2and (SiC)x-MgB2composite pellets, when sintered, contain various impurity phases. The isothermal magnetizations M(H) of a series of samples were measured at temperatures between 5 and 50 K in fields up to 5 T, using a PPMS-9 (Quantum Design). The optimal amounts of Ag and SiC nano-powder in Agx-MgB2and (SiC)x-MgB2to obtain the largest flux pinning effect are 8 and 4 wt.-%, respectively. The "two-step" structures in ZFC M(T) curves of (SiC)x-MgB2were more developed than Agx-MgB2. The best flux pinning centers can be created by adding a suitable size and amount of SiC nano-powder, not too large to increase the decoupling between the MgB2grains. [J744]

"Investigation on the current nonuniformity in current-mode TFT active-matrix display pixel circuitry"

Detailed analysis of the mechanisms that cause deviations of the emission current from the input data current in polycrystalline silicon (poly-Si) thin-film transistor (TFT) current-copier active matrix carbon nanotube field emission display (FED) pixel circuits is presented. These effects make the modulated emission current sensitive to the process variations of the circuit elements. Monte Carlo circuit analysis with a Gaussian statistical distribution of all related process parameters in the pixel circuit shows the emission current nonuniformity, and therefore illustrates the importance of improving the poly-Si TFT process for the design of high-resolution and high-brightness current-mode active matrix addressed displays. The analysis is also suitable for design and optimization of other reported current-mode active matrix addressed FED or organic light-emitting displays. [J745]

"Duromer MID technology for system-in-package generation"

The Duromer molded interconnect device (MID) technology for realization of a stackable system-in-package (SiP) is similar to conventional MID technology, which is usually realized using thermoplastic polymers, combining the functionality of housing and substrate into one device. Advantages of the conventional MID technology are the reduction of parts during assembly by integrating mechanical and electrical functionality into a device and the reduction of space, as MID allows a three-dimensional (3-D) integration of devices. A

disadvantage of conventional technology, especially if combined with typical technical thermoplastics, is the large mismatch in coefficient of thermal expansion (CTE) between substrate and advanced microelectronic components as chip scale package (CSP) or flip-chip. This is reducing the applicability of thermoplastic MID to moderate temperature ranges and/or to rather robust components. To overcome this disadvantage, the use of low CTE duromer as epoxy molding compounds (EMCs) as base material for device assembly is proposed, generating a unique technology well adapted to SiP and microelectromechanical system (MEMS) packaging needs, the Duromer MID approach. The technological realization of Duromer MID uses conventional backend processes as IC bonding to flex, transfer molding using epoxy molding compounds, laser machining, metallization, and structurization processes well known from PCB processing. The use of existing equipment allows both a rather fast process implementation and a cost-effective manufacturing of the components. Within this paper, the investigations described previously are driven further toward a description of a generic packaging technology integrating detailed analysis of metallization processes and assembly issues. Summarized, this paper presents further process development and feasibility analysis of wafer-level packaging technologies for SiP solutions based on a Duromer MID approach. [J746]

"Nano-power subthreshold current-mode logic in sub-100 nm technologies"

The feasibility of robust MOS current-mode logic (MCML) digital circuits operated in subthreshold regime is investigated. The design of a subthreshold MCML inverter gate in a 90 nm CMOS technology is presented together with the evaluation of its DC performance. [J747]

"3D chip stack technology using through-chip interconnects"

The current technology in micro-and nano-electronics is insufficient to meet future demands for several applications. Most state-of-the-art solutions rely on so-called embedded technologies, which are both expensive and complex. One solution to the problem of integrating mixed technologies is the concept of 3D stacking. Our approach implements an epitaxial etch-stop layer for thickness control of the thinning process. Using this etch-stop layer, we can create a precise alignment of back-side vias to the landing pads in the first metal layer of the active CMOS, resulting in small via diameters and high connection densities between individual-layers of the 3D stack. Furthermore, we can use other materials, like GaAs (gallium arsenide), in combination with an epitaxial lift-off process. We use a copper-tin soldering process based on the solid-liquid interdiffusion (solid) process to create the electrical and mechanical connection between the single chip layers. Using this process, we created true multilayer stacks and tested them with respect to the static electrical properties of ohmic contacts and interchip vias. We directly incorporated these results in the design of test circuits that create tests for stuck-at failures of the interchip connections after stack assembly. This article presents a technology overview of how to achieve the goal in a 3D fabrication process. It also shows measurements for characterizing interconnects. [J748]

"Fast switching bistable electromagnetic microactuator"

A fast switching electromagnetic microactuator with two stable positions is presented. The actuator of size 2.0Ч2.2 mm is fabricated using UV-LIGA technology. Test results show that a current pulse with an amplitude of 50 mA is needed for the actuator's switching between two stable states, and the switching time is approximately 20 μs. The displacement of the actuator is about 17 μm. [J749]

"Special issue on dynamics & control of micro and nano scale systems"

{no data available} [J750]

"Co-existence of biquadratic and unidirectional anisotropy in IrMn/CoFe/FeOx /CoFe films"

We observed the coexistence of biquadratic and unidirectional anisotropy in the CoFe layer by inserting the nano-oxide-layer FeOxin the IrMn/CoFe bilayers. Analyses of X-ray magnetic circular dichroism suggested that the FeOxpossessed ferromagnetic components. Mixed valence states of Fe, Fe2+and Fe3+were observed in the FeOxlayer, which implied that both antiferromagnetic and ferromagnetic components might co-exist in the FeOxlayer. The uniaxial anisotropy in CoFe at 90° may originate from the interaction of CoFe with the antiferromagnetic components of the FeOxlayer in the presence of interfacial magnetic roughness. The unidirectional anisotropy at 0° may result from the exchange biasing from the IrMn layer through the ferromagnetic components in the FeOxlayer. [J751]

"Magnetic transport mechanism in double ferromagnetic tunnel junctions with two-dimensional ferromagnetic particles"

Magnetic transport properties of Co90Fe10/AlOx/Co90Fe10/AlOx/Co90Fe10ferromagnetic double tunnel junctions

have been investigated with respect to the thermal fluctuation. A middle Co90Fe10layer is discontinuous by forming Co90Fe10particles two-dimensionally, which shows superparamagnetic behavior above 80 K. The average diameter of the Co90Fe10particles is estimated to be 4.8-5.0 nm from both a magnetization curve at room temperature and temperature dependence of coercivities deduced from magnetoresistance curves. This finding agrees with the maximum diameter (5.2 nm) evaluated from cross-sectional transmission electron microscope images, revealing that the dominant electron transport process heavily depends on the largest particles. [J752]

"Preparation of cellulose-based biocompatible suspension of nano-sized γ-Alx Fe2-x O3"

We have been able to synthesize γ-AlxFe2-xO3(0.07≤x≤1) in the size range 5-30 nm by wet chemical method. X-ray diffraction patterns confirm that all the as prepared samples were mono crystalline except the one with x=1.0 which was amorphous. With Al3+substitution average size of the particles ranges between 5 and 30 nm. Al3+has a tendency to occupy the octahedral site of spinel structure reducing the net magnetization. This was confirmed from the Mцssbauer spectra and magnetization measurement data. We could make suspension of γ-Al0.07Fe1.93O3in cellulose dispersed water. This showed a good degree of biocompatibility with HeLa cells. [J753]

"Design methodologies for robust nano-positioning"

In this paper, we present a systematic control design and analysis for a two-dimensional nano-positioner. The primary emphasis of the paper is on the robustness of the closed-loop device as these flexure-stage-based, piezoactuated nano-positioners are nonlinear and operate in diverse conditions. To this end, we have used many tools from modern control theory to model devices and to quantify device resolution, bandwidth, and robustness. The implementation of this procedure for the simultaneous achievement of the objectives of robustness, high precision and high bandwidth is presented. The merits of the paradigm are demonstrated through experimental results. [J754]

"Degradation of solid dielectrics due to internal partial discharge: some thoughts on progress made and where to go now"

The amount of literature on partial discharge (PD) and partial discharge induced degradation is vast. In the past 10-20 years significant progress has been made on research within partial discharge induced aging of dielectrics. Researchers now agree on the main mechanisms pertaining to this topic. With the advent of a new generation of dielectrics of which many properties now can be affected by the introduction of small amounts of nano-sized particles it seems to be a good moment to review the progress on the understanding of PD induced aging. Focusing on internal partial discharge in solid polymeric insulation this paper tries to identify achievements and at the same time challenges still to be solved. [J755]

"Dynamic bandpass filtering using a programmable Interferometer array"

We describe the principle and present preliminary results obtained on a dynamic bandpass filter using a 4-f free space imaging system with demultiplexing optics in one arm of a Michelson interferometer. Attenuation and blocking are performed by delaying the channel optical paths thanks to a reconfigurable nano-polymer dispersed liquid crystal phase modulator array. Our system is intrinsically polarization insensitive. [J756]

"Electrically aligned binary system of nanoparticles"

Aligned arrays of binary nanoparticles of silver and silver oxide, respectively, with mean diameters of 8.5nmhave been prepared within a polymethylmethacrylate film. The alignment along an electric-field direction has been achieved by applying an electric field of 10V/mmat frequency ranging from 1kHzto1MHz. This behavior has been explained as arising due to a dipole-dipole interaction between the metal and oxide nanoparticles, respectively. The electrical resistivity is shown to arise due to variable range hopping mechanism. These nanocomposites exhibit three orders of magnitude resistivity changes as the relative humidity is varied from 35% to 95%. [J757]

"Field-emission characteristics of carbon nanotube paste layers"

A three-dimensional simulator was used to analyze the field-emission mechanism of a carbon nanotube (CNT) emitter layer as a surface electron emitter in a triode structure for field-emission display. An electrostatic image potential was added to the Fowler-Nordheim equation to improve the accuracy of the calculation, and then several important parameters affecting the field-emission characteristics were studied. We calculated the field enhancement factor (beta)and emission factor (kappa)of the CNT emitter layer using the experimentally

obtained current-voltage (I-V) values and the extended Fowler-Nordheim equation by the least-squares-fitting method. By simulating 211 structures, we confirmed the existence of a shielding effect between the emitters and a penetration phenomenon of the anode voltage. [J758]

"Filling high aspect-ratio nano-structures by atomic layer deposition and its applications in nano-optic devices and integrations"

Atomic layer deposition, a highly uniform and conformal deposition process, was utilized to fill trenches of various high aspect-ratio nano-grating structures. Dielectric (e.g., SiO2), metal (e.g., aluminum), and dielectric/metal (e.g., Au/SiO2) hybrid nano-gratings with a linewidth down to 50nmand an aspect ratio up to 14:1 (700nm:50nm)were trench-filled with various materials particularly nano-laminate materials such as TiO2/SiO2and SiO2/Al2O3. Various high-performance optical devices such as true-zero-order optical retarders (i.e., wave plates) and nanowire-grid polarizers were realized based on an UV-nanoimprint lithography process and the atomic layer deposition for trench fillings. Thanks to both unique material properties and nano-structure trench filling capability, the atomic layer deposition opens a path for innovative nano-structure based optical devices and integrated optical devices. [J759]

"Optical emission from individual InGaAs quantum dots in single-defect photonic crystal nanocavity"

Collective and individual emissions from In0.5Ga0.5Asquantum dots (QDs) in single-defect photonic crystal nanocavities are investigated. When the cavity mode is collectively excited by the QD ensemble, a pair of dipolelike modes with definite linear polarizations is shown. Under low excitations, single-exciton emission lines are resolved. The power dependence of individual QD emissions reveals a nearly tenfold light enhancement for on-resonance QDs. The polarization state of each individual QD is also investigated. It is found that an individual dot could excite either a pure dipole mode or a mixture of both dipole modes. This behavior can be attributed to the random distribution of QDs in the nanocavity. [J760]

"Nanostructural characterization and two-dimensional electron-gas properties in high-mobility Al Ga N /Al N /Ga N heterostructures grown on epitaxial AlN/sapphire templates"

Al0.26Ga0.74N/AlN/GaNheterostructures with a 1nm-thick AlN interfacial layer were grown on epitaxial AlN/sapphire templates by metal-organic vapor phase epitaxy, and they exhibited excellent film qualities and very high electron mobilities, such as over 2100cm2/Vsat room temperature and over 25 000cm2/Vsat 15Kwith a two-dimensional electron-gas (2DEG) density of approximately 1Ч1013/cm2. Cross-sectional transmission electron microscopy images revealed that the thin AlN layer with a thickness of 1nmis continuously grown between AlGaN and GaN layers with atomically abrupt and flat interfaces. The experimental and calculated results for 2DEG transport properties indicated that an AlN interfacial layer between AlGaN and GaN layers effectively suppresses alloy disorder scattering and that epitaxial AlN/sapphire templates largely contribute to the high electron mobility because they allow for the realization of a high-quality GaN channel with a low dislocation density and a smooth interface. [J761]

"Electrical properties of compacted assembly of copper oxide nanoparticles"

Cu2Onanoparticles with diameters in the range 6.0-8.6nmwere prepared by a chemical method. Both dc and ac electrical properties were measured on a compacted nanoparticle assembly. dc electrical resistivity in the temperature range 140-300Kwas found to arise due to a variable range hopping conduction mechanism. The ac resistivity variation as a function of frequency (in the range 10kHzto3MHz) and temperature (range 220-320K) was explained on the basis of the power-law exponent in percolating clusters. The interfacial amorphous phase of the nanoparticle assembly appears to control the electrical behavior of the system. [J762]

"Towards nano-fluidics by solvent deformation of electron beam resist"

Improvements in the fabrication technology of planar micro- and nano-fluidic systems are continually being sought. In this work, we demonstrate and characterize a potential method for making planar nano-fluidic channels in cross-linked UV-3 resist using a single-step electron-beam lithography process. Earlier work indicated that the fluids used in the resist development process influenced the final form of the nano-fluidic structures. In this study the development, rinsing and drying conditions for the resist processing have been investigated in detail to find the best conditions for channel formation. The process was then exploited to construct more complex planar nano-fluidic features, including Y- and T-shaped junctions that are required for practical systems. [J763]

"Simulation of air bubble scattering effects in 193 nm immersion interferometric lithography"

In 193nmimmersion lithography, the presence of air bubbles in water poses a serious concern to the resist image formation. In this study, air bubble scattering effects were characterized by the Mie theory and the finite-difference time-domain (FDTD) method. The influence range of bubbles both in forward and lateral directions with respect to their sizes was analyzed. It is predicted that as bubble size exceeds 90nmin diameter, light scattering becomes significant. In the FDTD simulation, the effects of scattered waves in two- and three-beam interferometric lithography were simulated to mimic the actual imaging formation in an immersion scanner. It is found that the more beams are involved in the image formation, the more scattered waves interfere with the image forming waves, and then degrade the final image. Finally, the effect of a moving bubble was also simulated. The phenomenon of image distortion in the presence of bubbles was simulated by employing the three-dimensional FDTD method. [J764]

"Deep subwavelength nanolithography using localized surface plasmon modes on planar silver mask"

The development of a near-field optical lithography is presented in this paper. By accessing short modal wavelengths of localized surface plasmon modes on a planar metallic mask, the resolution can be significantly increased while using conventional UV light source. Taking into account the real material properties, numerical studies indicate that the ultimate lithographic resolution at 20nmis achievable through a silver mask by using 365nmwavelength light. The surface quality of the silver mask is improved by adding an adhesion layer of titanium during the mask fabrication. Using a two-dimensional hole array silver mask, we experimentally demonstrated nanolithography with half-pitch resolution down to 60nm, far beyond the resolution limit of conventional lithography using I-line (365nm)wavelength. [J765]

"Monolithically integrated circular polarizers with two-layer nano-gratings fabricated by imprint lithography"

We developed an integrated circular polarizer based on stacking an aluminum nano-wire grid polarizer with a dielectric nano-grating-based quarter waveplate. The polarizer consists of 65 nm wide and 130 nm tall aluminum wires with a period of 148 nm. For integration, the aluminum nanowires were buried into a silicon dioxide matrix by a trench filling and planarization technology. The buried nanowire polarizer achieved excellent optical performance in a broad wavelength range from 400 nm to 900nm. On top of the buried and planarized nanowire polarizer, a visible quarter waveplate based on a 200 nm period silicon nitride nano-grating was fabricated. Both the 148 nm period aluminum grating and the 200 nm period silicon nitride grating were fabricated by an ultraviolet (UV)-nanoimprint lithography. The ability to integrate multiple nanostructure-based optical layers opens a path for novel integrated optical devices, as well as a new strategy for driving both miniaturization and cost. [J766]

"Direct-write e-beam patterning of stimuli-responsive hydrogel nanostructures"

The need for stimuli-responsive components in microfluidic systems has led to the development of hydrogel-based patterned microstructures. The most commonly practiced means for fabricating micropatterned hydrogels is based on in situ photopolymerization using 365nmUV light in a liquid medium. This approach has been found to be very successful for patterning hydrogel-based features with tens or hundreds of microns resolution, but its main drawback lies in having to contain the liquid prepolymer mixture within the device for irradiation. We instead propose an alternate approach that uses direct-write electron-beam radiation to cross-link a dry, spin-coated thin film of linear polymer. After exposure, the linear polymer is dissolved in water leaving behind the cross-linked regions. When immersed in water, the cross-linked regions assume the properties of hydrogel and undergo naturally thermoreversible swelling and shrinking. This direct-writing approach can be used to fabricate hydrogel-based nanostructures down to 100nmlinewidth and also is amenable to easy integration into nano and bio devices. We focus on patterning a well-known thermoreversible hydrogel, poly (N-isopropylacrylamide), and use it to discuss various aspects of process methodology, fabrication, characterization, and stimuli-response properties of nanosized hydrogels in detail. [J767]

"Fabrication of three-dimensional stamps for embossing techniques by lithographically controlled isotropic wet etching"

The excellent characteristics that nanoimprint lithography (NIL) shows as a two-dimensional patterning technique, such as resolution and throughput, are shared with its three-dimensional (3D) structuring version. Nevertheless, the potentialities of NIL for 3D structuring remain largely unexplored and unexploited, hindered by the difficulties in the fabrication of high quality masters with throughput suitable for practical purposes. We present a technique

that allows production of stamps with tightly controlled three-dimensional profiles in the 10nm-100mcmscale range. This technique consists of a sequence of lithographic steps alternated with isotropic wet etching processes performed on a quartz substrate. Scanning electron microscopy and atomic force microscopy characterization shows that 3D structures with very accurate shape control and nanometer scale surface roughness can be formed with this method. Quartz stamps have been employed in nanoimprint, hot embossing, or casting processes to shape complex plastic elements. This technique is expected to have many applications in different nanotechnology-related fields such as optics, nanomechanics, microfluidics, and plasmon nano-optics. [J768]

"Valence band structure of ultrathin silicon and germanium channels in metal-oxide-semiconductor field-effect transistors"

The ultrathin body (UTB) silicon-on-insulator metal-oxide-semiconductor field-effect transistor (MOSFET) is promising for sub-50-nmcomplementary metal-oxide semiconductor technologies. To explore a high-mobility channel for this technology, this paper presents an examination of Si and Ge hole sub-band structure in UTB MOSFETs under different surface orientations. The dependence of the hole subband structure on the film thickness (TBody)was also studied in this work. We found that the valence-band mixing in the vicinity of the zone center Gamma is strongly dependent on TBodyfor both Si and Ge, particularly for the surface orientation. This gives rise to the following two phenomena that crucially affect the electrical characteristics of p-MOSFETs: (1) an anomalous increase of quantization mass for Si and Ge surfaces as TBodyis scaled below 5nm. (2) The dependence of energy dispersion and anisotropy on TBodyespecially for the surface, which advantageously increases hole velocity along the [011] channel as TBodyis decreased. The density of states for different surface orientations are also calculated, and show that-for any given surface orientation-Ge has a smaller density of states than Si. The Ge surface has the lowest density of states among the surface orientations considered. [J769]

"Wafer-based nanostructure manufacturing for integrated nanooptic devices"

The authors have developed a nanomanufacturing platform based on wafer-level nanoreplication with mold and nanopattern transfer by nanolithography. The nanoreplication process, which is based on imprinting a single-layer spin-coated ultraviolet (UV)-curable resist, achieved good nanopatterning fidelity and on-wafer uniformity with high throughput. Some manufacturing issues of the nanoreplication process, such as the impact of wafer and mold surface particles on nanoreplication yield, are also discussed. Nano-optic devices, such as, quarter-wave plates and polarizers, were manufactured with the nanomanufacturing platform. An average wafer-level optical performance yield of 86% was achieved. The developed technology is applied for high-throughput and low-cost manufacturing nanostructure-based optical devices and integrated optical devices. [J770]

"Bond-and-transfer scanning probe array for high-density data storage"

This paper reports a study of a wafer-level bond-and-transfer technique for scanning probe arrays and its future application on probe-based data storage. The bonding performance between sodium ion-rich glass and silicon-nitride-deposited silicon substrate has been characterized. The effects of tool pressure, bonding time, surface properties, and cleanliness were thoroughly discussed. Furthermore, the silicon-nitride-based scanning probe array with pyramidal tip and 1.5-μm-thick cantilevers were successful bonded and transferred to Pyrex 7740 substrate by the optimized condition of wafer-scale electrostatic force bonding and transferring processes. The nano-patterning capabilities of scanning probe array for high-density data storage were also discussed. [J771]

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{no data available} [J772]

"An open-loop nano-positioning micromechanical digital-to-analog converter for grating light modulation"

We report an open-loop digitally driven precision positioning mechanism, termed micromechanical digital-to-analog converter (MDAC), and its pioneering application in a grating light modulator. A prototype grating light modulator driven by a 6-bit MDAC has been fabricated using the polysilicon multiuser microelectromechanical systems processes, achieving a total stroke of 296 nm (full-scale output) and step size [least significant bit (LSB)] of 4.7 nm in a highly repeatable and stable manner. The grating light modulator demonstrated about 13-dB contrast ratio between maximum and minimum intensity of the zeroth diffraction order. The proposed mechanism can be configured for many promising applications including digital variable optical attenuators for optical fiber communications. [J773]

"Improvement of InGaN-GaN light-emitting diode performance with a nano-roughened p-GaN surface"

This investigation describes the development of InGaN-GaN light-emitting diode (LED) with a nano-roughened top p-GaN surface which uses Ni nano-mask and wet etching. The light output of the InGaN-GaN LED with a nano-roughened top p-GaN surface is 1.4 times that of a conventional LED, and wall-plug efficiency is 45% higher. The operating voltage of InGaN-GaN LED was reduced from 3.65 to 3.5 V at 20 mA and the series resistance was reduced by 20%. The light output is increased by the nano-roughening of the top p-GaN surface. The reduction in the series resistance can be attributed to the increase in the contact area of nano-roughened surface. [J774]

"MEMS integrated submount alignment for optoelectronics"

One of the most expensive and time-consuming production processes for single-mode fiber-optic components is the alignment of the photonic chip or waveguide to the fiber. The alignment equipment is capital intensive and usually requires trained technicians to achieve desired results. Current technology requires active alignment since tolerances are only 0.2μm or less for a typical laser diode. This is accomplished using piezoelectric actuated stages and active optical feedback. Joining technologies such as soldering, epoxy bonding, or laser welding may contribute significant postbond shift, and final coupling efficiencies are often less than 80%. This paper presents a method of adaptive optical alignment to freeze in place directly on an optical submount using a microelectromechanical system (MEMS) shape memory alloy (SMA) actuation technology. Postbond shift is eliminated since the phase change is the alignment actuation. This technology is not limited to optical alignment but can be applied to a variety of MEMS actuations, including nano-actuation and nano-alignment for biomedical applications. Experimental proof-of-concept results are discussed, and a simple analytical model is proposed to predict the stress strain behavior of the optical submount. Optical coupling efficiencies and alignment times are compared with traditional processes. The feasibility of this technique in high-volume production is discussed. [J775]

"Diagnostics of hydrogen plasma with in situ optical emission and silicon probes"

In this work, an approach has been adopted to explore plasma properties by combining an in situ optical emission technique with a contact angle measurement. Hydrogen plasma was generated with a radio-frequency power source. The plasma parameters such as number densities and temperatures were derived from the optical emission spectroscopic data. Small silicon chips were placed at various positions inside a discharge tube as probes for the plasma conditions. The hydrogen-plasma-treated silicon chip surfaces were characterized with the contact angle measurement method. The change of wettability on the silicon surface was observed with various plasma treatment times. The spectroscopic information about the plasma is correlated with the results of the surface characterization. It is found that the rate of the increasing hydrophilicity is sensitive to the amount of helium added and the location in the discharge tube. A simple model describing the relation between the surface coverage area of water droplet and the variation of contact angle has been established. We have proposed plasma excitation and reaction mechanisms for the observed correlation between plasma temperatures and the wettability of the silicon surface. It shows that small silicon chips can serve as "litmus tests" for the plasma conditions without introducing too much perturbation. [J776]

"Switching of submicron-sized, antiferromagnetically coupled Co Fe B /Ru /Co Fe B trilayers"

This work reports on the magnetic reversal of submicron-sized elements consisting of an CoFeB/Ru/CoFeBartificial ferrimagnet (AFi). The elements were patterned into ellipses having a width of approximately 250-270 nm and a varying aspect ratio between 1.3 and 8. The coercivity was found to decrease with an increasing imbalance of the magnetic moment of the two antiferromagnetically coupled layers and is therefore strongly affected by an increase of effective anisotropy due to the antiferromagnetic coupling of the two layers. With respect to a single layer of amorphous CoFeB, patterned in comparable elements, the AFi has an increased coercivity. Switching asteroids comparable to single layers were only observed for samples with a high net moment. [J777]

"Thermally activated carrier transfer processes in In Ga N /Ga N multi-quantum-well light-emitting devices"

We have studied the temperature-dependent carrier transfer processes in InGaN/GaNmulti-quantum-well light-emitting devices using various optical techniques such as photoluminescence, electroluminescence, and photoluminescence excitation spectra. The role of the defects in the GaN barrier neighboring to the InGaN region was demonstrated clearly in capturing carriers only at low temperatures. The physical origin of the defects was

most possibly attributed to the stacking faults at the interface according to the high-resolution transmission electron spectroscopy pictures. [J778]

"Oxidation behavior of titanium nitride films"

The oxidation behavior of titanium nitride (TiN) films has been investigated by using x-ray diffraction, Raman scattering spectroscopy, and field emission scanning electron microscopy. TiN films were deposited onto Si substrates by using cathodic arc plasma deposition technique. After that, the films were annealed in the air at 500-800 °C for 2 h. The x-ray diffraction spectra showed that rutile-TiO2appeared above 600 °C. The relative intensity of TiO2rapidly increased with temperatures. Only rutile-TiO2was detected above 700 °C. Raman scattering spectra indicated the presence of rutile-TiO2signals above 500 °C. Meanwhile an additional Si peak appeared at 700 °C in Raman spectra, above which only Si peak appeared. Many nano pores were found on the surface of films annealed at temperatures between 600 and 700 °C in field emission scanning electron microscopy, while the granular structure existed at 800 °C. The as-deposited TiN films had an apparent columnar structure. The thin and dense oxide overlayer appeared at 500 °C, and thicker oxide layer existed above 600 °C. The elongated grain structure with many voids existed in the film at 800 °C. These pores-voids might result from the nitrogen release during the oxidation of the nitride. The oxide layer obviously grows inward indicating the oxidation of TiN films belongs to an inward oxidation. The pre-exponential factor and the activation energy of the oxidation were evaluated by Arrhenius-type relation. These values were 2.2Ч10-6cm2/sand 110±10kJ/mol, which are consistent with those reports in the literature. [J779]

"Prediction of ultraviolet-induced damage during plasma processes in dielectric films using on-wafer monitoring techniques"

We measured electron-hole pairs generated in dielectric film using our developed on-wafer monitoring technique to detect electrical currents in the film during the plasma etching processes. The electron-hole pairs were generated by plasma induced ultraviolet (UV) photons, and the number of electron-hole pairs depends on the UV wavelength. In SiO2film, UV light, which has a wavelength of less than 140nm, generates electron-hole pairs, because the band gap energy of the film is 8.8eV. On the other hand, in Si3N4film, which has a band gap energy level of 5.0eV, UV light below 250nminduces the electron-hole pairs. Additionally, we evaluated the fluorocarbon gas plasma process that induces UV radiation damage using multilayer sensors that consisted of both SiO2and Si3N4stacked films. In these cases, electron-hole pair generation depended on the dielectric film structure. There were more electron-hole pairs generated in the SiO2deposited on the Si3N4film than in the Si3N4deposited on the SiO2film. As a result, our developed on-wafer monitoring sensor was able to predict electron-hole pair generation and the device characteristics. [J780]

"Dielectric properties and microstructure of nano-MgO dispersed Ba 0.3 Sr 0.7 Ti O 3 thin films prepared by sputter deposition"

In this study, thin films prepared from the targets of Ba0.3Sr0.7TiO3(BST), BST/5mol%MgO,BST/10mol%MgO, and BST/20mol%MgOcomposites, using radio frequency magnetron sputtering, have been reported. As-deposited films were found to be amorphous and began to crystallize after annealing at temperatures of 650 °C and above. The addition of MgO in the BST films resulted in the hindrance of crystallization and inhibition of grain growth. MgO was substituted into the BST lattices to a certain degree. High-resolution transmission electron microscopy results revealed some MgO dispersed in the BST matrix. The MgO dispersed in the dense BST matrix was found to be around 25 nm in size. The dielectric constant was estimated to be 90 for the pure BST film annealed at 700 °C, and observed to be slightly reduced with the MgO addition. The dielectric losses of the Ba0.3Sr0.7TiO3(0.006) and BST/MgOfilms (0.002-0.004) were much less than those of the Ba0.6Sr0.4TiO3(0.013) and Ba0.7Sr0.3TiO3films (0.11-0.13). The leakage current was smaller for the BST/10mol%MgOfilm compared to the pure BST film and this low leakage current may be attributed to the substitution of Mg in the B sites of BST lattices which might have behaved as an electron acceptors. [J781]

"IEE Proceedings Science, Measurement & Technology-editorial"

Summary form only given. IEE Proceedings Science, Measurement & Technology is a journal with a unique scope. Work published relates to applications in electronic engineering, electrical engineering and communications as well as medical engineering. The scope continues to revolve around the three themes of electromagnetism, materials and measurement and instrumentation. Nowhere is the convergence of the three themes more evident than in the rapidly growing field of nano- and microtechnology and systems. [J782]

"MR ratio enhancement by NOL current-confined-path structures in CPP spin valves"

We have compared the magnetoresistance (MR) performance of current-confined-path (CCP) current-perpendicular-to-plane giant magnetoresistance (CPP-GMR) spin valve films with a nano-oxide-layer (NOL), made between natural oxidation (NO) and ion-assisted oxidation (IAO). For the NO, an MR ratio was only 1.5% at an RA of 370 mΩμm2, whereas for the IAO, an MR ratio was greatly increased to 5.4% at an RA of 500 mΩμm2. Fitted data by the Valet-Fert model showing larger MR enhancement effect by the IAO is explained by the improvement of the metal-purity of the Cu inside the CCP structure. By further improvement of metal-purity of the Cu, a large MR ratio of more than 30% can be expected at a small RA of 300 mΩμm2. The CCP-CPP spin valve film is a promising candidate for realizing high-density recording heads for 200 to 400-Gbpsi recording. [J783]

"Dielectrophoretic batch fabrication of bundled carbon nanotube thermal sensors"

We present a feasible technology for batch assembly of carbon nanotube (CNT) devices by utilizing ac electrophoretic technique to manipulate multiwalled bundles on an Si/SiO2substrate. Based on this technique, CNTs were successfully and repeatably manipulated between microfabricated electrodes. By using this parallel assembly process, we have investigated the possibility of batch fabricating functional CNT devices when an ac electrical field is applied to an array of microelectrodes that are electrically connected together. Preliminary experimental results showed that over 70% of CNT functional devices can be assembled successfully using our technique, which is considered to be a good yield for nanodevices manufacturing. Besides, the devices were demonstrated to potentially serve as novel thermal sensors with low power consumption (microwatts) with electronic circuit response of approximately 100 kHz in constant current mode operation. In this paper, we will present the fabrication process of this feasible batch manufacturable method for functional CNT-based thermal sensors, which will dramatically reduce production costs and production time of nanosensing devices and potentially enable fully automated assembly of CNT-based devices. Experimental results from the thermal sensors fabricated by this batch process will also be discussed. [J784]

"Double-Layer antireflection coating design for semi-infinite one-dimensional photonic Crystals"

A theoretical formalism is established for double-layer (DL) antireflection coating (ARC) on a one-dimensional (1-D) photonic crystal (PC). Conventional DL-ARC for a bulk is equally applicable for a 1-D PC when the bulk substrate index is replaced with the optical admittance, which can be obtained from the electromagnetic Bloch waves of the infinite 1-D PC. Numerical calculations are performed for a model structure composed of GaAs and AlAs-oxide layers to confirm the validity of the theory. In terms of realization and practicality, this DL-ARC is expected to be superior to the single-layer version. [J785]

"Development of an optical pumping nuclear spin polarizer"

We have been developing an optical pumping nuclear spin polarizer (OPNSP) to enhance nuclear magnetic resonance (NMR) signals from small amount of nano and biological materials. In this scheme, a semiconductor and a target (nano or biological) material are in close contact with each other, and high nuclear spin polarization in the semiconductor created by the optical pumping method is transferred to the nuclei in the target material by a cross-polarization at the interfaces and a spin diffusion inside the target material. As a result, high nuclear spin polarization is realized in the target material. In this paper, we present profiles of the nuclear spin polarization in the target material of the OPNSP calculated for the multilayered and multi-columnar configurations, from which suitable designs of the OPNSP to achieve high nuclear polarization in the target materials are discussed. [J786]

"Chip-to-chip optoelectronics SOP on organic boards or packages"

In this paper, we demonstrate compatibility of hybrid, large-scale integration of both active and passive devices and components onto standard printed wiring boards in order to address mixed signal system-on-package (SOP)-based systems and applications. Fabrication, integration and characterization of high density passive components are presented, which includes the first time fabrication on FR-4 boards of a polymer buffer layer with nano scale local smoothness, blazed polymer surface relief gratings recorded by incoherent illumination, arrays of polymer micro lenses, and embedded bare die commercial p-i-n photodetectors. These embedded optical components are the essential building blocks toward a highly integrated SOP technology. The effort in this research demonstrates the potential for merging high-performance optical functions with traditional digital and radio frequency (RF) electronics onto large area and low-cost manufacturing methodologies for multifunction applications. [J787]

"NASA's swarm missions: the challenge of building autonomous software"

The National Aeronautics and Space Administration (NASA) introduces its new millenium mission class. Motivated by the need to gather more data than is possible with a single spacecraft, scientists have developed a

new class of missions based on the efficiency and cooperative nature of a hive culture. The missions, aptly dubbed nanoswarm is a little more than mechanized colonies cooperating in their exploration of the solar system. Each swarm mission can have hundreds or even thousands of cooperating intelligent spacecraft that work in teams. One swarm mission under concept development for 2020 to 2030 is the autonomous nano technology swarm (ANTS). For software and systems development, this is uncharted territory that calls for revolutionary techniques. [J788]

"Nano- and pico-dispensing of fluids on planar substrates using SAW"

The increasing interest in miniaturization of biological and chemical experiments or assays demands precise metering of the smallest amounts of reagents, e.g., on a planar substrate. Very sophisticated spotting systems can nowadays produce arrays of many thousands of different substances on an area of a few square inches. Such micro arrays and the technology behind them have become an important tool in genomic expression assays, proteomic applications, and even in the field of combinatoric chemistry. We present a technique to dispense the smallest amounts of fluids in the form of either simple spots or more complicated microarrays, where we use surface acoustic waves in combination with a predetermined surface chemistry. In addition to a detailed description of the technique, several examples of applications are presented. [J789]

"From micro to nano: properties and potential applications of micro- and nano-filled polymer ceramic composites in microsystem technology"

In microsystem technology, four important material classes are established either for the generation or the replication of microstructured surfaces: silicon, polymers, metals and ceramics. Composite materials consisting of a polymer matrix and ceramic fillers show improved thermomechanical properties in comparison to polymers and can be introduced as a new additional material class. The substitution of micro-sized ceramic fillers by nano-sized ceramics in composites has a strong influence on the composite's physical properties: the reduction of ceramic particle size down to the nanometre scale results in an improved sinter activity owing to the large surface area. The fabrication of dense ceramics is simplified and can be used for a rapid prototyping of microstructured ceramic parts. The addition of nano-sized ceramics with particle sizes of [J790]

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{no data available} [J791]

"High efficiency 90° silica waveguide bend using an air hole photonic crystal region"

We propose the hybrid integration of an air hole photonic crystal (PhC) structure with a high Δ (0.75%) single-mode silica waveguide to achieve an ultracompact high efficiency 90° bend for transverse-magnetic polarized light. Diffraction from the periodic boundary between the PhC and silica waveguide regions is shown to seriously degrade the optical efficiency of the bend. A microgenetic algorithm (μGA) combined with a two-dimensional finite-difference time-domain method is used to modify the PhC and its boundary layer to suppress this diffraction which in turn maximizes bend efficiency. The final optimized structure has a 99.4% bend efficiency at a wavelength of 1.55 μm and occupies an area of only 27 Ч 27 μm. [J792]

"Micro-nano actuators driven by polarised light"

Results on a system exhibiting all-optical actuation are reported. Clamped silicon cantilevers, coated on top with thin films of chalcogenide glasses, reversibly deflect upwards or downwards when illuminated with linearly polarised light with the electric vector of the light being respectively parallel or perpendicular to the cantilever axis. The response is strongly wavelength selective, the maximum, and fastest, response being achieved for illumination with light having a photon energy comparable to the bandgap energy of the semiconducting amorphous chalcogenide layer. This effect can form the basis of micro-opto-mechanical system devices, controlled by varying the intensity, wavelength or polarisation direction of the incident light. [J793]

"A dual-gate-controlled single-electron transistor using self-aligned polysilicon sidewall spacer gates on silicon-on-insulator nanowire"

A dual-gate-controlled single-electron transistor was fabricated by using self-aligned polysilicon sidewall spacer gates on a silicon-on-insulator nanowire. The quantum dot formed by the electric field effect of the dual-gate structure was miniaturized to smaller than the state-of-the-art feature size, through a combination of electron beam lithography, oxidation, and polysilicon sidewall spacer gate formation processes. The device shows typical MOSFET I-V characteristics at room temperature. However, the Coulomb gap and Coulomb oscillations are clearly observed at 4 K. [J794]

"Laser mode locking using a saturable absorber incorporating carbon nanotubes"

This paper describes a new class of saturable absorber device based on single-wall carbon nanotube (SWNT)-the saturable absorber incorporating nano tube (SAINT). The device possesses ultrafast optical properties comparable to that of the industrial standard semiconductor saturable absorber mirror (SESAM). Passively mode-locked picosecond fiber lasers in different configurations are demonstrated using SAINTs as mode lockers. This is the first demonstration of optical pulsed lasers based on the carbon nanotube technology, and the first practical application of carbon nanotubes in the field of applied optics. [J795]

"Characterization and modeling of SOI varactors at various temperatures"

Capacitance and quality factor of accumulation-mode and inversion-mode MOS varactors in silicon-on-insulator CMOS process were measured over a temperature range of 0°C≤T≤150°C. The temperature coefficient of capacitance of inversion-mode devices is larger than that of accumulation-mode devices in the normal operating range, because the threshold voltage is sensitive to temperature. Besides, the quality factor decreases with increasing temperature for these two types of varactors due to the increase of parasitic resistance. A device model based on BSIM3v3 model is proposed to simulate the temperature effect. The modeling results of capacitance, series resistance and quality factor for SOI varactors have excellent agreement with measured results. [J796]

"Nanoelectromechanics in engineering and biology (nano-and microscience, engineering, technology, and medicine series)-Book Review"

{no data available} [J797]

"Microelectromechanical devices for satellite thermal control"

Future space missions will include constellations of spacecraft, including nano- and picosatellites, where adaptive thermal control systems will be needed that fit the constraints of space applications with limited power and mass budgets. A microelectromechanical systems (MEMS) solution has been developed that will vary the emissivity on the surface of the small satellite radiator. The system is based on louver thermal controllers, where panels are mechanically positioned to modulate the effective radiator surface area. This system consists of MEMS arrays of gold-coated sliding shutters, fabricated with the Sandia ultraplanar, multilevel MEMS technology fabrication process, which utilizes multilayer polycrystalline silicon surface micromachining. The shutters can be operated independently to allow digital control of the effective emissivity. This first demonstrator technology is limited in the possible emittance range to a 40% change. Early prototypes of MEMS louvers that open away from the structure have shown the capability of a much wider dynamic range. The first generation of this active thermal management system will be demonstrated on NASA's New Millennium Program ST-5 spacecraft. With the opportunity to validate the MEMS thermal control technology in space on ST-5, lightweight, low-power MEMS radiators offer a possibility for flexible thermal control on future nanosatellites. [J798]

"Study on InGaAsP-InGaAs MQW-LD with symmetric and asymmetric separate confinement heterostructure"

We studied symmetric and asymmetric InGaAsP-InGaAs 1.55-μm multiquantum-well (MQW) laser diodes (LDs) with highly p-doped layers in the two-step separate confinement heterostructure (SCH). The p-doping in p-SCH suppresses the electron overflow from the MQWs to p-SCH, but it is an origin of free carrier absorption loss. An additional InGaAsP layer inserted inside n-SCH makes asymmetric field distribution and, therefore, reduces the portion of optical field distribution in highly p-doped regions with high optical loss. Compared with symmetric structure, asymmetric SCH LD has low threshold current density, low internal loss, and high and flat slope efficiency with respect to temperature. [J799]

"Electrokinetics in micro devices for biotechnology applications"

Electrokinetics is the study of the motion of bulk fluids or selected particles embedded in fluids when they are subjected to electric fields. With the recent developments in microfabrication, electrokinetics provides effective manipulation techniques in the micro and nano domains, which matches the length scale of various biological objects. The ability to manipulate objects down to molecular levels opens new avenues to exploit biological science and technology. Understanding of the fundamental characteristics and limitations of the forces becomes a crucial issue for successful applications of these force fields. In this paper, we review and examine the range of influence for electrokinetically manipulated biological objects in microdevices, which can lead to interesting applications in biotechnology. [J800]

"Double sampling data checking technique: an online testing solution for multisource noise-induced errors on on-chip interconnects and buses"

With processors and system-on-chips using nano-meter technologies, several design and test efforts have been recently developed to eliminate and test for many emerging DSM noise effects. In this paper, we show the emergence of multisource noise effects, where multiple DSM noise sources combine to produce functional and timing errors even when each separate noise source itself does not. We show the dynamic nature of multisource noise, and the need for online testing to detect such noise errors. We propose an online approach based on low-cost double-sampling data checking circuit to test for such noise effects in on-chip buses. Based on the proposed circuit, an effective and efficient testing methodology has been developed to facilitate online testing for generic on-chip buses. The applicability of this methodology is demonstrated through embedding the online detection circuit in a bus design. The validated design shows the effectiveness of the proposed testing methodology for multisource noise-induced errors in global interconnects and buses. [J801]

"Electrical characterization of individual carbon nanotubes grown in nanoporous anodic alumina templates"

We report electrical transport measurements of individual carbon nanotubes grown catalytically in a nanoporous anodic aluminum oxide template by thermal chemical vapor deposition of acetylene. The four-terminal resistance at room temperature scales linearly with the nanotube length indicating diffusive nature of transport. The conductance shows an exp[(-1/T)1/3]dependence on temperature T, suggesting that two-dimensional variable-range hopping is the dominant conduction mechanism. The maximum current density carried by these nanotubes is on the order of 106 A/cm2.copyright 2004 American Institute of Physics. [J802]

"Anomalous relationship between hardness and wear properties of a superelastic nickel-titanium alloy"

We have studied the behavior of microwear and hardness of a superelastic nickel-titanium alloy using a triboindenter at various temperatures. Wear resistance was found to anomalously decrease with an increase in hardness. The observations are analyzed based on simple contact theory which suggests that the increase of hardness with the temperature is mainly due to an increase in phase transition stress, while the decrease of wear resistance with the temperature is due to an increase of the austenite elastic modulus and a decrease of the amount of phase transition that can be recovered. copyright 2004 American Institute of Physics. [J803]

"Cr 2 O 3 surface layer and exchange bias in an acicular CrO 2 particle"

It has been found by electron diffraction and high-resolution transmission electron microscopy that each commercial CrO2particle is enclosed by an epitaxial Cr2O3layer 2.5 nm thick. The epitaxial relationships of Cr2O3layers on CrO2particles have been identified. Magnetic hysteresis loops measured at different temperatures (5-300 K), after the sample was cooled from 350 K with a 50 kOe field, were found to be perfectly symmetrical, i.e., no exchange bias was observed, which is unexpected for ferromagnetic/antiferromagnetic core/shell structured particles. To gain a deeper understanding of the phenomenon, the "as-received" commercial CrO2particles were annealed at 600 °C in air for 1 h to thicken the Cr2O3shells. Exchange bias was clearly observed in the annealed particles with thicker Cr2O3shells. At 5 K, the exchange bias field reached 220 Oe. These experimental observations can be explained well within the framework of the random field model. copyright 2004 American Institute of Physics. [J804]

"Phonon confinement in oxide-coated silicon nanowires"

Raman spectroscopy of micron-long crystalline Si nanowires covered with a thick SiO2layer showed a downshift and asymmetric broadening of the Raman first order TO phonon peak when compared with the bulk (q=0)mode. The Raman shift and broadening were attributed to phonon confinement in the nanowires. A phenomenological phonon confinement model, incorporating the effects of nanowire diameter distribution, is presented. This model is shown to accurately describe the broadening of the Raman peak and is consistent with the microstructure of Si nanowires. In addition to the work a distribution of the phonon wave vector was directly taken into consideration replacing the diameter distribution to fit the Raman TO peak. The effects of the nano-Si:SiO2boundary on the Raman spectra are discussed in terms of softening of the phonon confinement. copyright 2004 American Institute of Physics. [J805]

"Electrochemical growth of Co nanodots on patterned Si substrates"

A silicon substrate, prestructured by a focused ion beam, is used as a nano-electrode template to perform a

selective electrodeposition of cobalt nanodots. It is found that the shape of the magnetic nanostructures determines to a large extent their magnetic properties. Using magnetic force microscopy, a transition from in-plane to out-of-plane single domain magnetization is observed when the diameter of the 400nmheight dots is reduced from 400 to 200nm. Additional ferromagnetic resonance measurements confirm that the magnetic anisotropy is imposed mainly by the shape of the cylindrical dots. [J806]

"Multifunctional transducer using poly (vinylidene fluoride) active layer and highly conducting poly (3,4-ethylenedioxythiophene) electrode: Actuator and generator"

Monomorph and bimorph multifunctional transducers such as actuators and generators were fabricated using a piezoelectric poly (vinylidene fluoride) (PVDF) films as the active layer and a highly conducting poly (3,4-ethylenedioxythiophene)/poly (4-styrenesulfonate) [PEDOT/PSS (DMSO for solvent)] as the electrode. In order to enhance the adhesion of the films, either the PVDF films or PEDOT/PSS (DMSO) electrodes were modified using an ion-assisted-reaction (IAR) method. The direct (generator) and inverse piezoelectric (motor) effects as well as the pyroelectric effect in the PVDF-PEDOT/PSS based devices were observed. The tip displacement of the 12mmby 30mmbimorph device made with the PEDOT/PSS (DMSO) electrodes was 3.5mmat the resonance frequency with an appled potential of 40Vrms. The sinusoidal output voltage of the bimorph type generator consisting of the PVDF active layers and PEDOT/PSS (DMSO) electrodes increased with increasing tip displacement induced by a vibrator. A maximum output voltage of 4.1Vin the pyroelectric PVDF device was generated with a change in temperature. [J807]

"High-electron-mobility Al Ga N /Al N /Ga N heterostructures grown on 100-mm -diam epitaxial AlN/sapphire templates by metalorganic vapor phase epitaxy"

Al0.26Ga0.74N/AlN/GaNheterostructures with 1-nm-thick AlN interfacial layers were grown on 100-mm-diam epitaxial AlN/sapphire templates and sapphire substrates by metalorganic vapor phase epitaxy. It was found that AlN/sapphire templates significantly enhanced the electron mobility of the two-dimensional electron gas (2DEG) confined at the GaN channel. This can be explained by the high-crystal-quality GaN channel realized by the use of epitaxial AlN/sapphire templates as substrates. The very high Hall mobilities of approximately 2100cm2/Vsat room temperature and approximately 17000cm2/Vsat 77Kwith a 2DEG density of approximately 1Ч1013/cm2were uniformly obtained for AlGaN/AlN/GaNheterostructures on 100-mm-diam epitaxial AlN/sapphire templates. The Hall mobility of AlGaN/AlN/GaNheterostructures on epitaxial AlN/sapphire templates reached a very high value of 25500cm2/Vsat 15K. [J808]

"In situ detection of faradaic current in probe oxidation using a dynamic force microscope"

A faradaic current on the order of a sub-pico-ampere was detected while fabricating two-dimensional oxide nanostructures on H-passivated Si(001) surfaces. The detected faradaic current has been shown to faithfully reflect the degree of probe oxidation with a clear dependence on the variation of voltage and the tip speed. The faradaic current in dynamic mode can serve as a sensitive monitor of the nano-oxidation reaction for implementing precise closed-loop control of the oxide growth. copyright 2004 American Institute of Physics. [J809]

"Carbon nanotubes-zeolite complex: A Li-intercalated compound with high storage capacity"

We report a composite system for Li intercalation, in which ultrasmall-diameter (4 E) carbon nanotubes are confined inside the channels of nanoporous zeolite crystals. The first-principles pseudopotential calculations show that there are several possible sites for lithium to be intercalated, including the interior and exterior of the nanotubes. The vapor phase adsorption and electrochemical measurements both indicate that the lithium capacity of the system can be 10%by weight, which is higher than that of graphite intercalation compounds. The enhanced Li capacity makes the nanotubes-zeolite complex a plausible candidate for Li battery applications. copyright 2004 American Institute of Physics. [J810]

"Thermal conductivities of individual tin dioxide nanobelts"

We have measured the thermal conductivities of a 53-nm-thick and a 64-nm-thick tin dioxide (SnO2)nanobelt using a microfabricated device in the temperature range of 80-350 K. The thermal conductivities of the nanobelts were found to be significantly lower than the bulk values, and agree with our calculation results using a full dispersion transmission function approach. Comparison between measurements and calculation suggests that phonon-boundary scattering is the primary effect determining the thermal conductivities. copyright 2004 American Institute of Physics. [J811]

"Formation chemistry of high-density nanocraters on the surface of sapphire substrates with an in situ etching and growth mechanism of device-quality GaN films on the etched substrates"

An efficient method has been investigated to grow GaN films with sapphire substrates being treated in situ metalorganic chemical vapor deposition reactor for a special effect rather than simple thermal cleaning. First, a thin GaN layer is grown on the sapphire substrate. And then it is almost etched away by thermal decomposition. It is found that the decomposition of GaN induces the decomposition of sapphire resulting in the formation of high-density nanocraters on its surface. Finally the device-quality GaN film is regrown on the etched substrate with residual gallium droplets as nucleation sites. The chemistry of the etching process and the mechanism of the final GaN growth process have been discussed. The distinct feature of this method is the in situ formation of high-density nanocraters on the surface of the substrate. A rough interface between the substrate and GaN can improve the efficiency of the light-emitting diode built on it greatly. copyright 2004 American Institute of Physics. [J812]

"Surface passivation effects on AlGaN/GaN high-electron-mobility transistors with SiO 2, Si 3 N 4, and silicon oxynitride"

Surface passivation effects were studied on AlGaN/GaN high-electron-mobility transistors (HEMTs) using SiO2,Si3N4,and silicon oxynitride (SiON) formed by plasma enhanced chemical vapor deposition. An increase of IDmaxand gmmaxhas been observed on the passivated (SiO2,Si3N4and SiON) HEMTs when compared with the unpassivated HEMTs. About an order of magnitude low IgLeakand three orders of magnitude high IgLeakwas observed on Si3N4and SiO2passivated HEMTs, respectively, when compared with the unpassivated HEMTs. The increase of IgLeakis due to the occurrence of surface related traps, which was confirmed by the observation of kink and hysteresis effect on dc and ac IDS-VDScharacteristics, respectively. Though the Si3N4passivated HEMTs show better dc characteristics, the breakdown voltage (BVgd)characteristics are not comparable with SiO2,SiON passivated and unpassivated HEMTs. The SiON is also a very promising candidate as a surface passivant for AlGaN/GaN HEMTs because it shows better BVgdwith low hysteresis width and small IDcollapse than Si3N4passivated HEMTs. copyright 2004 American Institute of Physics. [J813]

"Structure of the glycerol liquid/vapor interface studied by sum-frequency vibrational spectroscopy"

Surface-specific sum-frequency vibrational spectroscopy has been used to study the structures of the glycerol liquid/vapor interface. The results show that the molecules at the glycerol surface are highly polar ordered with the CH2and CH groups projecting into the vapor and the OH group remaining at the surface or pointing into the bulk. More quantitatively, we have also determined how the CH2groups of the molecules are oriented at the surface. copyright 2004 American Institute of Physics. [J814]

"The influence of the annealing sequence on p+ /n junctions observed by scanning capacitance microscopy"

This letter reports on the investigation of p+-njunction variation produced by various annealing sequences. With well-controlled photoperturbation, we have employed scanning capacitance microscopy to directly observe the junction narrowing induced by post-spike furnace annealing. For p+-njunctions, it is revealed that post-spike furnace annealing may degrade the electrical activation of boron atoms, leading to junction narrowing without significant boron diffusion. The mechanism and the stability of electrical junctions formed by spike annealing are also discussed. The experimental results also clearly show that furnace annealing followed by spike annealing can result in junction broadening with a more concentrated boron profile. copyright 2004 American Institute of Physics. [J815]

"Exchange bias and the origin of magnetism in Mn-doped ZnO tetrapods"

Wurtzite-type ZnO tetrapod nanostructures were prepared by evaporating Zn metal under humid argon flow. After the fabrication, Mn was doped into ZnO nanostructures by diffusion at 600°C. The average concentration of Mn was determined to be 8.4mol%by x-ray fluorescence. X-ray diffraction patterns obtained from the doped and undoped samples are almost the same. High-resolution transmission electron microscopy observations reveal the existence of surface layers. Magnetic measurements show that the sample has a very large coercivity HC=5500Oeat 5.5Kand a Curie temperature TC=43K, which may suggest that ferrimagnetic (Zn,Mn)Mn2O4exists at the surface. Exchange bias is clearly observed below 22K. Exchange bias is attributed to the exchange interaction between ferrimagnetic (Zn,Mn)Mn2O4and spin-glass-like (or antiferromagnetic) phase in manganese oxides. [J816]

"Directional growth by low electric-field-controlled crystallization of bulk amorphous lithium

tetraborate"

Highly oriented rod-shaped crystals were grown during crystallization of bulk amorphous Li2B4O7under a low ac electric field of 5V/mm. The crystal caxis that is the long direction of rods and perpendicular to the flat surface of the sample is parallel to the applied electric-field direction. The oriented crystals, with an alignment within a declined angle of 15°, are so long along the cdirection compared with those of other directions that the geometrical structure of each rod is quasi-one-dimensional. The measured electromechanical coupling coefficient of kt=0.47is comparable to that of single-crystal Li2B4O7. [J817]

"Current collapse-free i-GaN /AlGaN /GaN high-electron-mobility transistors with and without surface passivation"

Drain current (ID)collapse-free i-GaN/AlGaN/GaNhigh-electron-mobility transistors (HEMTs) with and without surface passivation (electron-beam evaporated SiO2) were demonstrated using dc and pulsed (120Hz)IDS-VDScharacteristics up to the drain supply voltage of 40V. The observation of small IDtransients and negligibly small hysteresis widths with small white light illumination effects on both passivated and unpassivated i-GaN/AlGaN/GaNHEMTs confirms the suppression of collapse related traps. Three and two thermally activated trap levels were observed in passivated (+0.395, -0.079, and -0.949eV) and unpassivated (-0.066and -0.368eV)AlGaN/GaNHEMTs, respectively. However, i-GaN/AlGaN/GaNHEMTs with and without surface passivation exhibited only one trap level at -0.161eV. These results show that the addition of thin cap layer i-GaNscreens the collapse-related surface states/traps from channel. [J818]

"Magnetic-field-controllable avalanche breakdown and giant magnetoresistive effects in Gold/semi-insulating-GaAs Schottky diode"

Gold (Au)/semi-insulating (SI)-GaAs Schottky diode was fabricated by the standard photolithography method using wet etching. Magnetic-field-dependent avalanche breakdown phenomena were observed in the current-voltage curves measured under magnetic field. The avalanche breakdown due to impact ionization was postponed to higher electrical field under applied magnetic field. Accordingly, threshold voltages of avalanche breakdown increased with the applied magnetic field. Above 0.2T, avalanche breakdown was totally quenched. When Au-SI-GaAsSchottky diode was operated above the threshold voltage, giant mangetoresistive effects up to 100 000% were achieved under magnetic field of 0.8T. [J819]

"Near-ideal Schottky contact on quaternary AlInGaN epilayer lattice-matched with GaN"

Pd/Ti/Auand Ni/AuSchottky barrier diodes (SBDs) were demonstrated on quaternary AlInGaN. Current-voltage properties indicated that near-ideal and high-performance SBDs had been realized with ideality factor of 1.05, 1.07 and barrier height of 1.32, 0.98eVfor Pd and Ni SBDs, respectively. Capacitance-voltage measurement revealed that the high-density two-dimensional electron gas (2DEG) located at the AlInGaN/GaNinterface. Ruling out the possible contribution from piezoelectric polarization and conduction band offset, we believe that the formation of 2DEG is due to the existence of large spontaneous polarization in AlInGaN layer, which experimentally verifies the feasible application of quaternary AlInGaN in the high-electron-mobility transistor. [J820]

"Synthesis of 4 E single-walled carbon nanotubes in catalytic Si-substituted Al P O 4 -5 molecular sieves"

4Esingle-walled carbon nanotubes (SWCNs) were fabricated using Si-substituted AlPO4-5(SAPO-5) molecular sieves as the template. In comparison with neutral AlPO4-5, the SAPO-5 framework plays an important role as a catalyst in pyrolyzing the hydrocarbon molecules, owing to the Bшnsted acid sites. The first-principles calculation shows the Si decoration to be very favorable to the formation of carbon nanotubes in the SAPO-5 channels. The resulting SWCNs have better quality than those fabricated without Si doping, evidenced by clearer and stronger radial breathing modes in the Raman spectra. [J821]

"Electron transport through single phenylene-ethynylene molecular junctions at low temperature"

We present low-temperature electron transport measurements of individual phenylene-ethynylene molecular wires, connected to nanometer-spaced gold electrodes. Low-bias current-voltage (I-V)characteristics measured at 4.2Kare stable and show irregular steps. After application of a large voltage, the low-bias I-Vcurves switch between different stable configurations, some of which show negative differential resistance (NDR). Similar behavior, including the NDR, has been observed in molecules irrespective of whether they contain a NO2side group or not. We suggest that different I-Vcurves measured, including the NDR, could be due either to conformational changes in the molecules or a change in coupling of the molecular junction. [J822]

"Room temperature photoluminescence from nanostructured amorphous carbon"

Visible room-temperature photoluminescence (PL) was observed from hydrogen-free nanostructured amorphous carbon films deposited by pulsed laser ablation in different background pressures of argon (PAr). By varying PArfrom 5to340mTorr, the film morphology changed from smooth to rough and at the highest pressures, low-density filamentary growth was observed. Over the same pressure regime an increase in the ordering of sp2bonded C content was observed using visible Raman spectroscopy. The origin of the PL is discussed in terms of improved carrier localization within an increased sp2rich phase. [J823]

"Proximity effect of electron beam lithography for single-electron transistor fabrication"

In this letter, we shall describe a method, utilizing the proximity effect in electron beam lithography, suitable for fabricating silicon dots and devices, and demonstrate the electronic characteristics of the Sisingle-electron transistor. The drain current (Id)of the device oscillates against gate voltage. The electrical characteristics of the single-electron transistor were observed to be consistent with the expected behavior of electron transport through gated quantum dots, at up to 150K. The dependence of the electrical characteristics on the dot size reveals that the Idoscillation follows from the Coulomb blockade by poly-Sigrains in the poly-Sidot. The method of fabrication of this device is completely compatible with complementary metal-oxide-semiconductor technology, raising the possibility of manufacturing large-scale integrated nanoelectronic systems. [J824]

"Patterning conductive copper by nanotransfer printing"

We describe a method for patterning conductive copper over large areas by nanotransfer printing (nTP). This technique is purely additive and yields feature sizes in the 1-500 mcm range. Unlike gold patterns printed in a similar manner, oligomers from poly(dimethylsiloxane) (PDMS) stamps used in nTP permeate through the entire thickness of printed copper resulting in nonconductive patterns. Hot leaching the PDMS stamps in toluene prior to printing removes residual oligomers; printing with pretreated stamps reproducibly yields conductive copper patterns with an average resistivity of 31mu Omega -cm. [J825]

"Probing electron charging in nanocrystalline Si dots using Kelvin probe force microscopy"

By using Kelvin probe force microscopy, we investigate the contact potential difference (CPD) of nanocrystalline silicon (nc-Si) dots with various sizes before and after the dots charging. Few electrons are injected into the nc-Si dots using the atomic force microscope tip. A remarkable change in the dot potential is observed under the normal ambient conditions. Since the change in the dot potential represents the charging energy of the nc-Si dots, the number of electrons stored in the individual dots can be estimated by comparing the calculated charging energy and the measured CPD change caused by charging. We demonstrate that charge quanta are indeed injected and directly detected by this method by analyzing the dot diameter dependence of the CPD change for each dot. [J826]

"Particle size scaling of the giant electrorheological effect"

This letter shows that by decreasing the size of the barium titanyl oxalate nanoparticles coated with urea, achieved through Rb doping, the giant electrorheological (GER) effect can attain a yield stress of 250kPa. The shear thinning effect observed in parallel-plate sandwich configuration is also reported, and attributed to the centrifugal sedimentation effect of the inhomogeneous structures induced by applied electric field. In addition, it is found from experiments that the ER effect is very sensitive to the solid particles volume fraction. [J827]

"Hydrogen-doped high conductivity ZnO films deposited by radio-frequency magnetron sputtering"

Hydrogen-doped zinc oxide (ZnO:H) films were deposited by rf magnetron sputtering as transparent conductive films. The resistivity of ZnO:Hfilm was significantly reduced by the addition of H2in Ar during rf sputtering. The electrical resistivity of ZnO:Hfilms reached 2Ч10-4Omega cm. The carrier concentration increased with increasing H2concentration during deposition. X-ray diffraction results showed that the d0002interplanar spacing increased with increasing H2concentrations. The carrier concentration was significantly reduced in two orders of magnitude by increasing the substrate temperature from 150 to 250 °C during deposition. Both results suggested that the increase of carrier concentration by adding H2during sputtering was due to the hydrogen donor rather than the oxygen vacancies in ZnO films, consistent with the theoretical predictions by Van de Walle. UV-visible spectroscopy further showed that the transmittance is high up to 100% in the visible range. The band gap determined by optical absorption increased with increasing H2composition. The phenomenon is interpreted as the filling of conduction band by electrons in n-type semiconductor. [J828]

"Continuous liquid crystal pretilt control through textured substrates"

Reliable control on the pretilt alignment of nematic liquid crystal (LC) in the 30°-50° range is a well-known challenge. An unconventional approach, involving microtextured surfaces with domains favoring dissimilar LC alignments, has recently demonstrated applicability in bi- and tristable displays. These textured domains realize the so-called frustrated boundary condition in which the LC elastic energy built-up (frustration) can drive the LC alignment into macroscopic uniformity. Here we show that one can harness the frustrated boundary to achieve variable LC pretilt control up to 40°. [J829]

"Temperature dependence of thermal conductivity of Al x Ga 1-x N thin films measured by the differential 3omega technique"

Reliable values of thermal conductivity of thin films made of GaN and its alloys are important for further development of nitride technology due to the problem of self-heating in GaN-based power transistors and optical devices. Using the differential 3omega technique we measured the thermal conductivity of AlxGa1-xNthin films (x=0and 0.4) grown by the hydride vapor phase epitaxy. Thermal conductivity of the examined Al0.4Ga0.6Nalloy, which is about 25W/mKat 300K, displays a rather unusual temperature dependence. A noticeable growth of the thermal conductivity with temperature up to 350Kis more characteristic for amorphous or completely disordered materials. The measured high-temperature thermal conductivity data are in good agreement with predictions based on the virtual crystal model. Obtained results are important for modeling the self-heating effects in GaN transistors and can be used for the device structure optimization. [J830]

"Advanced nanoscale material processing with focused ion beams"

We present an approach for the generation of metallic Ga dots and In nano-crystallites which, in contrast to conventional bottom-up or top-down processes, is based on a subtractive self-organization process relying on material decomposition induced by focused ion beam exposure. The diameters of the Ga dots range from 120to850nmwith an aspect ratio of about 0.4 at a dot density of up to 7Ч107/cm2. Two-dimensional ordered arrays of freestanding dots were fabricated by a site control technique relying on prepatterned holes and an irradiation mediated migration and agglomeration. By the analogous technique we generated indium nanocrystallites on the (100) InAs surface with sizes ranging from about 50nmto a few microns obviously due to a preferential loss of arsenic atoms during Ga+focused ion beam irradiation. The influence of the ion dose, the beam energy, and the dose rate on the surface evolution was investigated by atomic force microscopy, scanning electron microscopy, Auger electron spectroscopy, and x-ray diffraction measurements. [J831]

"Deep-ultraviolet-microelectromechanical systems stencils for high-throughput resistless patterning of mesoscopic structures"

We describe a combination of 100-mmwafer scale deep-ultraviolet (DUV) exposure and a microelectromechanical systems (MEMS) process to fabricate silicon nitride membranes with submicrometer apertures to be used as miniature shadow masks or nanostencils. Apertures down to a lateral resolution of 200nmwere made in a 500-nm-thick membrane by DUV exposure and dry plasma etching. The membranes were released by a combination of wet silicon etching using potassium hydroxide (KOH) and dry silicon etching using a plasma process. The millimeter-size stencils were used for single-step, local deposition of metal micro- and nano-patterns without the need for photoresist process steps. We have performed stencil deposition on full wafer scale for micro- and nano-patterns in a variety of metals (e.g. Al, Au, Ni, etc.). Dry under-etching of the nanowires resulted in free-standing cantilevered nanoelectromechanical systems (NEMS) structures with resonance frequencies in the megahertz range. The resistless method allows us to pattern micrometer and nanometer scale patterns in a single step without any further processing. It is promising for the surface processing of MEMS/NEMS devices having sensitive or fragile surfaces, such as biochips, organic polymer layers, and self-assembled monolayers. [J832]

"High-speed and high-precision deflectors applied in electron beam lithography system based on scanning electron microscopy"

To develop a nano-lithography system based on scanning electron microscopy, a high-speed and high-precision deflection system including two prelens magnetic deflectors is introduced in this article. Best length ratio between two deflectors is achieved, which attributes to high sensitivity without loss of resolution. Some trade-off has been taken between aberrations and landing angle to get optimum performance of deflection system. The art of wire electron discharge machining is used to guarantee geometric accuracy and lower inductance. Frequency response test and lithographic experiments confirm the design. [J833]

"Fabrication and properties of ultranano, nano, and microcrystalline diamond membranes and sheets"

Thin diamond membranes and free-standing sheets are of interest for a variety of potential applications. This article describes the film nucleation, microwave plasma-assisted chemical-vapor-deposition synthesis, and subsequent processing steps required to make free-standing strong and flexible diamond foils of several cm2. Films are initially deposited on silicon wafers as ultrananocyrstalline, nanocrystalline, or microcrystalline diamond by varying selected deposition parameters including gas composition, nucleation, power, substrate temperature, and pressure. Subsequently the diamond is separated from the original substrate and applied either to new substrates or to frames. Diamond membranes and sheets with thickness between 1 and 3mcmhave been fabricated from each of these film types. The sheets are drapable and can be applied to curved surfaces and wrapped around cylinders. Properties of the films including optical transmission, Young's modulus and fracture strength are described. Several examples of foils and associated frames and substrates are given. [J834]

"Controllable fabrication of fiber nano-tips by dynamic chemical etching based on siphon principle"

A dynamic chemical etching method based on siphon principle has been developed for controllable fabrication of fiber nano-tips, which could be used in near-field optical microscope and optical nanosensors. Compared with traditional static chemical etching, this method has advantages such as reproducibility, controllability, convenience, less cost, and making tip surface smooth. The overall shape and the tape angle of the tip can be effectively controlled through the speed and direction of water flux. Tips with taper angles from 20° to 55°, and tips with double tapers have been achieved by this method. [J835]

"Effects of annealing treatment on microstructure and photocatalytic performance of nanostructured TiO 2 coatings through flame spraying with liquid feedstocks"

Nanostructured titanium dioxide (TiO2)photocatalytic coating was deposited through flame spraying with liquid feedstocks. The effect of annealing treatment on the microstructure of the TiO2coatings was investigated. The microstructure of the coatings was characterized by x-ray diffraction, thermal analysis and transmission electron microscopy. The photocatalytic performance was characterized by photodegradation of gaseous acetaldehyde. The results showed that the as-sprayed nanostructured titania deposited by flame spraying with liquid feedstocks is mainly composed of anatase phase. X-ray diffraction analysis showed that annealing at a temperature higher than 600 °C results in transformation of the anatase phase to rutile phase. Transmission electron microscopy examination revealed that the particles in the deposit remain in their original nano-size when annealing temperature is lower than 800 °C. Thermal analysis suggested that the transformation from anatase to rutile may start at a temperature of around 400 °C. On the other hand, the results evidently indicated that photocatalytic performance is not directly related to the anatase content in the coating. The onset of the phase transformation dramatically degrades the photocatalytic activity. Those facts suggest that the transformation of the anatase phase to rutile phase begins at the surface of the particles which may result in the formation of a surface shell of the rutile phase TiO2. [J836]

"Mechanisms of nano-hole drilling due to nano-probe intense electron beam irradiation on a stainless steel"

Holes with diameters of a few nanometers were drilled in a stainless steel foil using intense electron beams of 2.4nmnominal probe size from a field-emission electron gun in a high-resolution transmission electron microscope. Drilling experiments were carried out at regions of different foil thicknesses for different durations using three different condenser lens apertures. A better understanding of the mechanisms of nano-hole drilling by nano-probe electron beams has been achieved in this article. It was observed that the drilling process initiates from the bottom surface of a thin region while it initiates from the top surface for a thick region. It is concluded that material removal during nano-hole drilling is mainly by localized vaporization within the foil and drilling progresses through the formation of a row of interconnected nano-voids along the irradiated volume across the foil thickness. [J837]

"Modeling, fabrication, and experimental application of clear x-ray phase masks"

Phase-shifting masks are widely used in optical lithography, and the question is whether the technology can be extended to much shorter wavelengths. We have extensively modeled the use of clear phase-mask materials as absorbers for x-ray exposures. Similar to the optical domain, the imaging from x-ray phase masks is highly nonlinear, and thus can be used to produce a feature reduction of 3-5Чcompared to the mask pattern. This observation suggests that mask fabrication might be easier, but the technique is most suited for less dense pattern requirements. In this article we review some of the salient modeling, examine the requirements for

effective fabrication of the masks, and provide some experimental verification of this approach to reach the sub-50nmregion. It is not essential to have exactly a 180° phase shift in the clear material, because mask feature reductions can be achieved with 45, 90, 180, and 270° shifts by choosing the appropriate thicknesses of the clear material. A mask with a 235nmfeature and a 45° thickness is transformed into a 134nmaerial feature, but the same dose for a 180° thickness results in an 86nmfeature. The best resolution is obtained in the so-called bright peak enhanced x-ray phase mask (BPEXPM) mode with thicknesses appropriate to 180° or greater. Previous modeling of the clear phase feature indicated a strong dependence on the wall slope, and fabrication processes are being pursued to verify the modeling and demonstrate the slope dependence on the feature profile. Silicon nitride with a phase shift of 126° is currently employed, but other materials could also be used in the mask fabrication. Experimentally, we are pursuing the feature width reduction achieved from correctly fabricated masks to--produce gate width structures at the sub-50nmregion. [J838]

"Low-temperature field emission system for development of ultracoherent electron beams"

Here, we present the design and test-operation performance of a low-temperature field emission (FE) system which can be employed to image and characterize the FE beam from low-temperature tips. Three radiation shields cooled by liquid helium and liquid nitrogen cryostats surround the FE tips and anodes completely. Once the FE system is cooled down to 5K, experiments can run for more than 15hwithout interruption. The design allows not only for the exchange of tips and anodes by load-lock equipment but also for the adjustment of tip-anode distance using a piezo-tube. Test runs in projection microscopy mode have presented clear diffraction-fringe patterns near the shadows of nano objects at temperatures from room temperature to 5.5K, indicating that the system is well suited for the investigation of the coherence of electron beam from FE tip. [J839]

"Electrical and optical characterizations of self-assembled quantum dots formed by the atomic layer epitaxy technique"

We investigated the electrical and optical properties of InGaAs self-assembled quantum dots grown using the atomic layer epitaxy (ALE) technique. Dots-in-a-well structures were grown by alternately supplying InAs and GaAs sources on an InGaAs layer and covering with another InGaAs layer. Three samples produced with different numbers of cycles of alternate InAs/GaAs supply were characterized by capacitance-voltage and photoluminescence (PL) measurements. For the ten cycle dots-in-a-well structure, a strong zero-dimensional electron confinement was observed even at room temperature. On the other hand, for the five-cycle structure, the PL results indicate that the InGaAs quantum well structure coexists unstably with premature quantum dots. By comparing the results for samples with different numbers of cycles, we suggest that an ALE dots-in-a-well structure can be formed by the aggregation of In and Ga atoms incorporated into the InGaAs quantum well layer when the number of cycles exceeds the critical number of seven cycles. copyright 2004 American Institute of Physics. [J840]

"Dynamical control of light propagation in nonlinear photonic crystals by applied electric fields"

We propose that, by applying an electric field to a Kerr nonlinear photonic crystal, we can tune its photonic band gap and dynamically control the light propagation. The method is efficient and easy to implement in practice. The transmission behavior of the light caused by nonlinear effects induced by both the external electric field and the light is numerically studied in detail in a one-dimensional superlattice. The dynamical control of light propagation can also be made possible in a Pockels photonic crystal by applying an electric field. copyright 2004 American Institute of Physics. [J841]

"Target system for fabrication and control of magnetic metal content in diluted magnetic semiconductors by pulsed-laser deposition"

A synthesis method for control of magnetic metal content in diluted magnetic semiconductors prepared by pulsed laser deposition is presented. We developed a double target system composed of a disc-like semiconductor target and a wire metal target. This system has the advantage that the magnetic metal content is effectively controlled by changing the position of the lens focusing the laser beam. We synthesized Ni-doped ZnTefilms using the target system and evaluated the Nicontent and crystallinity of the films by electron probe micro analysis and x-ray diffraction. [J842]

"Improvement of detected intensity in confocal microscopy by using reflecting optical system"

In confocal microscopy, the level of the detected intensity is low, which reduces the contrast of the images. We propose a reflecting optical system to improve the detected intensity. The result of the optimal design is presented and the performance of the resulting reflecting optical system is evaluated. A numerical simulation of

the effect of the reflecting optical system on the total system performance is also presented. A standard specimen is imaged to show the benefits of the proposed reflecting optical system. The results in this Note demonstrate a 37% increase of the detected intensity and better contrast of the image. copyright 2004 American Institute of Physics. [J843]

"First operation of ECR ion source at Kochi University of Technology"

To study nano-scale manufacturing using highly charged ion beams, a facility to produce and irradiate heavy ion beams has been installed at Kochi University of Technology (KUT). The facility includes an ECR ion source (ECRIS), a beam transport and analysis system, and an irradiation system. The first beam was extracted from ECRIS in January 2003. To evaluate the performance of ECRIS, the measurements of the current and mass spectrum of ion beams as a function of the voltage for the beam extraction and of the rf power have been carried out. It is concluded from the present results that the combined use of the ECRIS and acceleration system with the transport and analysis system build at KUT works normally. copyright 2004 American Institute of Physics. [J844]

"Two-photon absorption laser induced fluorescence on O and O 3 in a dc plasma for oxidation of aluminum"

It has been conjectured that atomic oxygen and ozone can have a great influence on the plasma oxidation of ultrathin aluminum for magnetic tunnel junctions. In order to measure the density of O and ozone, two-photon absorption laser induced fluorescence measurements are performed in the dc glow plasma that is used for the oxidation process. It was found that ozone is much more abundantly present compared to atomic oxygen. Using in situ, real-time ellipsometry measurements, we prove that ozone is not directly involved in the oxidation process. [J845]

"Optical properties of wurtzite and zinc-blende GaN/AlN quantum dots"

We investigate theoretically and compare optical properties of wurtzite and zinc-blende GaN/AlN quantum dots with heights from 1.5 to 4.5 nm. The quantum dot size corresponds to the strong quantum confinement regime. It has been established that the built-in piezoelectric field at the GaN/AlN interface governs optical properties of wurtzite quantum dots while having a small effect on zinc-blende quantum dots. The strain field strongly modifies the excitonic states in both wurtzite and zinc-blende GaN/AlN quantum dots. It has been shown that the radiative lifetime dependence on the quantum dot height is very different in the zinc-blende and wurtzite quantum dots. The excitonic optical properties of GaN/AlN quantum dots calculated using our model are in good agreement with available experimental data. Reported theoretical results for the optical spectra of GaN/AlN quantum dots can be used for interpretation of experimental data and optimization of the quantum dot structures for optoelectronic applications. copyright 2004 American Vacuum Society. [J846]

"Nondestructive dopant profile measurement and its quantitative analysis using the nanocapacitance-voltage method"

We propose a new method that can quantitatively extract the dopant profile in a nondestructive manner using scanning capacitance microscopy (SCM) or a nanocapacitance-voltage (nano-C-V)system. The method is based on a nanotip capacitor model, and not the common parallel-plate capacitor model. For the first time, we have physically analyzed a nanotip capacitor by considering the interaction between the air and a semiconductor and have calculated the full C-Vcurves and the rate of capacitance change with bias (dC/dV).We calculated the local dC/dVcurve that was matched to the experimental dC/dVdata. This quasi-three-dimensional modeling illustrates that the C-Vcharacteristics derived from the nanotip model are different from those of a conventional parallel-plate method. We found that the increase in capacitance in the inversion region (characterized by a double peak in the dC/dVcurve) is due to the quasispherical characteristics of the depleted layer generated by the nanotip located in the air. These results enable the quantification of dopant profiles in a step-by-step process using a one-dimensional inversion algorithm, and their subsequent comparison with a secondary ion mass spectroscopy profile. copyright 2004 American Vacuum Society. [J847]

"Fabrication of curved structures with electron-beam and surface structure characterization"

In this article, we propose a fabrication technology for preparing curved structures using an electron-beam writing strategy. Oxygen plasma treatment increases the surface roughness of SU-8 polymer, while minimizing the outgassing problem and stabilizing the SU-8 film. Fourier transform infrared spectra of epoxy bond near 915cm-1decreased upon increasing the dosage of the electron beam or the treatment time of the oxygen plasma. Convex, concave, and spiral structures were formed successfully using a gradient dosing strategy. The

interface between two shot sections was smoothed by the electron scattering effect. The curved profile was fabricated at various curvatures, and characterized using scanning electron microscopy and a profiler. In addition, a spiral structure was fabricated that possesses the advantageous feature of having a small chip area. We discuss a method of characterizing the spiral structure. copyright 2004 American Vacuum Society. [J848]

"Electron induced nanodeposition of tungsten using field emission scanning and transmission electron microscopes"

Electron beam induced chemical vapor deposition (EBI-CVD) is one of the promising methods for nanofabrication. EBI-CVD has generally been carried out in conventional scanning electron microscopes and the minimum size of the deposits was in the range between 20 and 300 nm. In this study, a field emission gun scanning electron microscope (FE-SEM) and a field emission gun transmission electron microscope (FE-TEM) with gas introduction systems were employed for deposition using a W(CO)6precursor in order to reduce the size of deposits. Dots, 15-20 nm in diameter, were produced using the FE-SEM. The dots consist mainly of tungsten with small amounts of carbon and oxygen. By using the FE-TEM, the diameter of the dots can be reduced to 3.5 nm. The relationship between probe size and dot diameter is discussed. Rods, the diameter of which was 8 nm, were also fabricated by scanning the beam position in the FE-TEM. Deposits produced by FE-TEM are smaller than those by conventional electron microscopes. copyright 2004 American Vacuum Society. [J849]

"High-resolution scanning spreading resistance microscopy of surrounding-gate transistors"

Scanning spreading resistance microscopy (SSRM) was performed in surrounding-gate transistors for 70 nm dynamic random access memories. Sub-10 nm features were resolved using full diamond tips and different processing schemes were correlated with the electrical characteristics of the devices and the SSRM measurements. SSRM was found to be a powerful tool for the characterization and failure analysis determination of this device concept in the very small scale. copyright 2004 American Vacuum Society. [J850]

"Formation mechanism and Coulomb blockade effect in self-assembled gold quantum dots"

Nanometer-scale Au quantum dots have been assembled on SiO2by controlling the reaction of raw materials to form a citrate Au sol and aminosilane/dithiol treated patterned Si wafer. Details of the formation mechanism have been studied. Three gold colloidal particles (15 nm), aligned in a chain to form a one-dimensional current path, were bridged on an 80 nm gap between the source and drain metal electrodes. The device exhibited a Coulomb blockade effect at 33 K. copyright 2004 American Vacuum Society. [J851]

"Selective growth of carbon nanotube on scanning probe tips by microwave plasma chemical vapor deposition"

We have selectively grown carbon nanotubes on the probe tip of an atomic force microscope by microwave plasma chemical vapor deposition. The catalyst domain was defined on the tip apex of an Si based scanning probe by local electric field induced oxidation of a TiN cap layer, under which the cobalt catalyst layer was predeposited on the probe surface. High resolution atomic force microscopy images of an SiO2trench pattern are demonstrated using the carbon nanotube tip. The nanotube tip fabrication method is simple and compatible with existing thin film process technology. copyright 2004 American Vacuum Society. [J852]

"Development of multiple As delta layer Si reference thin film for shallow junction secondary ion mass spectrometry profiling"

To meet the demand for shallow junction secondary ion mass spectrometry (SIMS) profiling, the surface transient Si sputtering effect should be corrected in addition to the improvement of depth resolution. With low-energy grazing incident ions, the SIMS depth resolution can be improved better than 1 nm. For the correction of the surface transient effect, we report that multiple As delta-layer Si thin films characterized with high-resolution transmission electron microscopy and medium-energy ion scattering spectroscopy can be used as a reference thin film. With the reference thin films, the depth scale shift in the surface transient region can be calibrated under each analysis condition. For low-energy Cs+ion bombardment, the average Si sputtering yield in the surface 5 nm layer can be 70% higher than that in the steady state, which corresponds to a depth scale shift of 2.0 nm to the shallower direction. copyright 2004 American Vacuum Society. [J853]

"Stability and composition of Ni-germanosilicided Si 1-x Ge x films"

The stability and composition of the Ni-germanosilicided films formed on relaxed Si1-xGexalloy has been studied in the temperature range of 400-900 °C. During the solid phase thermal reaction between Ni and Si1-xGex,a

nickel-germanosilicide Niy(Si1-wGew)1-yternary phase (w≤xand y≈0.5)and a Ge-rich Si1-zGezphase (z x)have been found. In the lower annealing temperature range of 500 °C,the Ge composition in the nickel-germanosilicide phase is similar to that of the Si0.75Ge0.25substrate. At the same time, germination of Si1-zGez(z x)takes place within the germanosilicide film. At higher annealing temperatures, Ni thermodynamically prefers to react with Si compared to Ge, and as a result, Ge segregates out from the germanosilicide grains to enrich Ge in the formed Si1-zGez(z x)grains in between the germanosilicide grains. On the other hand, the size of the germanosilicide grains increases almost linearly with annealing temperature while that for the Si1-zGezgrains remains almost constant up to an annealing temperature of 700 °C,and above which it increases sharply. As a result, the Ge-rich-- Si1-zGezgrains make the germanosilicide film discontinuous, leading to an increase in the sheet resistance of the germanosilicide film. copyright 2004 American Vacuum Society. [J854]

"Nonorthogonal wafer dicing for waveguide, microelectromechanical systems, and nanotechnology applications"

We propose a technique to dice wafer using photolithography and deep reactive ion etch. We demonstrate our technique by dicing an eight inch wafer into 1.8Ч104pieces of arbitrary shape and size. Our idea is suitable in dicing nano-chips and non-rectangular devices such as waveguide and microelectromechanical systems. copyright 2004 American Vacuum Society. [J855]

"Emission characteristics of NbC/Nb field emitters"

For several years we have searched for emitter materials that are capable of high currents and are environmentally tolerant. Our studies have focused on the refractory carbides of transitions metals. We have reported promising results with HfC and ZrC at several International Vacuum Microelectronics Conference (IVMC) conferences. Then we reported at the two previous IVMCs, on studies of gated arrays with individually addressable emitters made of niobium carbide, other transition metal carbides, and platinum. Here we report on an extensive study of the emission characteristics (noise and stability) of individual NbC/Nb field emitters at currents of about 1 mu A and at residual pressures ranging from 2Ч10-9to 2Ч10-5 Torr,for five different residual gases (H2,CO, CH4,Ar, and Xe). We conclude that flicker noise amplitude at 10 Hz increases slowly with residual pressure, according to an empirical formula: mu (p)=mu 0(p/p0)nwith n 0.2-0.3.For our studies of medium term stability, for given residual gas and pressure, we record about 30 consecutive I(V)characteristics and plot the corresponding points on a Fowler-Nordheim slope-intercept chart. We have developed different analytical expressions for slope and intercept for smooth emitters and for emitters with sharp protrusions. Analysis of slope-intercept charts leads to several conclusions, particularly that emission is dominated by small, sharp nano protrusions that are relatively unstable. Future plans include testing various tip conditioning techniques to improve stability. copyright 2004 American Vacuum Society. [J856]

"Generation of nano-sized free standing single crystal silicon particles"

A system has been designed to generate monodisperse, single crystal silicon nanoparticles. The particles are generated using a SiH4/H2mixture in a high density plasma. An aerodynamic lens assembly focuses and size selects the particles. A high voltage plate is used to accelerate the charged particles such that they can be injected into a high temperature annealing tube to be heated. The shape and structure of the particles are changed in the annealing tube. Single crystals are obtained. copyright 2004 American Vacuum Society. [J857]

"Microelectron field emitter array with focus lenses for multielectron beam lithography based on silicon on insulator wafer"

We report on a device concept, results of fabrication, and characterization of a monolithic electron field emitter array with focus lenses for multielectron beam lithography and high-density nano data storage. An array of individually addressable emitters of various materials was patterned on oxidized etch pits of a silicon on insulator (SOI) wafer. Si active layer of the SOI with gate hole array that self-aligned with the emitters was used as a common gate electrode. An array of cylindrical holes formed at the Si base of the SOI was used as a common lens electrode. For a single Pt emitter with gate hole of 2 mcm diameter, the emission current started at a gate voltage Vgate=90 Vand reached to 1.2 mu A current and 0.84 mW beam power at Vgate=300 Vand anode voltage Vanod=0.7 kV.The emission current was found to be stable with a fluctuation smaller than 10%/h. The emitter-gate and emitter-lens leak currents were found to be less then 1% compared with the emission current. The focusing characteristic of the device was experimentally confirmed by observing emission patterns on a phosphor anode screen. A simulation work using a finite-element method has shown that the emitted electron beam with emission cone angle within 15° can be focused at a spot of 40 nm diameter and 200 mcm focal length at a lens voltage Vlens=-6 V.copyright 2004 American Vacuum Society. [J858]

"Characterization of material contrast and effective wavelength effects in immersion inspection"

The electromagnetic effects of complementary clear-opaque nano-imprint mold inspection and light scattering from small defects are analyzed through simulation. For a wavelength of 365 nm, 40 nm features, and 10 nm defects in an opaque layer with 10% transmission and with a 20 nm gap between complementary molds, leakage light from feature edges dominates the total transmitted light. However, a filter in the pupil can generally enhance defect intensity signals to about 10% of the defect-free intensity. The same polarization signals for defects on the edge are best enhanced by filters blocking signals perpendicular to that edge. The cross polarization signals are important for defects at corners and require no filter. Simulations of light scattering by small square-post defects show that scatter light scales with the square of defect volume at defect sizes up to 20 nm at a wavelength of 193 nm. The use of immersion at 193 nm increases the cross polarization by the refractive index of the liquid but there is little improvement for the same polarization. An opaque layer material with high refractive index contrast to silica and liquid is desirable. copyright 2004 American Vacuum Society. [J859]

"Alkylation of nanoporous silica thin films by high density plasma chemical vapor deposition of a-SiC:H"

Film stacks of a-SiC:Hand molecularly templated nanoporous silica thin films have been prepared, and alkylation of pore surfaces of the nanoporous silica layer by the a-SiC:Hlayer was studied. The a-SiC:Hthin films were deposited by high-density plasma chemical vapor deposition (HDP-CVD) using trimethylsilane (3MS) as the precursor. Carbon is found to uniformly distribute in the thin nanoporous silica film, and the carbon content in the nanoporous film decreases with increasing the a-SiC:Hdeposition temperature. We used the modified Sanderson formalism to estimate the corresponding Si(2p)and C(1s)electron energies in x-ray photoelectron spectra (XPS) for possible terminal species on pore surfaces in the nanoporous silica layer. According to the XPS analysis and thermal desorption mass spectroscopy, the terminal species are probably in the chemical form of alkoxyl structures. The alkoxyl terminal groups introduced into the nanoporous silica thin film are believed to stem from hydrocarbons trapped in microvoids in the a-SiC:Hfilm, which are formed during the HDP-CVD deposition. The terminal alkoxyl groups in the nanoporous silica layer can greatly enhance the hydrophobicity of the nanoporous silica dielectric, and hence improve the dielectric property of the film stack of a-SiC:H/nanoporoussilica. An effective dielectric constant smaller than 1.7 can be obtained for the film stacks. copyright 2004 American Vacuum Society. [J860]

"Characteristics of nano electron source fabricated using beam assisted process"

A nano electron source was fabricated using electron beam-induced deposition. Characteristics of a nano electron source fabricated using beam assisted processes were investigated by current-voltage measurement. The emission current was observed at a gate voltage of 25 V and showed a linear dependence in Fowler-Nordheim plots. An emission half-angle of about 9.8° was obtained. copyright 2004 American Vacuum Society. [J861]

"Frictional properties of alkanethiol self-assembled monolayers with different thermal annealing"

We have studied the thermal annealing effect on friction of alkanethiol self-assembled monolayers (SAMs) using atomic force microscopy and frictional force microscopy. The friction is found to increase with thermal annealing time once the annealing temperature is high enough. The change in friction is well correlated with the change in the SAM structure. From a densely packed (Ч)R30°phase to a (рЧ)stripe phase with lower density, the magnitude of friction is found to increase by 10 times. Such an increase in friction is proposed as being due to the less compact surface structure of the stripe phase, which opens up additional energy dissipation channels to the film. copyright 2004 American Institute of Physics. [J862]

"Thermal stability of InGaN multiple-quantum-well light-emitting diodes on an AlN/sapphire template"

InGaN multiple-quantum-well light-emitting diodes (LEDs) were grown on an AlN/sapphire template by metalorganic chemical vapor deposition. The crystalline quality was investigated by x-ray diffraction and electron-beam-induced current. The thermal stability of the LED was demonstrated by measurements of current-voltage, light output power-current, and electroluminescence (EL) spectra at different temperatures. The output power at 200 mA decreased by 7.3% for the LED on the template upon increasing temperature from 25 to 95 °C, while that for the LED on sapphire decreased by 23.9%. The peak external quantum efficiency decreased from 0.23% to 0.22% and from 0.15% to 0.10% for the LEDs on the template and on sapphire, respectively. The EL spectrum peak at 20 mA shifted to lower energy by 17.2 meV for the LED on the template upon increasing

temperature, while that for the LED on sapphire shifted by 32.7 meV. The LED on the template exhibited a higher output power and a better thermal stability with respect to the conventional LED on sapphire using a low-temperature GaN buffer layer, which is due to the low threading dislocation density in the active layer and the high thermal conductivity of AlN layer. copyright 2004 American Institute of Physics. [J863]

"Influence of arsenic during indium deposition on the formation of the wetting layers of InAs quantum dots grown by migration enhanced epitaxy"

We compared the structural and optical properties of InAs/GaAsquantum dots grown by migration enhanced epitaxy, with and without arsenic, during indium deposition. The uniformity and size of the quantum dots are enhanced in a sample without arsenic. As a result, narrower and longer wavelength photoluminescence is observed in this sample. Furthermore, the thickness of the wetting layers is reduced by 20%in the sample without arsenic, and this result agrees well with the speculation that metallic indium has a smaller driving force for corrugating the InAs wetting layers before they are transformed from two-dimensional to three-dimensional layers. Additionally, the photoluminescence linewidth of the sample without arsenic is insensitive to the cryostat temperature due to two major factors: the reduced thickness of the wetting layers and the enhanced uniformity. In the sample with arsenic, however, the photoluminescence linewidth shows typical anomalies. [J864]

"Effect of nano-crystallization of high velocity oxy-fuel-sprayed amorphous NiCrBSi alloy on properties of the coatings"

NiCrBSiself-fluxing alloy coatings were deposited by high velocity oxy-fuel (HVOF) spraying. Annealing treatment was applied to the as-sprayed coatings to develop the microstructure of the Ni-based coating. The microstructure of the coating was characterized using optical microscopy, x-ray diffraction and transmission electron microscopy. The crystallization behavior of the amorphous coating was also characterized by differential scanning calorimetry. The properties of the coating were characterized by microhardness and abrasive wear tests. The results showed that the as-sprayed HVOF coating deposited by well melted spray particles exhibited a dense microstructure of amorphous phase. It was revealed that the crystallization of the amorphous phase in HVOF NiCrBSicoating occurs at a temperature of about 502°C. Annealing at temperature a little higher than recrystallization temperature leads to the formation of the nano-crystalline microstructure. The subsequent nanostructured Ni-based coating presents higher microhardness and excellent wear performance. With the further increase in annealing temperature, the growth of the nano-crystalline grains occurs and, accordingly, the microhardness of the coating and the wear performance decrease. Thereafter, the microstructure and properties of the Ni-based self-fluxing alloy coating can be controlled through postannealing treatment. [J865]

"Organosilane self-assembled monolayers directly linked to the diamond surfaces"

An amino-terminated self-assembled monolayer (SAM) was prepared from p-aminophenyltrimethoxysilane (H2N(CH)6Si(OCH3)3,APhS)on diamond substrates irradiated by vacuum ultraviolet (VUV) light (wavelength: 172nm) through chemical vapor deposition. Furthermore, the APhS-SAMwas irradiated by VUV light in air. After the VUV irradiation, only one layer of siloxane (SiOx)was left as a result of the selective decomposition of organic compounds. APhS-SAMwas reprepared on the SiOxsurface. The evidence as to the respective processes was clearly obtained by x-ray photoelectron spectroscopy (XPS) and water contact angle measurements. Based on the chemical bonding states analysis, APhS-SAMswere confirmed to be directly linked to the diamond substrates and SiOxlayers with bonding types of Si-O-Cand Si-O-Si, respectively. The compositions obtained by XPS measurement indicate that the thickness of the SiOxlayer was increased gradually by repeating the APhS-SAMformations and VUV irradiations in this order. Finally, we are successful in controlling the nano-scale thickness of the SiOxlayer, which is the interface between APhS-SAMs and diamond substrates. [J866]

"Zinc-embedded silica nanoparticle layer in a multilayer coating on a glass substrate achieves broadband antireflection and high transparency"

A zinc-embedded silica (Zn-SiO2)nanoparticle layer has been applied as the outermost layer over the three-layer coating system, Zn-SiO2/SiO2/ITO(indium tin oxide), coated on a soda-lime glass substrate. The additional coating of the zinc-embedded nanoparticle layer over the 2-layer/glass, i.e., SiO2/ITO/glasssystem, yielded a significant diminution in reflectance, as well as an improved transmittance as compared to the 2-layer/glass system. Plausible mechanisms responsible for such phenomena are discussed. The application of the zinc-embedded silica nanoparticle layer to the multilayer coating system is shown to provide a flexible way to achieve a broadband antireflection and a high transmission. [J867]

"Interdiffusion and structural change in an InGaAs dots-in-a-well structure by rapid thermal

annealing"

Post-growth rapid thermal annealing (RTA)has been used to investigate an interdiffusion and the structural change in an InGaAsdots-in-a-well (DWELL) structure grown by molecular beam epitaxy using an alternately supplying InAsand GaAssources. In the case of the as-grown sample, which has a metastable quantum structure due to an intentional deficit of source materials, it is found that an InGaAsquantum well (QW) coexists with the premature quantum dots (QDs), and an intermediate layer exists between the QW and the QDs. Through the RTA process at 600 and 800°Cfor 30s, metastable structure changes into a normal DWELL structure composed of QDs and QW as a result of the intermixing of premature QDs and the intermediate layer. [J868]

"A quantitative model for the blueshift induced by rapid thermal annealing in GaNAs /GaAs triple quantum wells"

The effects of rapid thermal annealing (RTA) on the optical properties of GaNAs/GaAstriple quantum wells grown by chemical beam epitaxy are studied in detail by photoluminescence (PL) spectroscopy at 77K. Special emphasis is put on the RTA-induced PL peak blueshift. It is found that the blueshift is neither due to nitrogen diffusion from well layer to barrier layer nor due to homogenization of nitrogen composition fluctuations. The blueshift is due to the coupling between the radiative recombination of PL emission and the nonradiative recombination of nonradiative centers. A quantitative model is proposed in which the blueshift is proportional to the relative change of the concentration of nonradiative centers. This model quantitatively explains not only our present results but also previous observations. [J869]

"Diffusion of O 2 in C 60 crystal by measuring the decay of electrical conductivity"

The time dependence of the decay of dark electrical conductivity sigma (t)from C60crystals under air exposure was investigated at different temperatures. The decay of sigma (t)can be fitted via a stretched exponential function, indicating that the diffusion of O2in C60crystal follows a hierarchically constrained dynamic. The diffusivity of molecular oxygen in C60crystal is estimated using the least-square fitted time constant, and an activation energy EA=1.5eVcorresponding to the diffusion process is deduced from the Arrhenius plot. The mechanism of the diffusion process is then discussed. [J870]

"Optical, structural, and electrical characteristics of high dielectric constant zirconium oxide thin films deposited by spray pyrolysis"

The spray pyrolysis technique was used to obtain high dielectric constant zirconium oxide films. These films were deposited on silicon substrates, and quartz slides from two different solution concentrations (0.033 and 0.066 M) of zirconium acetylacetonate dissolved in N,N-dimethylformamide at substrate temperatures in the range of 400-600 °C. The films are transparent with a surface roughness lower than 40 E and with the ZrO2stoichiometry. The refractive index of the films was up to 2.12 at 630 nm. Infrared spectroscopy measurements show a dominant absorption band associated to ZrO2at 420 cm-1and the presence of silicon oxide (SiO2)peaks as well. Cross-section transmission electron microscopy (TEM) images of these films reveal the existence of a thin layer at the silicon substrate interface with the deposited ZrO2film. It is also found from both cross-section and plan-view TEM observations that the deposited layers consist of tetragonal ZrO2nano-crystallites embedded in an amorphous zirconium oxide matrix. Spectroscopic ellipsometry measurements were fitted assuming the existence of a thin interface layer on top of the Si substrate, composed of SiO2,ZrO2,and crystalline silicon. The as-deposited films have a dielectric constant in the range from 10.9 to 17.5 when they are deposited at different substrate temperatures for the two spraying solution concentrations studied. The films withstand electric fields up to 3 MV/cm, without observing destructive dielectric breakdown. copyright 2004 American Vacuum Society. [J871]

"Microelectromechanical system device for calibration of atomic force microscope cantilever spring constants between 0.01 and 4 N/m"

Calibration of atomic force microscope (AFM) cantilevers is necessary for the measurement of nano-newton and pico-newton forces, which are critical to analytical application of AFM in the analysis of polymer surfaces, biological structures and organic molecules. Previously we have described microfabricated array of reference spring (MARS) devices for AFM cantilever spring-constant calibration. Hitherto, these have been limited to the calibration of AFM cantilevers above 0.03 N/m, although they can be used to calibrate cantilevers of lower stiffness with reduced accuracy. Below this limit MARS devices similar to the designs hitherto described would be fragile and difficult to manufacture with reasonable yield. In this work we describe a device we call torsional MARS. This is a large-area torsional mechanical resonator, manufactured by bulk micromachining of a "silicon-on-insulator" wafer. By measuring its torsional oscillation accurately in vacuum we can deduce its torsional spring constant. The torsional reference spring spans the range of spring constant (from 4 down to 0.01 N/m)

that is important in biological AFM, allowing even the most compliant AFM cantilever to be calibrated easily and rapidly. copyright 2004 American Vacuum Society. [J872]

"Nano patterning on optical fiber and laser diode facet with dry resist"

Semiconductor micro and nanofabrication lithography techniques for application in microelectronics as well as in micromechanics and optoelectronics can gain significantly from using a dry resist process, since it enables the deposition of a very uniform lithographically sensitive layer on a potentially very small area. This would otherwise be extremely difficult to achieve by using a traditional spin coated resist, such as poly(methylmethacrylate) (PMMA). We demonstrate the use of an electron sensitive sterol based evaporated electron beam resist to fabricate high-resolution features (down to 100 nm) on a small surface area. This electron beam resist has a sensitivity comparable to PMMA and is deposited using a simple thermal evaporation. Two practical applications are explored: first, this resist makes it possible to fabricate a Fresnel zone plate lens on the tip of an optical fiber in order to demonstrate the principle and the potential of highly efficient coupling of diode laser emission into the fiber; second, we use this evaporated electron beam resist in order to pattern an optical diffractive element on the facet of a semiconductor laser. copyright 2004 American Vacuum Society. [J873]

"Spectroscopic characterization of high k dielectrics: Applications to interface electronic structure and stability against chemical phase separation"

Extensive spectroscopic characterization of high k materials under consideration for replacing Si oxide as the gate dielectric in Si-based microelectronic devices has been accomplished. Band offset energies of Zr silicates with respect to Si have been determined as a function of silicate alloy composition by combining near-edge x-ray absorption fine structure spectroscopy, vacuum-ultraviolet spectroscopic ellipsometry, x-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy, and ab initio calculations on cluster models. These studies provide insight that applies to both transition metal- and rare earth-based dielectrics, including binary oxides and silicate and aluminate alloys. Results have been used to estimate the electronic conduction through Hf silicate films as a function of alloy composition. Thermally induced chemical phase separation in Zr silicate films has been characterized using XPS, Fourier transform infrared spectroscopy, x-ray diffraction, high-resolution transmission electron microscopy, and extended x-ray absorption fine structure spectroscopy. Our results indicate separation into a noncrystalline, Si-rich phase and either nano- or microcrystalline ZrO2,depending on the original film stoichiometry. copyright 2004 American Vacuum Society. [J874]

"Luminescence behavior of Li-doped Gd 2 O 3 :Eu 3+ thin film phosphors grown by pulsed laser ablation"

Gd2O3:Eu3+and Li-doped Gd2O3:Eu3+luminescent thin films have been grown on Al2O3(0001)substrates at substrate temperatures in the range of 500-700 °C and oxygen pressure in the range of 100-300 mTorr using a pulsed laser deposition technique. The films grown under different deposition conditions have been characterized using microstructural and luminescent measurements. The photoluminescence brightness data obtained from Li-doped Gd2O3:Eu3+films grown under optimized conditions have indicated that sapphire is a good substrate for the growth of high quality Li-doped Gd2O3:Eu3+thin film red phosphor. The luminescence of the Gd2O3:Eu3+films is highly dependent on the crystallinity and surface roughness of the films. In particular, incorporation of Li+ions into the Gd2O3lattice induces a remarkablly enhanced crystallinity and photoluminescence. The full width at half maximum of the diffraction peaks is narrower (20%) for films grown with versus films grown without Li doping. The root mean square roughness of these films was found to vary from 7.5 to 16.1 nm depending upon the Li doping. The highest emission intensity of Li-doped Gd2O3:Eu3+films was increased by a facto--r of 2.3 in comparison with that of Gd2O3:Eu3+films. This phosphor is promising for the flat panel displays. copyright 2004 American Vacuum Society. [J875]

"Physical self-assembly and the nucleation of three-dimensional nanostructures by oblique angle deposition"

Growth front morphology of a thin film formed by physical vapor deposition is controlled by many factors including surface diffusion and shadowing effects. Instabilities can occur if shadowing is more dominant compared to other surface effects and can lead to many diverse physically self-assembled three-dimensional nano-size structures. In this article, we explore the fundamental nucleation and growth mechanisms of the nanostructures during oblique angle deposition. Monte Carlo simulations were carried out to predict the island density, island size distribution, and island-island correlation during the initial stages of growth. The results were compared to that obtained by the oblique angle sputter deposited tungsten films imaged by atomic force microscopy and scanning electron microscopy. Isolated islands with quasiperiodic distribution were formed as a natural consequence of the shadowing effect. Isolated columnar structures are shown to grow on these islands

and the width W of the columns is predicted to grow as a function of column length d in a power law form, W dp,where the exponent p is between 0.3 and 0.5. The predicted p is consistent with the experimentally determined exponent values for growth of column widths from a variety of materials such as W, Co, Cu, and Si. The exponent values calculated from a derived continuum equation were also consistent with the experimental results. copyright 2004 American Vacuum Society. [J876]

"Direct trim etching process of Si/SiO 2 gate stacks using 193 nm ArF patterns"

A polysilicon gate of 30 nm length is successfully fabricated by direct trimming of a gate stack that consists of organic BARC, polycrystalline silicon (poly-Si) and SiO2.It is achieved by patterning the gate stack using a 193 nm photoresist process and trimming the poly-Si gate with HBr/Cl2plasma chemistry in an inductively coupled plasma (ICP) etcher. HBr is found to be more effective than Cl2as a trimming etchant since it can achieve a higher trimming rate. A maximum trimming rate of 32 nm/min is obtained with gas chemistry of 80% HBr and 20% Cl2at 40 mTorr, ICP power of 700 W, and rf bias power of 0 W. In general, the trimming rate increases with an increase in ICP power from 200 to 800 W and decrease in pressure from 70 to 10 mTorr. The inclusion of SF6and O2to the plasma and the longer trimming time are found to be very effective in reducing the poly-Si footprint which is observed after the trimming process. copyright 2004 American Vacuum Society. [J877]

"Investigation of etching properties of HfO based high-K dielectrics using inductively coupled plasma"

The etching properties of HfO based high dielectric constant (K)films, HfO2,HfON, HfSiO, and HfAlO, were investigated using inductively coupled plasma of Cl2/HBr/CHF3/CF4/O2.The etch rates varied depending on the chemical components in the films. Among HfO2,HfON, HfSiO, and HfAlO, the etch rates of HfSiO increased most significantly with increasing radio frequency bias power. This may be attributed to the ternary network of Hf-Si-O that is different from the binary network of other films of Hf-O, Hf-N, Si-O, and Al-O. The etch rates of HfON were higher than those of HfO2due to the effect of the high Hf-N etch rates compared to the Hf-O etch rates, whereas the HfAlO etch rates were lower than those of HfO2due to the effect of the low Al-O etch rates. Etch residues and chemical compositions of HfO based dielectrics were analyzed by x-ray photoelectron spectroscopy and time-of-flight secondary ion mass spectroscopy. A significant amount of fluorides existed on the surface after CF4/CHF3etching whereas only a small amount of chloride and bromide existed after Cl2/HBretching. The high temperature post-treatment step was effective in reducing the amount of residues. copyright 2004 American Vacuum Society. [J878]

"Giant exchange bias and the vertical shifts of hysteresis loops in gamma -Fe 2 O 3 -coated Fe nanoparticles"

We fabricated core/shell-structured Fe nanoparticles, in which the alpha -Fe core is about 5 nm in diameter and the gamma -Fe2O3shell is about 3 nm thick, and systematically studied their structural and magnetic properties. The magnetic hysteresis (M-H)loops, measured at low temperatures, after the particles were cooled from 350 K in a 50 kOe field, show significant shifts in both horizontal and vertical directions. It has been found that the exchange-bias field can be as large as 6.3 kOe at 2 K, and that the coercive field is also enhanced greatly in the field-cooled (FC) loops. The large exchange bias and vertical shifts of the FC loops at low temperatures may be ascribed to the frozen spins in the shells. A simple model is proposed to interpret the observations. copyright 2004 American Institute of Physics. [J879]

"Solid C 60 doped with C 70 : Order-to-disorder transition studied with dielectric and 13 C nuclear magnetic resonance spectroscopies"

C60crystals containing C70at various dopant levels from 0% to 10% have been grown via a method of "solvent dilution." Their crystallographic structures as revealed by x-ray diffraction exhibit an extra hcp lattice, and this stacking fault character increases with C70concentration. The same trend applies to the shift of transition temperature in dielectric spectra, and in 13Cnuclear magnetic resonance spectra, an additional resonance appeared besides the primary resonance in doped samples. We explain such phenomena as follows. The additional resonance arises from a diamagnetic ring-current effect in C70.C60and C70molecules in an hcp phase undergo a cylindrical motion around their threefold axis, which is parallel to the crystallographic sixfold axis, instead of "spherical" motion in fcc C60crystal. The lower molecular rotations correspond to lower free energy of the high-temperature phase. The free energy barrier between the high- and the low-temperature phases thus decreases, accounting for the suppression of orientational order-disorder transition temperature. copyright 2004 American Institute of Physics. [J880]

"Excitation energy transfer and population dynamics in a quantum dot system induced by optical

near-field interaction"

Energy transfer and exciton population dynamics in a two-quantum dot system coupled with a phonon heat-bath system are examined using the density matrix formalism. In such a system, optical near-field interactions induce energy transfer between quantum dots, and exciton-phonon interactions guarantee the unidirectional excitation energy transfer. Our theoretical investigation shows that the population dynamics change drastically depending on the coupling strengths due to optical near-field interactions and exciton-phonon heat-bath interactions. The temperature effect promotes frequent energy back-transfer from the heat-bath to the quantum dot system. Applying our theoretical formulation, we numerically calculate the time evolution of populations, and estimate energy transfer time or state-filling time for a CuCl quantum dot system. The estimated time is suitable for the elements in our proposed optical nano-switch and nano-photonic devices. copyright 2003 American Institute of Physics. [J881]

"Transmission electron microscopy study on ferromagnetic (Ga,Mn)N epitaxial films"

We report on the crystal structure of epitaxial (Ga,Mn)N films with Mn=0.2%grown by plasma-enhanced molecular beam epitaxy, exhibiting n-type conductivity and room temperature ferromagnetism (Ms=0.76 emu/cm3,Hc=90 Oe).The additional diffraction spots are found in the zone axis of B=[11Ï00]for the (Ga,Mn)N epilayer due to a single twin orientation in the closed packed hexagonal matrix. High-order Laue zone measurements reveal the expansion of lattice parameter a(3.1851-3.1865 E) by doping Mn, demonstrating that Mn ions substitute for Ga ions in the (Ga,Mn)N. copyright 2003 American Institute of Physics. [J882]

"Comparison of force balance calibration techniques for the nano-Newton range"

With the rapid progress of micro- and nanoscale fabrication technology, devices are continually being created which produce extremely small forces. This creates a distinct need for a measurement instrument and adequate calibration techniques which can resolve forces below 1 mu N. Two calibration methods for force balance measurements in the nano-Newton range are presented. These methods are based on a free molecule gas dynamic expansion through a thin-walled orifice and the electrostatic actuation of a miniature comb drive. Due to the advantages and disadvantages of every calibration technique, multiple techniques are often required to validate performance results for microscale devices. Because these calibration techniques typically rely on completely different physical processes and can be described by different sets of analytical equations, the comparison of one technique to another is necessary when high accuracy is required. The gas dynamic and electrostatic force calibration techniques have been compared and were found to agree to within 8% for force levels between 35 nano-Newtons and 1 mu N. copyright 2003 American Institute of Physics. [J883]

"Spin-current-assisted domain-wall depinning in a submicron magnetic wire"

We demonstrate experimentally the domain-wall depinning triggered by injecting the polarized spin current into the domain wall. The domain wall is pinned at the junction of a large pad and a narrow wire prior to the current injection experiment. When the polarized spin current is injected along the direction of the domain-wall propagation, the pinned domain wall is freed and pushed into the wire at the critical current that monotonously decreases by increasing the applied bias magnetic field. These results imply that the injection of the spin-polarized current into the domain wall causes additional magnetic pressure due to the spin-momentum transfer between the spin-polarized current and the localized magnetic moment. copyright 2003 American Institute of Physics. [J884]

"Suppressed pinning field of a trapped domain wall due to direct current injection"

We investigate the influence of the dc current injection on trapped domain walls in magnetic nanostructures designed for high precision anisotropy magnetoresistance measurements. The results obtained for a simple strip with no trapped domain wall are compared with those for the strip with the trapped domain wall. The depinning field of the domain wall decreases significantly when the electron current is applied along the direction of the domain wall propagation. On the other hand, the switching field only shows a small reduction when the electron current is opposed to the domain wall propagation. The origin of this behavior can be explained by considering Joule heat as well as an additional pressure exerted on the domain wall due to the transfer of the spin angular momentum from the spin-polarized current to the local magnetic moment. copyright 2003 American Institute of Physics. [J885]

"Metal drift induced electrical instability of porous low dielectric constant film"

Nano-porous carbon doped oxide (CDO) is one of the potential low dielectric constant (low-k)materials that can achieve a dielectric constant as low as 2.2 and is expected to be suitable for the next generation multilevel

interconnection. However, the electrical stability of CDO in contact with metal has not been addressed. In this work, metal ions' drift into nano-porous CDO is investigated. It is observed that both the Al and Cu ions can be driven into porous CDO film easily by applying electric field or thermal treatment. This results in a severe flat band voltage shift of the metal/CDO/Si capacitor structure. It is hypothesized that the lacking formation of self-limited aluminum oxide between Al and CDO film make Al ions drift into CDO. The adhesion of Al and Cu to CDO is also very poor. A physical model, combining weak dielectric polarization and metal ions drift, was proposed to explain the observed electrical instability. The inconsistent results regarding the Al/porous low-k/Sistructure reported in the previous literatures can also be explained with this proposed model. Fortunately, TaN, as a common diffusion barrier material for Cu interconnect structure, is proved to have good adhesion to CDO. Negligible metal ions would drift in CDO during electrical stress. It is concluded that with a suitable diffusion barrier, such as TaN, CDO is still a very promising material for next generation Cu-interconnect technology. copyright 2003 American Institute of Physics. [J886]

"Standard sample probes for characterizing optical apertures in near-field scanning optical microscopy"

A quick, cost effective, semiquantitative means for gauging the quality of near-field scanning optical microscopy (NSOM) probe apertures has been demonstrated by employing a nanoperforated thin metal film standard sample. Small 182 nm holes were created by evaporating gold over dispersed latex spheres with subsequent removal of the spheres. The size of the NSOM aperture can be determined from a deconvolution of the image size and the known sample size and geometry. Results from the standard correlate well with aperture size measurements made from scanning electron micrographs.copyright 2003 American Institute of Physics. [J887]

"Assembly of nanodevices with carbon nanotubes through nanorobotic manipulations"

Properties and potential applications of carbon nanotubes are summarized by emphasizing the aspects of nanoelectronics and nanoelectromechanical systems (NEMS). The main technologies for the assembly of nanodevices through nanomanipulations with scanning probe microscopes and nanorobotic manipulators are overviewed, focusing on that of nanotubes. Key techniques for nanoassembly include the preparation of nano building blocks and property characterization of them, the positioning of the building blocks with nanometer-scale resolution, and the connection of them. Nanorobotic manipulations, which are characterized by multiple degrees of freedom (DOFs) with both position and orientation control, independently actuated multiprobes, and a real-time observation system, are one of the most promising technologies for assembling complex nanodevices in three-dimensional space. With a nano laboratory, a prototype nanomanufacturing system based on a 16-DOF nanorobotic manipulation system, the assembly of nanodevices with multiwalled carbon nanotubes are presented. Nanotube-based building blocks are prepared by directly picking up, in situ property characterization, destructive fabrication, and shape modifications. Kinds of nanotube junctions, the fundamental elements for both nanoelectronics and NEMS, are constructed by positioning the building blocks together under the real-time observation with a field-emission scanning electron microscope, connecting them with naturally existing van der Waals forces, electron-beam-induced deposition, or mechanochemical bonding. [J888]

"Nonlinear circuit foundations for nanodevices. I. The four-element torus"

Not all molecular and nanodevices are useful from an information technology perspective. Such devices are said to be inept in a precise technical sense that can be easily tested from an explicit mathematical criteria to be presented in this two-part tutorial review. Often an inept device can be redesigned into a smart device capable of computing and artificial intelligence by massaging the device's parameters, such as doping, concentration, geometrical profile, chemical moiety, etc., in accordance with the principle of local activity to be articulated in Part II. In particular, designing a smart nanodevice amounts to fine tuning the device parameters into a much smaller niche within the device's locally active parameter region called the edge of chaos where complexity abounds. Molecular and nanodevices will remain novelty toys for nanodevice specialists unless they possess realistic nonlinear circuit models so that future nano circuit designers can simulate their exotic designs as easily and accurately as current CMOS circuit designers. A mathematically consistent theory for modeling nonlinear, high-frequency nanodevices, specially those which exploited exotic tunneling and entanglement quantum mechanical effects, such as Coulomb blockade, quasi-particle dynamics, Kondo resonance, Aharonov-Bohm nonlocal interactions, etc., will require the introduction of a complete family of fundamental circuit elements as model building blocks. They are presented via a doubly periodic table of circuit elements somewhat reminiscent of Mendeleev's periodic table of chemical elements. These fundamental circuit elements can be compactly represented by a loop of four generic species of circuit elements wrapped around the surface of a torus where any higher order element having an arbitrarily high order of frequency dependence can be generated from one of them, modulo the integer 4, ad infinitum. The significance of this four-element torus is that realistic circuit models of all current and future molecular and nanodevices must necessarily build upon an appropriate subset of

nonlinear circuit elements begotten from this torus. [J889]

"Using self-assembly for the fabrication of nano-scale electronic and photonic devices"

Challenges facing the scaling of microelectronics to sub-50 nm dimensions and the demanding material and structural requirements of integrated photonic and microelectromechanical systems suggest that alternative fabrication technologies are needed to produce nano-scale devices. Inspired by complex, functional, self-assembled structures and systems found in Nature we suggest that self-assembly can be employed as an effective tool for nanofabrication. We define a self-assembling system as one in which the elements of the system interact in pre-defined ways to spontaneously generate a higher order structure. Self-assembly is a parallel fabrication process that, at the molecular level, can generate three-dimensional structures with sub-nanometer precision. Guiding the process of self-assembly by external forces and geometrical constraints can reconfigure a system dynamically on demand. We survey some of the recent applications of self-assembly for nanofabrication of electronic and photonic devices. Five self-assembling systems are discussed: 1) self-assembled molecular monolayers; 2) self-assembly in supramolecular chemistry; 3) self-assembly of nanocrystals and nanowires; 4) self-assembly of phase-separated block copolymers; 5) colloidal self-assembly. These techniques can generate features ranging in size from a few angstroms to a few microns. We conclude with a discussion of the limitations and challenges facing self-assembly and some potential directions along which the development of self-assembly as a nanofabrication technology may proceed. [J890]

"The highlights in the nano world"

In this highlight paper, the key structures and devices in nanoelectronics and spintronics are described. The successful realization of magnetic RAM (MRAM) by using nanotechnology has been demonstrated through the integration of 1-Mb chip. In this design, the pseudo spin valve (PSV) technology has been applied. Key quantum devices like quantum dot surface emitting lasers, quantum dot intersubband detectors, and molecular electronics are presented. In the emergent nanobiotechnology, nanodevices fabricated by using biotechnology and nanobiomedical applications using nanoparticles have been addressed. Since universities play important roles in both research and education, innovative nanotechnology education efforts in universities such as the National Nanotechnology Infrastructure Network have been described. Finally, the leading role of the IEEE in promoting worldwide nanotechnology research and education is addressed and future advances in nanotechnology are expected. [J891]

"Median-based robust algorithms for tracing neurons from noisy confocal microscope images"

This paper presents a method to exploit rank statistics to improve fully automatic tracing of neurons from noisy digital confocal microscope images. Previously proposed exploratory tracing (vectorization) algorithms work by recursively following the neuronal topology, guided by responses of multiple directional correlation kernels. These algorithms were found to fail when the data was of lower quality (noisier, less contrast, weak signal, or more discontinuous structures). This type of data is commonly encountered in the study of neuronal growth on microfabricated surfaces. We show that by partitioning the correlation kernels in the tracing algorithm into multiple subkernels, and using the median of their responses as the guiding criterion improves the tracing precision from 41% to 89% for low-quality data, with a 5% improvement in recall. Improved handling was observed for artifacts such as discontinuities and/or hollowness of structures. The new algorithms require slightly higher amounts of computation, but are still acceptably fast, typically consuming less than 2 seconds on a personal computer (Pentium III, 500 MHz, 128 MB). They produce labeling for all somas present in the field, and a graph-theoretic representation of all dendritic/axonal structures that can be edited. Topological and size measurements such as area, length, and tortuosity are derived readily. The efficiency, accuracy, and fully-automated nature of the proposed method makes it attractive for large-scale applications such as high-throughput assays in the pharmaceutical industry, and study of neuron growth on nano/micro-fabricated structures. A careful quantitative validation of the proposed algorithms is provided against manually derived tracing, using a performance measure that combines the precision and recall metrics. [J892]

"Micro- and nano-electrokinetics in medicine"

First Page of the Article [J893]

"Extremely scaled silicon nano-CMOS devices"

Silicon-based CMOS technology can be scaled well into the nanometer regime. High-performance, planar, ultrathin-body devices fabricated on silicon-on-insulator substrates have been demonstrated down to 15-nm gate lengths. We have also introduced the FinFET, a double-gate device structure that is relatively simple to fabricate and can be scaled to gate lengths below 10 nm. In this paper, some of the key elements of these

technologies are described, including sublithographic patterning, the effects of crystal orientation and roughness on carrier mobility, gate work function engineering, circuit performance, and sensitivity to process-induced variations. [J894]

"Zeroing in on ethical issues in nanotechnology"

Setting aside exaggerated notions of both the benefits and harms to be expected from nanotechnologies, we need to focus ethical investigation on specific initiatives at the nano scale that are already underway or planned. The aims are to anticipate ethical issues likely to arise in specific cases, to foster sensitivity to ethical issues and responsibility among nano specialists and policy makers, and to stimulate interchange between nano specialists and members of the public so that the public can become involved. After clarifying what the term "nanotechnology" embraces and looking at cautionary lessons from experience with the information technologies and biotechnology, the discussion turns to the importance of anticipating consequences, intended and unintended. Although specific nano options to consider are lacking, a brief survey indicates the issues to watch out for: preventable harms, conflicts about justice and fairness, respect for persons, and more specifically, safeguards for workers in new production processes, intellectual property concerns, preservation of university values in university/industry relationships, and conflicts of interest. Three main fronts of activity are needed to address ethical issues: 1) incorporating ethics research into nano research and development enterprises; 2) devising mechanisms to involve the public so that their perspectives and concerns feed back into research and development; and 3) initiating educational efforts at every level addressing both technical aspects and ethics and social implications aspects. [J895]

"High aspect ratio nano-oxidation of silicon with noncontact atomic force microscopy"

We report the formation of high aspect ratio 0.3 (height/width) oxide features with noncontact mode atomic force microscopy assisted lithography. The process requires high humidity levels, series of short pulses 100 ns, high voltage level 25 V, a tip oscillation amplitude 20 nm, and feedback "on." We also show that the application of a voltage at magnitude higher than a certain limit damages the surface. copyright 2003 American Vacuum Society. [J896]

"Fabry-Perot structures for attenuated phase-shifting mask application in ArF and F 2 lithography"

We demonstrate a structure for an attenuated phase-shifting mask (APSM) which is based on a three-layer Fabry-Perot structure for ArF (193 nm) and F2 (157 nm)excimer laser based lithographies. The APSM structure is composed of a metal/dielectric/metal stack. The optical characteristics of the Fabry-Perot structure meet the following requirements: 180° phase shift, transmittance in the range of 4%-15%, reflectance of less than 10% at the exposure wavelength, and high inspection contrast at the inspection wavelength. Common dielectric and metal materials, such as chromium, tungsten, amorphous silicon, silicon dioxide, aluminum oxide, and aluminum nitride films, can be used to construct the Fabry-Perot structure. The top metal layer can also prevent charge accumulation during electron-beam writing. copyright 2003 American Vacuum Society. [J897]

"Aluminum oxidation by a remote electron cyclotron resonance plasma in magnetic tunnel junctions"

The aluminum barrier in exchange biased (Mn-Ir/Co-Fe/AlOx/Py)magnetic tunnel junctions was formed by oxidation with an electron cyclotron resonance plasma source. This technique allows, in contrast to commonly used floating substrate, an independent control of the energy of the ions bombarding the Al film by adjusting a direct current bias voltage at the sample. Here, we show that low energy ions and oxidation times between 50 and 200 s lead to optimum barrier properties and a maximum tunnel magneto resistance (TMR) ratio of 46% at room temperature and 73% at 10 K. Shorter oxidation time gives underoxidized samples with strongly reduced TMR. Ions with energy above 30 eV turn out to strongly overoxidize the sample resulting in large junction resistance and reduced TMR values. copyright 2003 American Vacuum Society. [J898]

"Highly selective and high rate SiO 2 etching using argon-added C 2 F 4 /CF 3 I plasma"

A high SiO2etching rate (more than 5000 A/min) and an extremely high etching selectivity to photoresist (more than 10) have been simultaneously achieved in C2F4/CF3I/Arplasma using a conventional dual-frequency reactive ion etching system. The etching selectivity increases with increases of Ar dilution in C2F4/CF3I.The carbon/fluorine ratio of the fluorocarbon polymer on the photoresist was drastically increased by Ar dilution and ion bombardment, which caused the etching rate of a photoresist to decrease. Under these conditions, high-aspect-ratio SiO2contact etching (0.09 mcm Φ, more than 10) was achieved. These gas chemistries are promising candidates for use in nano-scale high-aspect-ratio SiO2etching. copyright 2003 American Vacuum Society. [J899]

"Fabrication of nickel oxide nanostructures by atomic force microscope nano-oxidation and wet etching"

We report the fabrication of nickel oxide nanostructures by atomic force microscope nano-oxidation and subsequent wet etching. By applying a negative bias to a conductive tip, nickel oxide patterns are first created by the process of nano-oxidation. The unoxidized nickel film is then etched away in a diluted nitric acid solution. Auger electron spectroscopy measurements confirm the complete removal of the nickel film and the preservation of the oxide patterns. Nickel oxide nanodots with diameters as small as 100 nm are reliably produced by the present method. copyright 2003 American Vacuum Society. [J900]

"Comparison of dry etching of AlGaAs and InGaP in a planar inductively coupled BCl 3 plasma"

We studied dry etching of AlGaAs and InGaP in a planar inductively coupled BCl3plasma. The process parameters were planar ICP source power (0-500 W), reactive ion etching (RIE) chuck power (0-150 W), and chamber pressure (5-15 mTorr). The process results were characterized in terms of etch rate, surface morphology, and surface roughness. The planar inductively coupled BCl3plasmas were also monitored with in situ optical emission spectroscopy (OES). BCl3planar inductively coupled process (ICP) etching of AlGaAs showed very vertical sidewall, clean and smooth surface, while that of InGaP showed somewhat rough surface after etching. Etch rates of AlGaAs were generally higher than those of InGaP in the planar BCl3ICP etching. It indicated that InClXbyproducts had relatively low volatility during InGaP etching in the planar inductively BCl3plasmas. Increase of ICP source power and RIE chuck power strongly raised etch rates of both AlGaAs and InGaP. That of pressure decreased etch rate of both materials. OES data showed that emission intensity of the planar BCl3ICP was a strong function of ICP source power and chamber pressure, while it was almost independent of RIE chuck power. copyright 2003 American Vacuum Society. [J901]

"Large scale ultraviolet-based nanoimprint lithography"

Limits in resolution and accuracy of large scale ultraviolet (UV)-based nanoimprint lithography using rigid quartz molds and spin coated UV curable resists are presented. The resolution and precision parameters are closely followed from pattern in the mold through imprints in the resist and finally compared with structures transferred into silicon by special etching processes. Specific attention is paid to the simultaneous patterning of nano and microscale structures. The applicability for functional nanoelectronic components is demonstrated by the fabrication of an NMOS transistor based on SOI, whose channel width is reduced to 50 nm. copyright 2003 American Vacuum Society. [J902]

"Free-space-wiring fabrication in nano-space by focused-ion-beam chemical vapor deposition"

Focused-ion-beam chemical vapor deposition (FIB-CVD) is an excellent technology for forming three-dimensional nanostructures. Various diamond-like-carbon (DLC) free-space-wirings have been demonstrated by FIB-CVD using a computer-controlled pattern generator, which is a commercially available pattern generator for electron-beam (EB) lithography. The material composition and crystal structure of DLC free-space-wiring were studied by transmission-electron microscopy and energy-dispersive x-ray spectroscopy. As a result, it became clear that DLC free-space-wiring is amorphous carbon containing a Ga core in the wire. Furthermore, the electrical resistivity measurement of DLC free-space-wiring was carried out by two terminal electrodes. Au electrodes were fabricated by EB lithography and a lift-off process. The electrical resistivity was about 100 Omega cm at room temperature. copyright 2003 American Vacuum Society. [J903]

"Electron emission from nanotips of amorphous diamond"

Amorphous diamond can be deposited with a high-density (4Ч1010emitters/cm2)of nano-sized emitters. The turn on applied field strength was reduced by increasing aspect ratio of amorphous diamond nanotips. Moreover, the field emission was highly sensitive to the aspect ratio of tips, and relatively inert to the sp3/(sp3+sp2)ratio. The lowest turn on applied field strengths was 4.6 V/mcm at the current density of 10 mu A/cm2;and 11 V/mcm at the current density of 10 mA/cm2.High reproducibility of field emission was also observed in this study. copyright 2003 American Vacuum Society. [J904]

"Formation of polycrystalline silicon germanium/HfO 2 gate stack structure using inductively coupled plasma etching"

A gate stack structure consisting of a polycrystalline silicon germanium (poly-SiGe) conductor and a HfO2dielectric on a silicon substrate was formed by inductively coupled plasma etching using HBr/Cl2/O2.Etch rates of poly-SiGe with 46% Ge were 1.7-2.0 times higher than those of polycrystalline silicon, depending on

processing conditions. In the small feature sized devices of 100 nm gates, the notching at the sidewall of poly-SiGe was pronounced up to the depth of 50 nm. The amount of notching increased with increasing inductive power and pressure, and decreasing rf bias power. A HfO2etch rate of 950 E/min was obtained at the condition of 550 W inductive power, 360 W rf bias power, and 10 mTorr pressure. Etch rates of HfO2increased with increasing inductive power and rf bias power. Etching selectivity of poly-SiGe with respect to HfO2increased significantly with the addition of 3.8% O2to HBr, and it was possible to control the selectivity in the range of 15-70 by changing the rf bias power. The change in etching selectivity was considered mainly due to the change in HfO2film property, originating from the incorporation of O into the remaining nonvolatile Hf and the reformation of HfOxduring etching. copyright 2003 American Vacuum Society. [J905]

"Cleaning of Si and properties of the HfO 2 -Si interface"

The effectiveness of modified Shiraki and RCA cleans on the properties of HfO2gate dielectric and its interface with silicon has been investigated. Modified Shiraki clean provides atomically flat and more completely hydrogen terminated Si surfaces resulting in sharper low energy electron diffraction images and longer inhibition times for native oxide regrowth. Capacitors based on HfO2deposited by reactive electron beam evaporation under O2partial pressure and annealed in H2atmosphere show different properties, dependent on the cleaning method. Capacitance-voltage curves obtained on RCA cleaned samples show lower capacitance and higher distortion than those of modified Shiraki samples. Analysis of capacitance-voltage curves implies higher density of interfacial traps in RCA cleaned devices and thicker interfacial oxides compared to modified Shiraki clean, resulting in higher effective oxide thickness of the dielectric stack. copyright 2003 American Vacuum Society. [J906]

"Microstructure and properties of ultrathin amorphous silicon nitride protective coating"

The effect of N content on the structure and properties of rf reactively sputtered amorphous silicon nitride (a-SiNx)has been studied by Rutherford backscattering spectrometry, x-ray reflectivity, ellipsometry, and nano-indentation. The N content in the film increased with the N2concentration in the sputtering gas until the Si3N4stoichiometry was reached. The hardness of a-SiNxincreased with density, which in turn increased with the N content. The maximum hardness of 25 GPa and density of 3.2 g/cm3were attained at the stoichiometric Si3N4composition. With the application of a protective overcoat for magnetic disks in mind, thin a-SiNxfilms were deposited on CoPtCr media to examine their coverage, pinhole density, and wear resistance. According to x-ray photoelectron spectroscopy, the minimum thickness of a-SiNxrequired to protect the CoPtCr alloy from oxidation was 10 E, which was 10 E thinner than that of the reference amorphous nitrogenated carbon (a-CNx).A statistic model showed this lower thickness required for a-SiNxcan be attributed to its high density, which corresponds to 93% bulk density of Si3N4.Compared with 45 E a-CNxcoated disks, 15 E a-SiNxcoated disks had lower pinhole defect density and superior wear resistance. copyright 2003 American Vacuum Society. [J907]

"Surface morphology and magnetization reversal"

We have studied the microstructure and surface morphology in annealed and nonannealed (001) epitaxial Ni films deposited on MgO single crystalline substrates. The correlation between microstructure and the magnetic anisotropy properties of the films such as the magnetization reversal has been determined. Scanning tunneling microscopy images of the surface of the annealed films indicate self-assembled periodic stripe nano-patterning, while images of the nonannealed films show typical mounded surfaces. The azimuthal dependence of the coercive field in the nonannealed films exhibits fourfold symmetry as expected from the symmetry of the crystal. The annealed films exhibit an additional uniaxial symmetry superimposed to the fourfold symmetry. Additional structural studies to understand the origin of the surface nano-patterning observed on (001) Ni films will also be presented. copyright 2003 American Vacuum Society. [J908]

"Enhancement of emission characteristics for field-emitter arrays by optimizing the etched feature of the gate electrode"

The etched features of thin chromium (Cr) films deposited on SiO2-Sisubstrate were investigated as a function of the substrate temperature during rf sputtering deposition. In this work, the changes of both the grain structures and crystallographic orientations of sputtered Cr films as a function of substrate temperature were examined, and we found that the tapering angle theta tof thin Cr film after reactive ion etching depends on the deposition condition, especially the substrate temperature during the rf sputtering process. Based on the obtained results, we fabricated two kinds of Cr-grated Mo-tip field-emitter arrays (FEAs): the first kind is a FEA with tapered-gate electrode (tapered-gated FEA, theta t≤90°)and the second kind is a FEA with taper-free gate electrode (nontapered-gated FEA, theta t=90°).We obtained more emission current than that of tapered-gated FEAs, whereas the gate leakage current of nontapered-gated FEAs was almost the same value as compared to that of

tapered-gated FEAs. Because of the optimized etched shape of the gated electrode, the field conversion factor beta of the nontapered-gated FEAs increased to 32% more than that of tapered-gated FEAs. Furthermore, the total transconductance Gmof nontapered-gated FEAs increased to 20% without increasing the packing density of FEAs. copyright 2003 American Vacuum Society. [J909]

"Multiple-pulse laser annealing of preamorphized silicon for ultrashallow boron junction formation"

Advantages of multiple-pulse laser annealing with a moderate energy fluence over a single-pulse annealing with a high energy fluence are demonstrated on the formation of shallow p+/njunction. When the silicon surface is preamorphized, the multiple-pulse laser annealing with a fluence adjusted to a value which can melt the amorphous layer but not crystal silicon shows that the successive pulses do not increase junction depth further but decrease sheet resistance significantly. Under this condition, the junction depth is still controlled by the depth of the preamorphized layer. However, when the laser fluence is high enough to melt the crystal silicon, the successive pulses result in the deepening of junction depth. This is attributed to the increase of surface roughness by the successive pulses, thereby increasing the total absorbed energy. copyright 2003 American Vacuum Society. [J910]

"Development of a cold-cathode electron gun for cathode-ray tube using a Mo-tip field-emitter array"

The Mo-tip field-emitter array (FEA) was applied to the electron gun of the cathode-ray tube (CRT). In order to replace the conventional thermionic cathode with a cold cathode, the Mo-tip FEA was newly designed according to the specification of the CRT electron gun. The electron-emission properties and display performances of the electron gun with a Mo-tip FEA cathode were characterized and discussed. The fabricated electron gun with a Mo-tip FEA cathode showed better performance in terms of emission current and switch-on time. Finally, the potential applicability was guaranteed by means of operating the 19 in. color CRT using the fabricated electron gun with the Mo-tip FEA. copyright 2003 American Vacuum Society. [J911]

"Fabrication of mesoscopic devices using atomic force macroscopic electric field induced oxidation"

We demonstrate the fabrication of mesoscopic devices on aluminum, titanium, and silicon-on-insulator thin films by using atomic force microscopic electric field induced oxidation together with selective wet etching. The fabricated device structure is a percolating network consisting of conducting dots (50-100 nm in diameter) randomly distributed within an area of 1Ч1mcm2.Details on how to fabricate the network structure and the making of electrical contacts to the device will be focused upon. Good agreement between results from transport measurement of an aluminum test sample we made and data from the literature warrants reliability of our sample fabrication technique. copyright 2003 American Vacuum Society. [J912]

"Packaging for microelectromechanical and nanoelectromechanical systems"

Packaging is a core technology for the advancement of microelectromechanical systems (MEMS) and nanoelectromechanical systems (NEMS). We discuss MEMS packaging challenges in the context of functional interfaces, reliability, modeling and integration. These challenges are application-dependent; therefore, two case studies on accelerometers and BioMEMS are presented for an in-depth illustration. Presently, most NEMS are in the exploratory stage and hence a unique path to identify the relevant packaging issues for these devices has not been determined. We do, however, expect the self-assembly of nano-devices to play a key role in NEMS packaging. We demonstrate this point in two case studies, one on a silicon nanowire biosensor, and the other on self-assembly in molecular biology. MEMS/NEMS have the potential to have a tremendous impact on various sectors such as automotive, aerospace, heavy duty applications, and health care. Packaging engineers have an opportunity to make this impact a reality by developing low-cost, high-performance and high-reliability packaging solutions. [J913]

"Infrared passbands from fractal slit patterns on a metal plate"

We show that a fractal pattern of submicron wide slits, etched on a 0.1-mcm-thick gold film, exhibit multiple pass and stop bands in the wavelength regime of 2-200 mcm. In the midinfrared regime, the passbands show 36%transmission (three orders of magnitude higher than the reference), and the stop bands exhibit 80%reflection. In the far infrared regime, the passband transmittances are 25%, 29%, and 14%, respectively, at wavelengths of 34, 62, and 111 mcm. These transmittances are rather high in view of the fact that supporting substrate is itself only about 40% transmitting, and a control pattern of holes with similar void-to-metal ratio is 3000 times less transmitting in all frequencies. We attribute the high transmittance from subwavelength slits to geometric resonances. copyright 2003 American Institute of Physics. [J914]

"Chirality-dependent curvature effect in smallest single-walled carbon nanotubes"

Polarized Raman spectra are measured for 0.4 nm single-walled carbon nanotubes embedded in the zeolite matrix. The polarization dependence of the Raman intensity of the radial breathing mode showed that the carbon nanotubes inside the channels of the zeolite are perfectly aligned. The observed radial breathing mode frequencies deviated from those predicted by the elastic model. The strong curvature effect leads to two features: (i) the radial breathing mode frequencies show obvious softening and (ii) the degree of the softening depends on the tube chirality, which agrees well with the theoretic calculations. copyright 2003 American Institute of Physics. [J915]

"First-principle study on GaN epitaxy on lattice-matched ZrB 2 substrates"

We theoretically investigate GaN epitaxy on ZrB2substrates by clarifying the atomic and electronic structures of GaN/ZrB2interfaces by first-principle calculations. Both the GaN epitaxial layer and the ZrB2substrate almost maintain the bulk structures when the epitaxial growth begins with the formation of N-Zr bonds. On the other hand, a remarkable zigzag structural change, which seems to deteriorate the lattice-matched nature of ZrB2substrates, is found in the interfacial B plane when B-N bonds are formed at the interface. These results indicate that suppression of the B-N bond formation is a key point for the effective use of ZrB2as a substrate of GaN. We also estimate the Schottky barrier heights of these interfaces. The calculated p-type Schottky barrier height of the interface which contains three N-Zr bonds is small enough to form ohmic contacts. copyright 2003 American Institute of Physics. [J916]

"Optical properties of organic dyes in nanoporous zeolite crystals"

Organic dye molecules of styryl 7 were introduced into the channels of AlPO4-5single crystals. Polarized absorption and photoluminescence spectra of the dye molecules were investigated. The polarization angle dependence of the absorption and photoluminescence intensity indicates that the dye molecules are highly oriented in the channels. The hexagonal-shaped AlPO4-5single crystal serves as a natural microcavity for lasing action of the dye molecules. The microcavity modes of the lasing action were also demonstrated. copyright 2003 American Institute of Physics. [J917]

"Anomalous compositional pulling effect in InGaN/GaN multiple quantum wells"

A series of InGaN/GaN multiple quantum wells (MQWs) was grown by metalorganic chemical vapor deposition with different well thickness. High-resolution x-ray diffraction studies revealed that the In composition is increasing along the growth direction from the bottom to the top of each well layer in these MQWs. While the In composition at the bottom of each well layer almost keeps constant, the increasing rate of In composition becomes obviously larger when the growth temperature is decreased. The important conclusion of this study is that the InGaN/GaN MQWs is shaped like a triangle due to the increasing of In composition from the bottom to the top of the well layer. The emission mechanism of the InGaN/GaN MQWs has to be discussed based on the triangular band gap structure. copyright 2003 American Institute of Physics. [J918]

"Formation mechanism of TiO 2 nanotubes"

Transmission electron microscopic observation showed that TiO2nanotubes synthesized via a simple hydrothermal chemical process formed a crystalline structure with open-ended and multiwall morphologies. Unlike multiwalled carbon nanotubes, the TiO2nanotube walls were not seamless. During alkali treatment, crystalline TiO2raw material underwent delamination in the alkali solution to produce single-layer TiO2sheets. TiO2nanotubes were formed by rolling up the single-layer TiO2sheets with a rolling-up vector of [001] and attracting other sheets to surround the tubes. copyright 2003 American Institute of Physics. [J919]

"A predictive tool in micro- and nanoengineering: Straightforward estimation of conformal film growth efficiency"

It is shown that the conformal film growth (CFG) efficiency (ECFG)of micro- and nanoscale cavities can be rationalized in terms of relevant physical and geometric parameters. Based on extensive numerical simulations and using the dynamic scaling theory of interface growth, it is concluded that the relevant quantity for the evaluation of ECFGis the so-called physical aspect ratio SP=L/Mbeta /alpha ,where alpha (beta) is the roughness (growth) exponent that governs the dynamic evolution of the system, and L (M)is the typical depth (width) of the cavity. The theoretical predictions are in excellent agreement with recently reported experimental data for the super conformal filling of electrodeposited copper and chemically deposited silver in confined geometries [J. Electrochem. Soc. 147, 4524 (2000)], thus providing the basis of a tool to manage micro- and nano-engineering-related problems not completely resolved so far. copyright 2003 American Institute of Physics.

[J920]

"Effects due to disorder on photonic crystal-based waveguides"

Using the multiple-scattering method, we have studied the effects of various types of disorders on the performance of two-dimensional photonic crystal-based waveguides with cylindrical inclusions. The following three types of disorders are considered: (a) all cylinders are disordered; (b) only those cylinders in the boundary layer of the waveguide are disordered; and (c) all cylinders except those in the boundary layer of the waveguide are disordered. Our results show that, for both the cases of position and size randomness, the quality of the waveguide is insensitive to the type-(c) disorder, but very sensitive to type-(a) and type-(b) disorder. We thus conclude that the uniformity of the microstructures in the boundary layer of the waveguide is vital in ensuring the functionality of the waveguide. copyright 2003 American Institute of Physics. [J921]

"Nanostructured silicon formations as a result of ionized N 2 gas reactions on silicon with native oxide layers"

Nanostructured silicon was formed by means of the ionized N2gas reaction on SiO2/Si,and the electronic structure, surface morphology, and optical properties were investigated. The physicochemically modified thin layers were resolved to SiNyand SiOxNythrough the observation of Si 2p,O 1s,and N 1score-level spectra in x-ray photoelectron spectroscopy. The formations of SiOxNyand SiO2nanostructures (3-4 nm in size), performed by the etching process followed by adsorption of ionized nitrogen, were confirmed by atomic force microscopy. The nanocrystalline Si (6 nm in size) distributed within the modified layer (approximately 10 nm thick) was observed after the in situ rapid thermal annealing processes, using high-resolution transmission electron microscopy. Photoluminescence with a wavelength peaking at around 400 nm was emitted from the nanocrystalline Si formed from the SiOxNy/SiO2/Sistructures. This work suggests that the nanocrystalline-Si formation and the nanostructured surface modification method, using the controlled ionized gas, were simple and efficient methods requiring low energy and low temperatures. copyright 2003 American Institute of Physics. [J922]

"ZnSe nanowires epitaxially grown on GaP(111) substrates by molecular-beam epitaxy"

We report molecular-beam epitaxy growth of single crystalline ZnSe nanowires with uniform diameters (10 nm) on GaP(111) substrates. The growth process was based on the Au-catalyzed vapor-liquid-solid deposition. As determined by electron microdiffraction and high-resolution transmission electron microscopy, ZnSe nanowires grew generally along the and directions with the orientation relationship of (111)ZnSe wire//(111)GaPand ZnSe wire//GaP.The dominant defects were found to be twins at the interface between the substrate and the nanowires along the (111) plane. copyright 2003 American Institute of Physics. [J923]

"Microcantilevers integrated with heaters and piezoelectric detectors for nano data-storage application"

A thermomechanical writing system and a piezoelectric readback system have been demonstrated using silicon cantilevers integrated with heaters and piezoelectric sensors for a low-power scanning-probe-microscopy data-storage system. A thin polymethylmethacrylate film has been used as a media to record data bits of 50 nm in diameter and 25 nm in depth using the silicon cantilever. The sensitivity of 0.22 fC/nm was also obtained using the fabricated cantilever. Finally, to obtain readback signals using the piezoelectric cantilever, a patterned oxide wafer with 30 nm depth was scanned to show the distinctive charge signals. copyright 2003 American Institute of Physics. [J924]

"Dielectric characteristics of low-permittivity silicate using electron beam direct patterning for intermetal dielectric applications"

A direct patterning technology of low-permittivity silicate-based polymer is investigated with electron-beam lithography for multilevel interconnections. The smallest feature size of 60 nm for damascene lines can be directly patterned in the silicate film. In this direct patterning, dielectric regions exposed by electron beam are crosslinked and form desirable patterns, while the others are dissolvable in an aqueous solution containing 2.38% tetramethylammonium hydroxide. With an optimum condition of electron-beam lithography, the electron-beam-irradiated silicate exhibits superior dielectric properties than that of the furnace-cured silicate film, due to minimizing the break of Si-H bonds and moisture uptake. The explanation is in agreement with the analyses of Fourier transform infrared spectroscopy and thermal desorption spectroscopy. copyright 2003 American Institute of Physics. [J925]

"Moore's law lives on [JCMOS transistors]"

We discuss several device structures suitable for scaling CMOS devices well into the nano-CMOS era, perhaps down below 10 nm physical gate length. The ultra-thin body MOSFET device structure has many features in common with today's bulk MOSFET, which makes it easier for industry to introduce into manufacturing. On the other hand, the double-gate structure as represented by the FinFET appears to offer greater scalability down to 10 nm gate length or perhaps even below. While a number of significant challenges remain to be overcome, including device parasitics, interfaces, and threshold voltage control techniques, it appears that the continued evolution of CMOS integrated circuit technology into this regime will not be impeded by basic limitations of the underlying transistor technology. The implication of this is that "Moore's law" may continue for yet another 15-20 years before the ultimate device limits for CMOS are reached. [J926]

"Positronium time-of-flight measurements of porous low-k films"

We demonstrate that positronium (Ps) time-of-flight (TOF) spectroscopy provides a powerful technique for probing the structure of porous low-dielectric constant (low-k)films. The emission of ortho-positronium (o-Ps)from the surface of a series of nano-porous silsesquioxane films was studied with a newly developed TOF spectrometer. Clear Ps emission peaks were observed from the two high porosity films (F38 and KI31), indicating their higher open porosity in comparison with other films. We also observed that the energy of o-Psemission from F38 is much higher than that from KI31. It was concluded that the open pores in the former film are less tortuous, and o-Psloses significantly less energy emerging from its surface than from that of latter film. copyright 2003 American Institute of Physics. [J927]

"Large band gaps in elastic phononic crystals with air inclusions"

We find that a large absolute band gap can be created by inserting air inclusions in a two-component elastic phononic crystal with small density contrast and filling fraction. The positions of the insertion are chosen to suppress the shear potential energy of the first optical band and lower their frequencies. This is demonstrated in a two-dimensional system consisting of aluminum cylinders in a triangular lattice with a filling fraction of 0.145 embedded in an epoxy host. Both the band structure and the transmission calculations show that the insertion of air cylinders in the earlier system is capable of creating a large elastic band gap with gap/midgap ratio Delta omega /omega c=0.53.Such a system makes the realization of a light and effective sonic insulator possible. copyright 2003 American Institute of Physics. [J928]

"Enhanced infrared absorption with dielectric nanoparticles"

Enhanced infrared absorption is demonstrated for anthracene coating polar dielectric nanoparticles of silicon carbide and aluminum oxide. An enhancement factor greater than 100 was measured near the surface of silicon carbide particles. This is the result of the enhanced optical fields at the surface of the particles when illuminated at the surface phonon resonance frequencies. This phonon resonance effect is analogous to plasmon resonance that is the basis of surface enhanced infrared absorption and surface enhanced Raman scattering. The results have implications for near-field microscopy, the characterization of nano-optical devices, and chemical sensing. In addition, the methodology used for surface phonon analysis of particles is useful for simulating comet and interstellar dust spectra. copyright 2003 American Institute of Physics. [J929]

"Spatial diffusion of excitons in n -type modulation-doped (Cd,Mn)Te/(Cd,Mg)Te single quantum wells under magnetic fields"

Time-resolved and spatially resolved photoluminescence (PL) measurements were performed on the (Cd,Mn)Te-based two-dimensional (2D) electron gas system at 4.2 K under magnetic fields up to 0.5 T. The detailed characteristics of the PL spatial extent under these magnetic fields were strongly dependent upon the intrinsic 2D carrier density. We found that, in the lower carrier density sample, the PL spatial extent increased with an increase in the magnetic fields. This is contrary to the result for the nonmagnetic system. These phenomena are qualitatively interpreted by considering the competition of the mobile neutral exciton (X), localized negatively-charged exciton (X-)and, furthermore, the suppression of a free-exciton-magnetic-polaron formation, which is one of the characteristic properties of diluted magnetic semiconductors such as (Cd,Mn)Te. copyright 2003 American Institute of Physics. [J930]

"High-resolution bistable nematic liquid crystal device realized on orientational surface patterns"

The four-fold symmetry of a checkerboard-like surface alignment consisted of square domains arrived at the macroscopic orientational bistability of nematic liquid crystals. Switching between the two orientations took place with an appropriate electric field. Here the threshold field of bistable switching decreased as temperature increased, and the light could heat only the selected region in the cell including a light-absorbing medium.

Irradiating the laser concurrently with an electric field, we addressed a selected region in the alignment pattern without the disturbance of neighboring regions. Extending this process, we realized an extremely fine bistable device of nematic liquid crystal with a pixel size down to about 2 mcm. copyright 2003 American Institute of Physics. [J931]

"Fabrication and magnetic properties of ultrathin Fe nanowire arrays"

Ultrathin Fe nanowire (about 5 nm in diameter) arrays have been fabricated by electrodeposition using anodic porous alumina templates. These ultrathin nanowires exhibited uniaxial anisotropy and a quite large coercivity (4190 Oe) at 5 K. In addition, the field needed to saturate the magnetization, when the field was applied perpendicularly to the easy axis, was much larger than the shape anisotropy field (2pi MS).This saturation field increased with decreasing temperature. We believed that this enhanced saturation field was mainly due to the contribution of the surface spins. copyright 2003 American Institute of Physics. [J932]

"Thermomechanical analyses of laser precision joining for optoelectronic components"

Thermomechanical analyses in laser-spot-welding (LSW) technique for a dual-in-line (DIP) type package has been studied experimentally and numerically to predict post-weld-shift (PWS). Experimental results show that the PWS of optoelectronic component changes sensitively depending on process parameters such as laser energy, beam delivery position, weld joint design and so on. This indicates that the PWS in laser packaging can be minimized by properly controlling the process parameters. A finite element method (FEM) has been carried out on the analysis of the effect of laser parameters and geometry of joint variation on PWS in laser packaging. And experimental studies of laser spot welding and electronic speckle pattern interferometry (ESPI) have also been conducted to validate the numerical model. A satisfactory agreement between the experimental results and FEM calculations suggests that the FEM provides one of the effective methods for predicting the PWS and optimizing package design in LSW technique for optoelectronic packaging. By using the numerical method above this work has led to an understanding of the effect of laser energy variation and joint design on thermal distortion. Hence the PWS can be controlled to produce a reliable laser module with high yield and high performance. [J933]

"Two-photon laser precision microfabrication and its applications to micro-nano devices and systems"

Two-photon absorption (TPA) provides the ability to confine photochemical and physical reactions to the order of laser wavelength in three dimensions. For applying TPA to laser precision microfabrication, we proposed a two-photon photopolymerization technique, by which photonic crystals and various micromachines with near-diffraction-limit features have been produced. Here we show that the diffraction limit was exceeded by utilizing nonlinear laser-matter interaction processes, and spatial resolutions far smaller than the diffraction limit were achieved. The super resolution, combined with other technologies newly developed by us including three-dimensional imaging of voxels, rapid surface profile scanning, device functionalization and its mechanical driving with a laser trapping force, and dye-doping polymerization for three-dimensional microdiagnosis, makes the technique quite compelling for nanophotonic and optical microelectromechanical (MEMS) applications. [J934]

"Characterization and reliability of dual high-k gate dielectric stack (poly-Si-HfO2 -SiO2) prepared by in situ RTCVD process for system-on-chip applications"

We investigate for the first time the possibility of integrating chemical vapor deposition (CVD) HfO2into the multiple gate dielectric system-on-a-chip (SoC) process in the range of 6-7 nm, which supports higher voltage (2.5-5 V operation/tolerance). Results show that CVD HfO2-SiO2stacked gate dielectric (EOT =6.2 nm) exhibits lower leakage current than that of SiO2(EOT =5.7 nm) by a factor of 102, with comparable interface quality (Dit 1Ч1010cm-2eV-1). The presence of negative fixed charge is observed in the HfO2-SiO2gate stack. In addition, the addition of HfO2on SiO2does not alter the dominant conduction mechanism of Fowler-Nordheim tunneling in the HfO2-SiO2gate stack. Furthermore, the HfO2-SiO2gate stack shows longer time to breakdown TBDthan SiO2under constant voltage stress. These results suggest that it may be feasible to use such a gate stack for higher voltage operation in SoC, provided other key requirements such as Vtstability (charge trapping under stress) can be met and the negative fixed charge eliminated. [J935]

"High-precision characterization of single-mode optical fiber arrays"

A precise method of measuring core center dispersion in single-mode fiber arrays is presented. This approach dispenses with the use of high-precision linear translation stages and is based on a direct comparison of the fiber core center position to a simple lithographically patterned template. Combining image recognition and efficient processing algorithm, the fiber-core center positions of fiber arrays can be determined with precision of

order of 0.1 μm, in both longitudinal and transversal directions. Complementary information about the position of fibers within v-grooves as well as bending of multifiber arrays can be also obtained. [J936]

"MgB2 thin films and Josephson devices"

Since the recent discovery of superconductivity in MgB2, various groups worldwide have been actively studying the growth of thin films based on this material. Impressive progress has been made, but various materials science challenges are still left to be solved. Guided by our own activities in this field, and reports presented in the literature, we reflect here on those challenges and possible ways for further improvement. Being important ingredients for many electronic applications, fabrication of Josephson devices and nano-structures in MgB2thin films will furthermore be described. [J937]

"Microwave-transmission, heat and temperature properties of electrically conductive adhesive"

Microwave heating significantly speeds up the curing process of polymer and polymer-based composites. The present theoretical work studies the microwave transmission through the electrically conductive adhesive (ECA), heat generation and transfer inside the ECA and subsequently the microwave heating rate of the ECA. By studying the temporal transmission property of the microwaves in the ECA, we have calculated quantitatively the electromagnetic field distribution around a metal filler. It has been shown that the penetration depth of the skin effect in the metal filler is significantly smaller than the one of a bulk metal material. The heat generation (microwave power absorption) is negligible in the metal filler due to its large electric conductivity. Furthermore, due to the high thermal conductivity, the thermal equilibrium between the metal filler and the surrounding adhesive is reached within a nano second (10-9s). The temperature of the whole ECA system becomes uniform within a time interval of 10-3s. When the temperature of the system is relatively low, the heating rate of the system is linearly proportional to the external microwave input power and the heating time. It gradually saturates when the temperature of the ECA is so high that the heat radiation from the ECA becomes significant. Numerical results of our theoretical model agree well with experimental data, thus providing a solid platform for designing the microwave curing process of the ECA. [J938]

"A floating well method for exact capacitance-voltage measurement of nano technology"

Small gate area with short gate length reduces the C-V distortion of ultrathin oxide devices, but results in high parasitic capacitance/total capacitance ratio. The floating well method can exclude the parasitic capacitance to obtain accurate inversion oxide thickness without using any dummy pattern. It is suitable for nano technology. [J939]

"The future of nanocomputing"

We are aware that the semiconductor industry had already entered the nanotechnology world. The working group proposed a hierarchy consisting of four levels: devices, architecture, state variables and data representation. We review on 3D heterogeneous integration, quantum cellular automata, defect-tolerant architecture, quantum computing, nano devices and other novel devices. This experience suggests some criteria we will need to apply to bring these early research efforts into the realm of high-volume manufacturing. [J940]

"A high-density MIM capacitor (13 fF/μm2) using ALD HfO2 dielectrics"

Metal-insulator-metal (MIM) capacitors with different HfO2thickness have been investigated. The results show that both the capacitance density and voltage coefficients of capacitance (VCCs) increase with decreasing HfO2thickness. In addition, it is found that the VCCs decrease logarithmically with increasing thickness. Furthermore, the MIM capacitor with 10-nm HfO2shows a record high capacitance density of 13 fF/μm2and a VCC of 607 ppm/V, which can meet the requirement of the International Technology Roadmap for Semiconductors. It can also provide a low leakage current of 5.95 Ч 10-8A/cm2at room temperature at 1 V, low tangent values below 0.05, and a small frequency dependence. These results indicate that the devices are suitable for use in silicon integrated circuit applications. [J941]

"High-performance p-channel Schottky-barrier SOI FinFET featuring self-aligned PtSi source/drain and electrical junctions"

A simplified and improved Schottky-barrier metal-oxide-semiconductor device featuring a self-aligned offset channel length, PtSi Schottky junction, and reduced oxide thickness underneath the sub-gate was proposed and demonstrated. To alleviate the drawbacks related to the nonself-aligned offset channel length in the original version, a self-aligned offset channel length is achieved in the new device by forming the silicide source/drain junction self-aligning to the sidewall spacers abutting the gate. This results in not only one mask count saving

but also better device performance, as facilitated by the reduced offset channel length of the self-aligned sidewall spacers. Moreover, the adoption of PtSi for the Schottky junction further improves the on-state current of p-channel operation, while a thinner oxide employed underneath the sub-gate effectively reduces the sub-gate bias needed to form the electrical junction to below 5 V. Significant improvement in on-current as well as leakage current reduction is achieved in the new improved device. [J942]

"Thermal and Mn diffusion behaviors of CoNbZr-based spin valves with nano oxide layers"

The authors investigated the specularity and thermal characteristics of CoNbZr-based spin valves (SVs) with and without employing nano oxide layers (NOL). Both CoNbZr- and Ta-based SV films composed of Si-SiO2-CoNbZr (or Ta)-CoFe-NOL-CoFe-Cu-CoFe-IrMn-CoNbZr (or Ta) were prepared by rf magnetron sputtering. Magnetoresistance (MR) ratios in the as-deposited state increased 48% (3.4% → 5.0%) with incorporation of NOL. In particular, a remarkable enhancement (about 95%) in the MR ratio after annealing at 300°C for 20 min was observed (5.0% → 9.8%). According to the Auger electron spectroscopy depth profile, the large increase of the MR ratios in the initial stage of annealing were due to the double specular scattering effects by the Mn-oxides at the surface and the NOL in the free layer. Due to high affinity of Mn for oxygen, Mn diffused preferentially to the position of high oxygen potential (such as the surface or the NOL) during prolonged annealing. The authors could artificially control the diffusion direction of Mn by providing an oxygen potential (like inserting NOL) in the SV structure. [J943]

"Recording studies on a self-assembling medium of cobalt nano-particles"

The potential of a rugged recording medium derived from precursor films of cobalt nitride that on rapid thermal processing disassociate and reassemble into a dispersion of nanoscale (10 nm dia.) cobalt particles is critically evaluated against commercial thin-film media exhibiting similar coercivity. Extensive low-velocity contact recording experiments show the medium capable of supporting linear densities in excess of 160 kfci (T-50 point) but that unacceptable levels of predominantly transition noise currently mar this performance. The source of this problem is identified as an excessive particle packing density resulting in weak interparticle interactions. Magnetic force imaging on small areas of recorded data shows evidence of particle-particle interactions and this is confirmed to be prevalent across the medium by analysis of ΔI plots derived from isothermal remnant magnetisation and DC demagnetisation curves taken using conventional magnetometry. Suggestions for resolving the high particle density are presented. [J944]

"Fine-line conductor manufacturing using drop-on demand PZT printing technology"

An emerging selective metallization process to fabricate fine-line conductors based on drop-on-demand (DOD) ink jet printing and novel nano-particle fluid suspensions (NPFS) was studied. The suspensions consist of 1-10 nm silver or gold particulates that are homogeneously suspended in an organic carrier. A piezo-electric droplet generator driven by a bipolar voltage signal is used to dispense 50-70 μm diameter droplets traveling at 1-3 m/s before impacting a compliant polyimide substrate. The deposit/substrate composite is subsequently processed at 300°C for 15 min to allow for complete evaporation of the carrier and for sintering of the nano-particles, thereby yielding a finished circuit interconnect. Test vehicles created using this technique exhibit features as fine as 120 μm wide and 1 μm thick with resistivities on the order of 3.5Ч10-5Ωcm. The circuitry performed well under environmental conditioning. As expected, repeatability of circuitry fabrication showed sensitivity to the generation of steady, satellite-free droplets. In an effort to generate droplets consistently, it is essential to develop a strong fundamental understanding of the correlation between device excitation parameters and dispensed fluid properties, and to resolve the microrheological behavior of the NPFS when flowing through the droplet generator [J945]

"High-rate low-temperature (90°C) deposition of Ni-Zn ferrite films highly permeable in gigahertz range"

Ni-Zn ferrite films have been prepared by spraying a reaction solution of FeCl2+ NiCl2+ ZnCl2(pH = 6.8) and an oxidizing solution of NaNO2+ CH3COONH4+ NH4OH (pH = 6.8-9.2) simultaneously onto rotating glass substrates at a substrate temperature of 90°C. The deposition rate increased with the pH value of the oxidizing solution, and a maximum deposition rate of 67 nm/min was attained at pH = 8.4. The film surface observed by scanning electron microscopy was smooth, and a high value of saturation magnetization Ms= 482 emu/cm3with a low value of coercivity Hc= 17 Oe were measured. The film showed a high static permeability μ' = 70 and very high magnetic resonance frequency fTof about 900 MHz. The imaginary part of the permeability μ" was greater than 30 over a wide frequency range from 300 MHz to 3 GHz. Ni-Zn ferrite films prepared in this study should be useful not only for planar inductors but also as shielding materials for electromagnetic interference suppressions. [J946]

"A micromachined vacuum triode using a carbon nanotube cold cathode"

A fully integrated on-chip vacuum microtriode using carbon nanotubes as field emitters was constructed laterally on a silicon surface using microelectromechanical systems (MEMS) design and fabrication principles. Each electrode in the triode was made of a hinged polycrystalline silicon panel that could be rotated and locked into an upright position. The device was operated at a current density as high as 16 A/cm2. Although the transconductance was measured only at 1.3 μS, the dc output power delivered at the anode was almost 40 Ч more than the power lost at the grid electrode. The technique combines high-performance nano-materials with mature solid-state fabrication technology to produce miniaturized power-amplifying vacuum devices in an on-chip form, which could potentially offer a route of integrating vacuum and solid-state electronics and open up new applications for "old-fashioned" vacuum tubes. [J947]

"Morphological evolution of epitaxial cobalt-semiconductor compound layers during growth in a scanning tunneling microscope"

We investigate the mechanisms of CoSi2and CoGe2growth by carefully controlled e-beam evaporation of Co onto Si(001) and Ge/Si(001) substrates from the very initial submonolayer stage, monitored in situ by scanning tunneling microscopy, aided by reflection high-energy electron diffraction. In order to grow different epilayer morphologies, we use flat and vicinal surfaces and two different methods of synthesis: reactive deposition (where Co is deposited onto a hot substrate), and solid-phase reaction (where Co is deposited at lower, or room, temperature). We attempt to account for the observed morphological differences in the epilayers by correlating them with parametric differences in the deposition and growth processes. copyright 2002 American Vacuum Society. [J948]

"Improvements of characteristics of fluorinated dielectric films integrated as interlayer dielectrics"

Fluorinated amorphous carbon films (a-C:F)with postnitrogen plasma treatments demonstrate the characteristics of interlayer dielectrics, including high resistance to pyrolysis, copper diffusion, and penetration of corrosive species into intermetals. Nitrogen plasma nitridation was performed to passivate a-C:F films against copper diffusion, and to prevent the fluorine contents from penetrating into copper intermetals. These improvements to a-C:F films are potentially applicable to fluorinated dielectrics, such as SiOF. copyright 2002 American Vacuum Society. [J949]

"Reduction of etching plasma damage on low dielectric constant fluorinated amorphous carbon films by multiple H 2 plasma treatment"

Two-step hydrogen plasma treatment on low dielectric constant (low-k)fluorinated amorphous carbon films (a-C:F)was conducted to improve their thermal stability and reduce the damage caused by the patterning processes. First, hydrogen plasma treatment repairs imperfect bonds of as-deposited a-C:Ffilms, stabilizing their chemical structures and increasing their resistance against elevated thermal stresses. After this passivation process, an additional hydrogen plasma treatment was applied to a-C:Ffilms that had been etched using a mixture of N2+O2+CHF3,enabling sub-130 nm damascene trenches to be patterned and repairing the chemical structures destroyed by the etching plasma. copyright 2002 American Vacuum Society. [J950]

"Improved TaN barrier layer against Cu diffusion by formation of an amorphous layer using plasma treatment"

The thermal stability and electrical properties of plasma-treated TaN films have been investigated by Cu/TaN/Si systems. The properties of diffusion barrier were evaluated by sheet resistance, x-ray diffraction (XRD), transmission electron microscopy (TEM), x-ray photoelectron spectroscopy (XPS), energy-dispersive spectroscopy (EDS), Auger electron microscopy (AES), and reverse-biased junction leakage current. A new amorphous layer is found to form on the surface of TaN film after the plasma treatment. Plasma-treated TaN films show better barrier performance than untreated TaN films. The sheet resistance of Cu/TaN(10 nm)/Si increases apparently after annealing at 625 °C for 1 h, while the Cu/plasma-treated TaN(10 nm)/Si is fairly stable up to annealing at 750 °C. The resistance to copper diffusion in plasma-treated TaN film is more effective. This is attributed that an amorphous layer that forms on the surface of TaN film after the plasma treatment. The thermal stabilities of Cu/TaN/n+-pjunction diodes are enhanced by plasma treatment. The Cu/TaN(10 nm)/n+-pand Cu/TaN(50 nm)/n+-pjunction diodes result in large reverse-biased junction leakage currents after annealing at 525 and 575 °C, respectively. On the other hand, plasma-treated TaN diffusion barriers improve the integrity of junction diodes up to 650 °C. Nano crystallization and stuffing effects of plasma treatments are believed to impede Cu diffusion into the Si substrate and hence improve the barrier performance. copyright 2002 American Vacuum Society. [J951]

"Effect of H 2 on the etch profile of InP/InGaAsP alloys in Cl 2 /Ar /H 2 inductively coupled plasma reactive ion etching chemistries for photonic device fabrication"

This study demonstrates etch profile engineering of InP, In1-xGaxAs1-yPy,and In0.53Ga0.47Asheterostructures results from adding H2to standard Cl2/Arinductively coupled plasma-reactive ion etching chemistries. Etch rate curves of bulk InP, In1-xGaxAs1-yPy,and In0.53Ga0.47Asshow a general parabolic trend as a function of the H2component of the Cl2/Ar/H2ratio. Three distinct etching profiles of InP/InGaAsP layers were realized by varying the Cl2/Ar/H2ratio. Highly anisotropic profiles result for Cl2/Ar/H2ratios between 2/3/1 and 2/3/2. Waveguiding structures fabricated using this technology are presented with a loss as low as 2 dB/cm. An InP racetrack resonator with a quality factor (Q) 8000is also presented. copyright 2002 American Vacuum Society. [J952]

"Epitaxially overgrown, stable W-GaAs Schottky contacts with sizes down to 50 nm"

A processing scheme for the fabrication of embedded W-GaAs contacts has been established and the resulting contact characteristics have been evaluated. The main advantage of these contacts is that they are stable during high-temperature epitaxial overgrowth. The fabrication scheme is based on a liftoff process with electron beam evaporation of tungsten and subsequent epitaxial overgrowth using metalorganic vapor phase epitaxy. Various methods were used to characterize the buried contacts. First, the structural properties of GaAs surrounding embedded W features, with widths down to 50 nm, were characterized by high-resolution transmission electron microscopy. Measurements of the conductivity in individual, buried wires were performed in order to study the influence of the overgrowth process on the properties of the tungsten. We also evaluated the current-voltage characteristics for macroscopic contacts, which revealed a clear dependence on processing parameters. Optimized processing conditions could thus be established under which limited contact degradation occurred during overgrowth. Finally, we used the overgrowth technique to perform a detailed investigation of the electrical and optical properties of floating-potential embedded nano-Schottky contacts by space-charge spectroscopy. copyright 2002 American Vacuum Society. [J953]

"Bright peak enhanced x-ray clear phase mask"

A clear bright peak enhanced x-ray phase mask (BPEXPM) is described. It employs the constructive interference of spatially coherent radiation as opposed to the destructive interference that is used in all the other phase-shifting schemes. This type of mask shows ultrahigh resolution imaging, feature reduction from the mask critical dimension (CD), and enhanced transmission. It has been simulated and verified experimentally with a 320 nm mask CD. Specifically, the BPEXPM exhibits: (1) approximately three times higher effective sensitivity, 40 mJ/cm2dose to mask for Shipley XP-9947E, a positive-tone chemically amplified resist that normally has a sensitivity of 120 mJ/cm2in the x-ray region and (2) resolution of 54 nm features in XP-9947E at a 50 mcm gap for a 320 nm mask CD. The simulation for the BPEXPM also predicts a wafer image CD of 31 nm at 10 mcm gaps with a 150 nm mask CD. copyright 2002 American Vacuum Society. [J954]

"Role of surface steps in the arrangement of silicon nano-dots on a vicinal Si(111) surface: Scanning tunneling microscopy investigation"

We have investigated the role of surface steps in the arrangement of silicon nano-dots on a vicinal Si(111) surface by scanning tunneling microscopy. Nanometer sized silicon nitride islands were formed on a vicinal Si(111) surface, which was 1°off toward [1Ï1Ï2]direction, via thermal nitridation using N2gas. On the nitrided surface, oxygen gas was dosed to induce a local selective etching of bare silicon using the silicon nitride islands as masks. The resultant surface showed one-dimensional arrangement of silicon nano-dots along the step edges of silicon surface. The lateral size of the dot in the direction perpendicular to the step edges was restricted to the terrace width of the stepped Si(111) surface. We consider that the preferential growth of silicon nitride islands on the edges of single height steps is responsible for the arrangement of silicon nano-dots along the step edges of the 1°off vicinal Si(111) surface. copyright 2002 American Vacuum Society. [J955]

"Thermal-flow techniques for sub-35 nm contact-hole fabrication in electron-beam lithography"

In this article, we demonstrate that 200 nm contact-hole resist patterns can easily be shrunk to less than 35 nm after a simple thermal-flow procedure. The optimal thermal-flow temperature was determined by differential-scanning calorimetry and wafer-curvature measurement. The effects of postapplied baked temperature, thermal-flow temperature, baking time period, and pattern density were evaluated. The resist after thermal flow is more intact than during dry-etching processes. The resist can overcome the resist-thickness loss during the thermal-flow procedure. copyright 2002 American Vacuum Society. [J956]

"Conceptual design of nanostructures for efficient photoinduced phase transitions"

By means of Monte Carlo simulations on a kinetic model, we demonstrate that the efficiency of a photoinduced phase change can in general be enhanced drastically by using a superstructure of an appropriate combination of two components. This is due to the accelerated nucleation of converted domains in the structural blocks relatively close to local instability. The present mechanism provides a general guideline on the design of photocontrollable materials with potential applications for memory and storage devices. copyright 2002 American Institute of Physics. [J957]

"Magneto-optical effects calculated for granular composites with magnetized nano-onions dispersed in matrixes"

For granular composite having nano-onions (nanosized, multicore-shell structured particles) dispersed in a matrix we derived an effective dielectric permittivity tensor including off-diagonal terms, based on the Maxwell Garnett effective field approximation. The magneto-optical Kerr effect was calculated from the effective permittivity tensor for the composite containing nano-onions with Au (core)/Fe (inner shell)/Au (outer shell) structure. The off-diagonal term, xy>=xy'>+ixy">,of the effective permittivity tensor and Kerr effect derived from it exhibit a dispersion relation, xy'>making a peak and xy">crossing zero, at a wavelength around 630 nm. The dispersion may be ascribed to the plasma resonance of Au, because similar peak was found in the Kerr rotation spectra for compositionally modulated multilayered Au/Fe films due to the plasma resonance of Au. copyright 2002 American Institute of Physics. [J958]

"Simple model for patterned bidirectional anchoring of nematic liquid crystal and its bistability"

An effective anchoring model for the patterned surface with bidirectional rubbing by atomic force microscope was proposed. The model was a simple additive function of two bidirectional anchoring contributions of the patterned surface, with consideration of higher-order terms of the anchoring function. The bistable switching behavior of the nematic liquid crystal cells with the patterned surface was investigated analytically and numerically using this anchoring model. copyright 2002 American Institute of Physics. [J959]

"Structure study of Se species in channels of AlPO 4 -5 crystals"

The thermal adsorption/desorption process of selenium species in the channels of AlPO4-5(AFI) single crystals is studied by simultaneous thermogravimetry (TG) and differential scanning calorimetry (DSC). There exist two peaks in the TG and DSC curves, indicating that two different structures of Se species, helical chain and 8-member ring, coexist in the AFI channels. Polarized Raman and optical absorption spectra show that the helical chains are highly aligned along the channel direction, while the Se8rings are randomly oriented in the channels. The helical chains have a lowest optical absorption band at 2.6 eV, which is strongly polarization dependent, while the 8-member rings have a lowest absorption band at 3.0 eV that varies slowly with the light polarization. copyright 2002 American Institute of Physics. [J960]

"Quantum size effect in magnetic tunnel junctions with ultrathin Fe(001) electrodes"

The transport properties of magnetic tunnel junctions with single-crystalline ultrathin Fe(001) electrodes are studied. The tunnel spectra and the bias dependence of the differential magnetoresistance show quantum-well oscillations. This effect provides evidence of ballistic transport through the Al-O barrier and shows that magnetic tunnel junctions with quantum-well states can be a tool for studying spin-dependent transport mechanisms in magnetic tunnel junctions. copyright 2002 American Institute of Physics. [J961]

"Microstructure and phase composition evolution of nano-crystalline carbon films: Dependence on deposition temperature"

Nano-crystalline carbon films possessing a prevailing diamond or a graphite character, depending solely on substrate temperature and deposition time, can be deposited from a methane-hydrogen mixture by the direct current glow discharge plasma chemical vapor deposition method. In this study we investigate the evolution of nano-crystalline carbon films deposited in the 800-950 °C temperature range onto silicon substrates aiming to enlight the physicochemical processes leading to the formation of nano-diamond films. While at a deposition temperature of 880 °C the formation of a thin precursor graphitic film is followed by deposition of a film of diamond character, at higher and lower temperatures the films maintain their graphitic character. The morphology of the films and their growth rate vary with deposition temperature: slower growth rates and higher film roughness are obtained at lower temperatures suggesting the importance of kinetic effects during the growth process. For deposition times longer than 60 min, similar morphologies are obtained irrespectively of the

deposition temperature. A preferred spatial alignment of the basal planes of the graphitic film at the interface with the silicon substrate was determined. The alignment was found to differ with deposition temperature: at 800 and 880 °C the alignment occurs along the graphitic aaxis perpendicular to the silicon substrate, while at 950 °C the caxis is aligned perpendicular to the silicon substrate. However, it was determined that for films a few hundred nm thick close to the evolving surface the films display a preferred alignment of the basal planes vertical to the surface, irrespectively of their orientation at the interface. The reason for this alignment is suggested to be associated with a stress relaxation mechanism in the graphitic films. It was determined that film growth is accompanied by the evolution of large local stresses which obtain a maximum value for the films deposited at 880 °C. The relaxation of these stresses is suggested to lead to the transformation of the graphitic material into the diamond phase. The narrow range of temperatures (880+/-10 °C) which enables the formation of the diamond phase indicates the importance of hydrogen adsorption/desorption processes in the nucleation and growth of the nano-crystalline diamond films. The morphological evolution of the films was analyzed by atomic force microscope. By electron diffraction and high-resolution transmission electron microscopy the phase composition of the films and their microstructure were examined. The alignment of the graphitic films within the near-surface region of the evolving films as a function of the deposition time and temperature was investigated by angle-resolved near edge x-ray absorption fine structure measurements. Raman spectroscopy was applied to determine the presence of stresses within the films and their phase composition. copyright 2002 American Institute of Physics. [J962]

"Direct nano-wiring carbon nanotube using growth barrier: A possible mechanism of selective lateral growth"

In this work we report the direct nano-bridging of carbon nanotubes (CNT) between micro-sized islands using conventional photolithography technique necessary for the nanomachining and the molecular device applications compatible with the Si-based process. The most distinct feature in this work is to use a growth barrier of Nb metal or insulating layer on the top of the catalytic metal to prevent the growth of CNT from the vertical direction to the substrate. As a result, CNTs of either "straight line" or a perfect "Y shape" were selectively grown between lateral sides of the catalytic metals or pre-defined electrodes without any trace of vertical growth. The length of the CNTs was 500-1000 nm and the diameter thinner than about 20 nm. We suggest that magnetic and crystallographic characteristics due to the unique interaction between the Nb overlayer and ferromagnetic Ni catalysts and nano-granulation of Ni layer during the growth process are important for the lateral (i.e., parallel to the substrate) CNTs growth. These results clearly indicate that this method would be one of the most feasible fabrication techniques for the nanomachines or the electronic applications with a high integration level. copyright 2002 American Institute of Physics. [J963]

"Comparison of hard magnetic electrodes for magneto-electronics by magnetic force microscopy"

Both spin valve sensor elements and magnetic tunnel junctions usually consist of a magnetically fixed hard magnetic layer and a soft magnetic counter electrode which can rotate freely in an external driving field. In order to yield reliable sensor signals, the hard magnetic electrode should be magnetically rigid against small fields, i.e., must not be influenced during switching of the sensing electrode. Furthermore, in order to provide a homogeneous switching behavior, the electrodes should show uniformity in their magnetic properties, especially if scaled and patterned down to sub-micron lateral sizes. In this paper, magnetic force microscopy is used to compare the magnetic properties of different hard magnetic layer stacks commonly used in magneto-electronic device technology, i.e. an artificial antiferrimagnet (CoFe/Ru/CoFe and Co/Cu/Co) and exchange biased stacks (MnIr/CoFe/Ru/CoFe). The domain pattern of a polycrystalline artificial ferrimagnet (AFi) shows a strong magnetization ripple, i.e., local variations of the magnetization directions, which are maintained in patterned submicron elements. These statistical local fluctuations can be quantitatively correlated with a reduction of the tunneling magnetoresistance (TMR) of 3%-5% in the minor loop. In addition for small area junctions, the ripple can cause different switching fields in neighboring elements. An additional exchange biasing by a thin natural antiferromagnet is shown to rigidly pin the local magnetization fluctuations of the AFi. The process used for the preparation of this system, however, creates 360° domain walls, which again deteriorate the TMR signal. copyright 2002 American Institute of Physics. [J964]

"Magnetic force microscopy using focused ion beam sharpened tip with deposited antiferro-ferromagnetic multiple layers"

The resolution of magnetic force microscopy can be improved by sharpening the tip using a focused ion beam (FIB). However, when the tip is too sharp it is difficult to deposit continuous films on the tip, and the magnetization of a certain portion of the tip may become unstable due to the small thickness or particle size of the magnetic coating. This in turn may degrade the signal to noise ratio of the detection signal. In this work, a novel tip coated with antiferromagnet-ferromagnet exchanged coupled multiple layers was developed. It was

found that the newly developed tip exhibits a much higher resolution than the conventional trimmed and nontrimmed tips. copyright 2002 American Institute of Physics. [J965]

"Single-molecule near-field optical energy transfer microscopy"

The nano-optical interaction between a sharp tip and a single dipolar emitter is investigated. Changes of the excited state lifetime and the fluorescence rate of single molecules are recorded simultaneously as a function of the tip position relative to the molecule. A subdiffraction-limited area of decreased fluorescence and shortened lifetime is observed for gold-coated Si3N4tips. The results are discussed in terms of molecular fluorescence in a system of stratified media. The outlined methodology holds promise for applications in ultrahigh-resolution near-field optical imaging at the level of single fluorophores. copyright 2002 American Institute of Physics. [J966]

"Extraordinary Hall effect in Co x Pt 100-x films"

CoxPt100-xalloy films, 8.7≤x≤40.6,have been fabricated by the magnetron co-sputtering technique. The structure of the films has been studied by x-ray diffraction and transmission electron microscopy. The results indicate the existence of CoPt3phase in these films. Electric transport and magnetotransport measurements have been performed in the temperature range of 5-300 K and field range of -5-5 T, in which the longitudinal resistivity (rho xx)and extraordinary Hall resistivity (rho s)have been obtained. A power law dependence of extraordinary Hall resistivity on the longitudinal resistivity, rho s rho xxv,is observed, however the value of the exponent (v)changes from 1 to 1.6 as the temperature changes from 5 to 100 K and above. Different vvalues suggest different mechanisms of the extraordinary Hall effect. The dependence of the Hall resistivity on the Co concentration, x, has also been studied. copyright 2002 American Institute of Physics. [J967]

"Ni-Zn ferrite films with high permeability (mu ' = 30, mu " = 30) at 1 GHz prepared at 90 °C"

Ni-Zn ferrite films were prepared by spin-spray ferrite plating method at 90 °C on glass substrates from a reaction solution of FeCl2(+FeCl3)+NiCl2+ZnCl2and an oxidizing solution of NaNO2+CH3COONH4.The complex permeability mu =mu '-imu "values of the as-plated films were measured at frequencies up to 3 GHz. The Ni0.28Zn0.18Fe2.54O4film 0.40 mcm in thickness plated using the mixture of Fe2+and Fe3+as iron ions exhibited a high mu 'of around 42 and a resonance frequency frof 1.2 GHz. This frvalue is about nine times as high as the 130 MHz that was estimated from Snoek's limit for the Ni-Zn ferrite bulk ceramics. Since mu 'also exhibited a maximum value of about 35, the films prepared in this study will be applicable to both rf inductors and wave absorbers for electromagnetic interference suppression. copyright 2002 American Institute of Physics. [J968]

"Head-to-disk spacing control in contact recording studies"

Recording studies with variable head-to-disk spacings have been carried out on a static test stand with a nanometer scale position accuracy. The head-to-disk spacing control was achieved through selective deposition of either supporting pads on the air bearing surface of commercial sliders or additional nonmagnetic layers (in this study, Cr) on commercial post-sputtering disks or the combination of these two. The additional supporting pads not only helped us solve the stiction problem but also allowed us to study the effect of head-to-disk spacing on the readout performance in a contact fashion. A series of read/write experiments have been carried out to study how the half-amplitude pulse width (PW50)parameter is dependent on the head-to-disk spacing by varying the height of the supporting pads or the thickness of the additional nonmagnetic layers or both using a commercial giant magnetoresistance head. It was found that some of the theoretical equations are able to predict the dependence of PW50on the head-to-disk spacing, but some of them do not. The results may be useful for performing scaling analysis studies of future high- density recording systems. copyright 2002 American Institute of Physics. [J969]

"Nanotribological studies of thin CrN x, CrO x and CN x overcoats for magnetic recording applications"

This work presents systematic nanotribological studies of thin CrNx,CrOxand CNxovercoats for magnetic recording applications over a wide range of N and O concentrations. Composition and crystal structure were determined by x-ray diffraction and x-ray photoelectron spectroscopy. The nanohardness and modulus of the thin films were measured with a Hysitron nanomechanical testing system. Nanoscratch tests were made using a Nano Indenter II system and used to assess the wear resistance and adhesion of the thin films. AFM was used to evaluate the surface morphology and the details of the wear track profiles. The hardness, modulus, tribological properties (wear resistance, elastic recovery, adhesion, friction coefficient) and surface roughness of CrNx,CrOxand CNxhave been compared. The hardness and adhesion of CrNxis comparable to CNx,and the

roughness of CrNxis lower than CNx.With a very thin Cr underlayer, CrNxappears to have the potential for magnetic recording applications. copyright 2002 American Institute of Physics. [J970]

"Spectroscopic ellipsometry study of optical transitions in Zn 1-x Co x O alloys"

Zn1-xCoxO(x≤0.22)films were prepared on (0001)-oriented Al2O3substrates by rf magnetron sputtering. The alloys show wurtzite crystal structure with the c-axis lattice constant increasing with increasing x.The optical properties of the samples were measured by spectroscopic ellipsometry at room temperature in the 1.5-5 eV photon energy region. As xincreases, the optical band gap absorption edge (E0)of the alloys shows a redshift from that of pure ZnO, reaching 350 meV for x=0.22.The excitonic character of the E0edge is gradually reduced as xincreases and is replaced by the three-dimensional critical-point shape. Optical absorption structures are also observed below the E0edge near 2 eV and interpreted as due to the transitions between the crystal-field-split 3dlevels of tetrahedral Co2+ions substituting Zn2+ions. copyright 2002 American Institute of Physics. [J971]

"Fabrication of nanometer-spaced electrodes using gold nanoparticles"

A simple and highly reproducible technique is demonstrated for the fabrication of metallic electrodes with nanometer separation. Commercially available bare gold colloidal nanoparticles are first trapped between prefabricated large-separation electrodes to form a low-resistance bridge by an ac electric field. A large dc voltage is then applied to break the bridge via electromigration at room temperature, which consistently produces gaps in the sub-10 nm range. The technique is readily applied to prefabricated electrodes with separation up to 1 mcm, which can be defined using optical lithography. The simple fabrication scheme will facilitate electronic transport studies of individual nanostructures made by chemical synthesis. As an example, measurement of a thiol-coated gold nanoparticle showing a clear Coulomb staircase is presented. copyright 2002 American Institute of Physics. [J972]

"Scaling of nano-Schottky-diodes"

A generally applicable model is presented to describe the potential barrier shape in ultrasmall Schottky diodes. It is shown that for diodes smaller than a characteristic length lc(associated with the semiconductor doping level) the conventional description no longer holds. For such small diodes the Schottky barrier thickness decreases with decreasing diode size. As a consequence, the resistance of the diode is strongly reduced, due to enhanced tunneling. Without the necessity of assuming a reduced (non-bulk) Schottky barrier height, this effect provides an explanation for several experimental observations of enhanced conduction in small Schottky diodes. copyright 2002 American Institute of Physics. [J973]

"Formation of ZnO nanostructures by a simple way of thermal evaporation"

Mass production of ZnO nanowires, nanoribbons, and needle-like rods has been achieved by a simple method of thermal evaporation of ZnO powders mixed with graphite. Metallic catalysts, carrying gases, and vacuum conditions are not necessary. Temperature is the critical experimental parameter for the formation of different morphologies of ZnO nanostructures. Zn or Zn suboxide plays a crucial role for the nucleation of ZnO nanostructures. The as-prepared ZnO nanowires consist of single crystalline cores and thin amorphous shells. As determined by electron diffraction, the growth direction of ZnO nanowires is [001], which has no orientation relationship with the substrate. A strong room-temperature photoluminescence in ZnO nanostructures has been demonstrated. copyright 2002 American Institute of Physics. [J974]

"Spin-polarized light-emitting diode using metal/insulator/semiconductor structures"

We have succeeded in growing ferromagnetic metals (Co, Fe, and NiFe)/Al2O3/AlGaAsheterostructures with homogeneous flat interfaces. The electroluminescence from a light-emitting diode with a metal/insulator/semiconductor (MIS) structure depends on the magnetization direction of the ferromagnetic electrode. This fact shows that a spin injection from the ferromagnetic metal to the semiconductor is achieved. The spin-injection efficiency is estimated to be the order of 1% at room temperature. copyright 2002 American Institute of Physics. [J975]

"Raman spectra of nano-structured carbon films synthesized using ammonia-containing feed gas"

We examined the Raman spectra of nanostructured carbon films grown using the ammonia-containing feed gas at two excitation wavelengths, 514.5 and 1064 nm. The increase of the ammonia concentration in the feed gas resulted in two prominent changes: the complete morphology change (from nanoparticle dominance to nanotube dominance) and the degradation of the graphitic sheet quality. However, the Raman spectra preserved strong resemblance to those of graphite and glassy carbon and showed only systematic variation in the peak position,

width, and the intensities. We noted that the ammonia-concentration-dependent broadening of D and G bands, the up-shift of D band, and the increase of the intensity ratio I(D)/I(G)of these films could be interpreted as the signature for the increase of disorder in the graphitic structure and/or the reduction of the graphitic crystallite size in accordance with the similar observation from other carbon-based films. We attributed the observed excitation-energy-dependent shift of the D-band position and the variation of I(D)/I(G)value to the resonance phenomena in Raman scattering. Moreover, we showed that the dispersion of the D band was in good quantitative agreement with the model proposed by Matthews etal [Phys. Rev. B 59, R6585 (1999)]. copyright 2002 American Institute of Physics. [J976]

"Characterization of GaAs-based n-n and p-n interface junctions prepared by direct wafer bonding"

In this study, the electrical characteristics and interface microstructures of GaAs-based n-n and p-n interface junctions prepared from direct wafer bonding have been systematically investigated through current-voltage measurements and transmission electron microscopy. It is found that a nearly continuous amorphous interface layer exists in all samples bonded at 400 °C. A drastic change in interface morphology caused by atomic rearrangement during high-temperature annealing at 600 °C leads to the formation of a locally perfect junction interface combined with an array of nanoscale, bubblelike amorphous regions. Each of them plays a different role in affecting carrier transports. The regions with local crystalline perfection can result in a considerable reduction of interface resistance for the majority carrier transport. However, the non-negligible interface resistance suggests that at interface boundary, there still exits a large number of interface states resulting from atomic imperfections, such as point defects and dangling bonds. On the other hand, the array of nanoscale, bubblelike regions is believed to provide a significant leakage path for minority carriers in p-n junctions. The p-n junction bonded at 400 °C exhibits an ideality factor of about 1.9 compared to 1.1 from an epitaxially grown p-n junction. After annealing at 600 °C, the increased leakage current along the bubblelike amorphous regions results in a deteriorating ideality factor from 1.9 to 2.5. copyright 2002 American Institute of Physics. [J977]

"Large sonic band gaps in 12-fold quasicrystals"

The sonic band-gap structures of 12-fold symmetry quasicrystals consisting of rigid cylinders in air are investigated by using the multiple scattering method. Large full gaps are found in this system owing to its high symmetry. At filling fractions between 0.2 and 0.4, this 12-fold square-triangle tiling is much better for the realization of sonic band gaps than the square or triangular lattice. This makes the 12-fold quasicrystal a promising structure for acoustic-wave band-gap materials. copyright 2002 American Institute of Physics. [J978]

"Thermal reaction of nickel and Si 0.75 Ge 0.25 alloy"

The interfacial reactions and chemical phase formation between nickel and ultrahigh vacuum chemical vapor deposited Si0.75Ge0.25alloy have been studied within the temperature range of 300-900 °Cfor forming low resistive and uniform silicide films for future application in SiGe based metal-oxide-semiconductor field effect transistor devices. The silicided films were characterized by the x-ray diffraction, Auger electron spectroscopy, scanning electron microscopy, transmission electron microscopy, and micro-Raman microscopy techniques. Smooth and uniform nickel monogermanosilicide NiSi0.75Ge0.25films have been observed for samples annealed at around 400-500 °C.For annealing temperatures of 500 °Cand above, Ge-rich Si1-zGezgrains where z 0.25were found among Ge deficient Niy(SiwGe1-w)1-ygrains where w 0.25and the Niy(Si1-wGew)1-yphase is thermally stable up to an annealing temperature of 800 °C.We found that the Ni/SiGe reaction is mainly diffusion controlled with Ge and Ni as the dominant diffusing species compared to Si during the annealing process. In addition, Ge has been found to promote agglomeration especially above 700 °C,leading to an abrupt increase in the sheet resistance. copyright 2002 American Vacuum Soci--ety. [J979]

"Alignment of InAs quantum dots on a controllable strain-relaxed substrate using an InAs/GaAs superlattice"

We fabricated InAs self-assembled quantum dots on a strained layer using molecular beam epitaxy. The controllable strained layer consisted of an InAs/GaAs superlattice and a GaAs spacer layer on a GaAs (001) substrate. We formed two-dimensional arrays of quantum dots along the 110 directions on the partially strain-relaxed layer that is formed using the superlattice system. The increase in the thickness of the partially strain-relaxed layer resulted in stronger alignment of the quantum dots. The aligned quantum dots are applicable to quantum devices, because they confine carriers well, in spite of the existence of dislocation networks. Strongly aligned quantum dots have a lower carrier transition energy because of their larger size and increased relaxation. copyright 2002 American Institute of Physics. [J980]

"Highly efficient green up-conversion luminescence of Nd 3+ -Yb 3+ -Ho 3+ codoped fluorite-type

nanocrystals in transparent glass ceramics"

Oxyfluoride glasses were developed with composition 30SiO2·15AlO1.5·28PbF2·22CdF2·(4.8-x)GdF3·0.1NdF3·0.1HoF3·xYbF3 (x=0,0.1, 0.2, 0.5, 1, 2, 3, 4, and 4.8) in mole percent. Powder x-ray diffraction analysis revealed that the heat treatments of the oxyfluoride glasses at 450 °C for 0.5 h cause the precipitation of Nd3+-Yb3+-Ho3+codoped fluorite-type nanocrystals of about 16.3 nm in diameter in the glass matrix. These transparent glass ceramics exhibited very strong green up-conversion luminescence due to the Ho3+:(5F4,5S2)→5I8transition under 800 nm excitation. The intensity of the green up-conversion luminescence in a 1 mol % YbF3-containing glass ceramic was found to be about 120 times stronger than that in the precursor oxyfluoride glass. The reason for the highly efficient Ho3+up-conversion luminescence in the oxyfluoride glass ceramics is discussed. An up-conversion mechanism is also proposed. copyright 2002 American Institute of Physics. [J981]

"Nano- and microchannel fabrication using column/void network deposited silicon"

Nano- and microchannels are fabricated using a novel deposited column/void network silicon film as a sacrificial material. This nanostructured silicon consists of nanometer-sized columns defined normal to the substrate in a void matrix, where the voids are continuously connected with each other, forming a network. The void network structure results in a high sacrificial layer etch rate due to the void network-enhanced transport of reactant and reaction products during the etching process, and high effective surface area. The use of our unique deposited column/void network material coupled with lift-off processing results in a manufacturable process for nano- and microchannel and nano- and microcavity fabrication. The approach provides extremely flat surfaces without a chemical-mechanical polishing process, and allows for multiple layers of channel or cavity structures with crossovers. copyright 2001 American Vacuum Society. [J982]

"Micro-crystalline diamond and nano-carbon structures produced using a high argon concentration in hot-filament chemical vapor deposition"

Micro-crystalline diamond films and nano-carbon structures in the form of wires have been grown by the introduction of argon at very high concentrations (60%-87.5% vol Ar) into the feed mixture (ethanol and hydrogen) of a hot-filament chemical vapor deposition reactor. The argon, in addition to acting as an inert diluent, also modified the kinetics of the carbon deposition process; its presence apparently minimized the deposition of intergranular hydrogenated species, induced an increase in the number of flaws between the diamond grains, increased the porosity of the films, and formed new carbon structures. Well-faceted diamond films, diamond-like carbon (DLC) balls, spongy-like wires, and multilayer structures were observed at different concentrations of Ar. Raman spectroscopy of the deposited material showed that structures of high quality diamond (60%-65% vol Ar) and carbon structures related to DLC, fullerenes and carbon nanotubes, may be deposited by this process. copyright 2001 American Vacuum Society. [J983]

"Nucleation and growth of well-aligned, uniform-sized carbon nanotubes by microwave plasma chemical vapor depositon"

The nucleation and growth of carbon nanotubes assisted by microwave plasma on metal surfaces have been observed by transmission electron microscopy. Microwave plasma generated nanoparticles of various sizes on metal surfaces. Initially, the nanoparticles were embedded in an amorphous carbon layer and led to the formation of carbon tube nuclei. At the early stage of growth, the carbon tube diameters ranged from 10 to 100 nm. Carbon tubes with diameters of 40-50 nm had a high growth rate in the vertical direction, resulting in the formation of tube arrays. copyright 2001 American Institute of Physics. [J984]

"Nanoscale luminescence spectroscopy of defects at buried interfaces and ultrathin films"

Low energy electron-excited nano-luminescence (LEEN) spectroscopy provides electronic band gap, confined state, and deep level trap information from semiconductor surfaces and interfaces on a nanometer scale. Correlation of luminescence features with their spatial location inside a growth structure-either depth wise or laterally-also provides information on the physical origin and growth dependence of the electronically active defects that form. LEEN spectroscopy of localized states illustrates this approach for a representative set of III-V nitride interfaces, including metal-GaN Schottky barriers, GaN/InGaN quantum wells, GaN ultrathin films, AlGaN/GaN pseudomorphic heterostructures across a single growth wafer, and GaN/Al2O3interfaces. In each case, electronic properties are sensitive to the chemical composition, bonding, and atomic structures near interfaces and in turn to the specifics of the growth process. copyright 2001 American Vacuum Society. [J985]

"Structural and mechanical properties of TiC and Ti-Si-C films deposited by pulsed laser

deposition"

TiC and Ti-Si-C films have been deposited by pulsed laser deposition at substrate temperatures ranging from room temperature to 600 °C onto (111) silicon wafers and 440C stainless steel substrates. X-ray diffraction, x-ray photoelectron spectroscopy, and electron microscopy were employed for structural and compositional evaluation of the films, and nano-indentation hardness testing and pin-on-disk wear tests were used to evaluate the mechanical and tribological properties. All the TiC films were highly crystalline except the one deposited at room temperature, whereas for the Ti-Si-C films the degree of crystallinity increased with temperature, ranging from amorphous for the room temperature deposit to about 50% crystalline at 600 °C. The hardness of the TiC films was relatively constant with deposition temperature at about 25 GPa, whereas the hardness of the Ti-Si-C films increased with deposition temperature from 11 to 33 GPa. The temperature dependence of the hardness is attributed to the degree of crystallinity and the extent of phase separation in the Ti-Si-C films. The wear test data showed good results for all films up to the tested limit of 10 000 cycles at 1 N load. copyright 2001 American Vacuum Society. [J986]

"Influence of substrate bias on the microstructure and internal stress in Cu films deposited by filtered cathodic vacuum arc"

Copper films were deposited by a novel off-plane double bend filtered cathodic vacuum arc technique at ambient temperatures. X-ray diffraction (XRD) and atomic force microscopy (AFM) are used to characterize the film's structure and surface morphology. The substrate bending method was used to study the internal stress. The influence of substrate bias on the surface morphology, grain size, crystalline structure, and internal stress was systematically studied. XRD results indicate that all the deposited Cu films exhibit face-centered cubic-type (fcc) crystallite structure with (111) preferred orientation growth. The increase of substrate bias results in the improvement of (111) preferred orientation. At the substrate bias of 0 V, the deposited films are composed of nano-sized columnar grains, which contribute to the tensile stress in the deposited films. The grain size and surface roughness increase gradually with increasing substrate bias up to -200 V. Further increase of substrate bias results in the drastic decrease of grain size and surface roughness due to self-sputtering. The internal stress in the deposited films is also strongly dependent on the substrate bias. The increase of substrate bias results in the decrease of tensile stress in the deposited films, and the transition of tensile to compressive stress at the substrate bias of -300 V. Further increase of substrate bias results in the linear increase of compressive stress in the deposited films. At the substrate bias of -300 V, dense and stress-free Cu films can be obtained. copyright 2001 American Vacuum Society. [J987]

"Surface alignment bistability of nematic liquid crystals by orientationally frustrated surface patterns"

We demonstrate a robust in-plane bistability of liquid-crystal surface alignment based on tailored submicrometer-sized surface domains imposing a frustrated alignment. By a nanorubbing technique utilizing the atomic force microscope, we prepared an orientational checkerboard pattern on polyimide layer, consisting of square unit domains on which the alignment is locally constrained to be planar yet orthogonal between the neighboring domains. Due to the four-fold rotational symmetry of the pattern, the two diagonal axes of the square domain become equally stable directions for the macroscopic liquid crystal alignment. The alignment could be switched between these two states by an in-plane electric field above a certain threshold, determined by the local azimuthal anchoring. copyright 2001 American Institute of Physics. [J988]

"Microstructure to substrate self-assembly using capillary forces"

We have demonstrated the fluidic self-assembly of micromachined silicon parts onto silicon and quartz substrates in a preconfigured pattern with submicrometer positioning precision. Self-assembly is accomplished using photolithographically defined part and substrate binding sites that are complementary shapes of hydrophobic self-assembled monolayers. The patterned substrate is passed through a film of hydrophobic adhesive on water, causing the adhesive to selectively coat the binding sites. Next, the microscopic parts, fabricated from silicon-on-insulator wafers and ranging in size from 150Ч150Ч15 μm3to 400Ч400Ч50 μm 3, are directed toward the substrate surface under water using a pipette. Once the hydrophobic pattern on a part comes into contact with an adhesive-coated substrate binding site, shape matching occurs spontaneously due to interfacial free energy minimization. In water, capillary forces of the adhesive hold the parts in place with an alignment precision of less than 0.2 μm. Permanent bonding of the parts onto quartz and silicon is accomplished by activating the adhesive with heat or ultraviolet light. The resulting rotational misalignment is within ~0.3°. Using square sites, 98-part arrays have been assembled in less than 1 min with 100% yield. The general microassembly approach described here may be applied to parts ranging in size from the nano- to milliscale, and part and substrate materials including semiconductors, glass, plastics, and metals [J989]

"Schottky barrier thin-film transistor (SBTFT) with silicided source/drain and field-induced drain extension"

A novel Schottky barrier thin-film transistor (SBTFT) with silicided source/drain and field-induced drain (FID) extension is proposed and demonstrated. In the new device configuration, a metal field-plate (or sub-gate) lying on the passivation oxide is employed to induce a sheet of carriers in a channel offset region located between the silicided drain and the active channel region underneath the main gate. The new device thus allows ambipolar device operation by simply switching the polarity of the bias applied to the field plate. In contrast to the conventional SBTFT that suffers from high GIDL (gate-induced drain leakage)-like off-state leakage current, the new SBTFT with FID is essentially free from the GIDL-like leakage current. In addition, unlike the conventional SBTFT that suffers from low on-off current ratio, the new device exhibits high on/off current ratio up to 106for both n- and p-channel modes of operation. Moreover, the implantless feature and the ambipolar capability of the new device also result in extra low mask count for CMOS process integration. These excellent device characteristics, coupled with its simple processing, make the new device very promising for future large-area electronic applications [J990]

"Bismuth nano-Hall probes fabricated by focused ion beam milling for direct magnetic imaging by room temperature scanning Hall probe microscopy"

Bismuth nano-Hall probes with dimensions ~120 Ч 120 nm were fabricated by focused ion beam milling and used for the direct room temperature magnetic imaging of crystalline garnet thin films and strontium ferrite permanent magnets by scanning Hall probe microscopy. At driving currents of 40 μA, the Hall coefficient and magnetic field sensitivity of the Bi nano-Hall probes were 3.3 Ч 10-4Ω/G and 7.2 G/√Hz, respectively [J991]

"Nonlinear dispersion properties of subwavelength photonic crystals"

Nonlinear pulse compression and pulse broadening have been analyzed and demonstrated with a coherent array of submicron silica spheres embedded with silicon and germanium nanoparticles (nano within a nano). copyright 2001 American Institute of Physics. [J992]

"Engineering acoustic band gaps"

By using a perturbative approach, we propose a simple, systematic, and efficient method to engineer acoustic band gaps. A gap can be enlarged or reduced by altering the microstructure according to the field-energy distributions of the Bloch states at the band edges as well as their derivatives. Due to the structure of the acoustic wave equation, the engineering of acoustic band gaps is much more efficient than that of photonic band gaps. The validity of the proposed method is supported by multiple-scattering calculations. Our method makes the acoustic band gap "designable." copyright 2001 American Institute of Physics. [J993]

"Analysis and control of monolithic piezoelectric nano-actuator"

This paper describes the analysis and control of a two degree-of-freedom (DOF) monolithic piezoelectric actuator. This actuator is part of a six-DOF manipulator capable of linear resolution to 2 nm and angular resolution to 1 arc-second. Design of this actuator differs from the existing ones in that it has a monolithic structure which enables a high bandwidth, low drift, and high force realization. A number of nonlinearities exist in the actuator, stemming from the geometry and material properties. For example, coupling of the actuator elements can be modeled as a soft spring which increases displacement/drive-voltage gain (scale factor) at high actuation levels. In this work, a combination of feedforward (amplitude-dependent command prefiltering/input shaping) and feedback control are applied to reduce the effects of 1) scale factor nonlinearities; 2) hysteresis; and 3) output oscillations [J994]

"Printing meets lithography: Soft approaches to high-resolution patterning"

We are developing a high-resolution printing technique based on transferring a pattern from an elastomeric stamp to a solid substrate by conformal contact. This is an attempt to enhance the accuracy of classical printing to a precision comparable with optical lithography, creating a low-cost, large-area, high-resolution patterning process. First, we introduce the components of this technique, called soft lithography, and review its evolution. Topics described in detail are the stamp material, stamp architecture, pattern design rules, and printing tools. The accuracy of the prints made by thin patterned elastomeric layers supported on a stiff and flexible backplane is then assessed, and defects are characterized using a new electrical metrology approach. This is followed by a discussion of various printing processes used in our laboratory: 1) thiol printing for high-resolution patterns of noble metals that may also be used as sacrificial masks; 2) confined contact processing with liquids in cavities or

cha nnels to chemically convert a substrate or deposit layers of materials or biomolecules; 3) printing of catalysts to mediate patterned deposition of metals; and 4) structured, light-guiding stamps for transferring high-resolution patterns into photoresists. Finally, we compare classical and high-resolution printing approaches, and describe their potential for emerging micro- and nano-scale patterning technologies. [J995]

"Numerical study of spin relaxation by thermal fluctuation: Effect of shape anisotropy"

Effects of the shape anisotropy on the thermally activated spin relaxation have been investigated using the stochastic Landau-Lifshitz-Gilbert equation. The relaxation times of a noninteracting particle and a thin film were compared with each other. In a noninteracting particle, the relaxation time largely increased with the shape anisotropy when the damping constant was smaller than a certain critical value. In this study, the critical damping constant was 0.02. However, the effect of the shape anisotropy on the energy barrier was negligible in a thin film. All of these results can be explained from the effect of magnetostatic interaction that is enhanced by precession motion at low damping constant. copyright 2001 American Institute of Physics. [J996]

"Isolated Fe-Co-Ni nanoparticles in a random arrangement and their magnetic properties"

Fe-Co-Ni particles with an average size of 45 and 135 nm are characterized in terms of magnetic phase transformation and magnetic properties at room temperature. The bcc structure of Fe-Co-Ni spherical particles was able to be synthesized from Fe-Co-Ni-Al-Cu precursor films by heating at 600-800 °C for the phase separation of Fe-Co rich Fe-Co-Ni particles, followed by a postheating at 600 °C for 5 h. The average size of nanoparticles was directly determined by the thickness of precursor films. Exchange interactive hysteresis was observed for the nano-composite (Fe-Co-Ni)+(Fe-Ni-Al) films resulting from the short exchange interface between ferromagnetic Fe-Co-Ni particles surrounded by an almost papramagnetic Ni-Al-Fe matrix. Arraying the isolated Fe-Co-Ni nanoparticles in a random arrangement on Al2O3substrate, the particle assembly showed a behavior of dipole interactive ferromagnetic clusters depending on their volume and interparticle distance. copyright 2001 American Institute of Physics. [J997]

"Geometry and strain effects on single-electron charging in silicon nano-crystals"

We investigate by numerical simulation the effects of geometry and strain on single-electron charging in 100-E-diameter silicon (Si) nano-crystals of various shapes, embedded in silicon dioxide (SiO2).Our approach accounts for the Si band structure within the effective mass approximation and a continuum strain model based on the deformation potential theory. Electron-electron interactions in nano-crystals are treated within the density-functional theory. We show that the interplay between the Si nano-crystal geometry and the particular spatial symmetry generated by the strain potential enhances confinement in the quantum-dot and dramatically influences the electronic structure and single-electron charging behavior. In particular, for a Si(001)-oriented truncated-sphere and hemispherical nano-crystals, the 001-oriented orbitals (YY'states) are relatively insensitive to nano-crystal strain compared to orbitals originating from conduction band valleys oriented in the other directions. copyright 2001 American Institute of Physics. [J998]

"Characteristics of fluorinated amorphous carbon films and implementation of 0.15 mcm Cu /a-C:F damascene interconnection"

Fluorinated amorphous carbon films (a-C:F)deposited by plasma enhanced chemical vapor deposition with low dielectric constant (K 2.3),thermal stability (higher than 400 °C) and acceptable adhesion to a cap layer such as SiOF or SiO2were obtained by varying the range of content ratios between carbon and fluorine, the rf power, the process pressure and the base temperature. Standard x-ray photoelectron spectroscopy and thermal desorption spectroscopy metrologies were employed to characterize the deposited a-C:Ffilms. The damascene pattern with 0.15 mcm and an etching selectivity of more than 50 (a-C:F/SiOF, SiO2)was implemented by a mixture of etching gases of N2+O2.The bias power, rf power and gas flows were incorporated to optimize the etching recipe for achieving a damascene profile with a high aspect ratio. The scanning electron microscope results showed that a better etch profile can be obtained at higher bias power. In our damascene architecture, the etching stop layer or hard mask of both SiOF and SiO2was studied. The SiOF, providing a lower dielectric constant than SiO2,would especially reduce the entire effective dielectric constant. Furthermore, we integrated electroplated copper into trenches or vias as small as 0.15 mcm, with aspect ratio of 6. copyright 2001 American Vacuum Society. [J999]

"Evolution of the dielectric breakdown in Co/Al 2 O 3 /Co junctions by annealing"

The temperature and dielectric stability of magnetic tunnel junctions are important requirements for magnetic memory devices and their integration in the semiconductor process technology. We have investigated the changes of the tunneling magnetoresistance (TMR), the barrier properties (height, thickness, and asymmetry)

and the dielectric stability upon isochronal annealing up to 410 °C in Co/Al2O3/Cojunctions with an artificial antiferromagnet as a pinning layer. Besides a small decrease of the TMR signal after annealing up to 230 °C, a strong decrease between 300 and 350 °C is found. According to Auger and transmission electron microscopy investigations, this decrease is mainly due to interdiffusion of the metallic layers. The dielectric breakdown is characterized by voltage ramp experiments. The size-averaged breakdown voltage improves from 1.35 V for the as prepared junctions to 1.55 V by annealing at 300 °C. At higher temperatures the breakdown voltage decreases strongly to 0.8 V (at 380 °C). Simultaneously, the typical breakdown process changes from few sudden current jumps to a large number of small steps. The breakdown properties are discussed within a statistical model and related to structural changes of the barrier. copyright 2001 American Institute of Physics. [J1000]

"Giant magnetoresistance in ion beam deposited spin-valve films with specular enhancement"

Three different techniques, natural oxidation, remote plasma oxidation and low energy ion beam oxidation, have been proved to be equally effective in forming nano-oxide layers (NOLs) in spin-valve films for specular enhancement of giant magnetoresistance (GMR) effect. GMR values over 12% have been routinely obtained in spin-valve films with NOL, corresponding to a 30% specular enhancement over those without NOL. The consistency and robustness of the oxidation processes has been demonstrated by a very large GMR value 19% in a dual spin-valve film with the NOLs formed in both pinned layers, the oscillatory dependence of the interlayer coupling field on Cu layer thickness in specular enhanced spin-valve films and the uniform and repeatable film performance over 5 in. substrates. copyright 2001 American Institute of Physics. [J1001]

"Emission lifetime of polarizable charge stored in nano-crystalline Si based single-electron memory"

The lifetime of the emission of a single electron stored in a nanocrystalline Si (nc-Si) dot has been studied in order to understand the physical processes for memory applications. A small active area field effect transistor channel (50Ч25 nm) is defined by electron-beam lithography on a thin (20 nm) silicon-on-insulator channel and allows for the electrical isolation of a single nc-Si dot. Remote plasma enhanced chemical vapor deposition is used to form 8±1 nm diameter nc-Si dots in the gas phase from a pulsed SiH4source. Electrons stored in a dot results in an observed discrete threshold shift of 90 mV. Analysis of lifetime as a function of applied potential and temperature show the dot to be an acceptor site with nearly Poisson time distributions. An observed 1/T2dependence of lifetime is consistent with a direct tunneling process, and interface states are not the dominant mechanism for electron storage in this device structure. Median emission lifetimes as a function of applied gate bias are readily modeled by the polarizability of an electron in a delocalized bound state over the entire semiconducting dot. copyright 2001 American Institute of Physics. [J1002]

"Preparation and properties of dc-sputtered IrO 2 and Ir thin films for oxygen barrier applications in advanced memory technology"

IrO2and Ir thin films have been deposited by dc sputtering in Ar/O2-and pure Ar atmospheres, respectively. The microstructural characterization of the films was done by x-ray diffraction and transmission electron microscopy and showed that (nano-)crystalline Ir and IrO2films with different textures could be deposited. Stress analyses showed that the stress of the Ir films can be varied from about -3.5 GPa for a deposition temperature of 100 °C to nearly zero stress if deposited at 500 °C. However, IrO2films generally exhibited a large compressive stress of about -1.5 GPa, which is nearly independent of substrate temperature, but changed with texture and stoichiometry of the films. Surface and roughness analyses of the cumulatively annealed samples were performed by various analysis methods, and stoichiometry was examined by Rutherford backscattering spectrometry. In situ stress measurements were used to investigate the stress relaxation behavior of the films up to 900 °C. We demonstrate that it is generally possible to optimize reactive IrO2sputter deposition by a detailed study of plasma and deposition conditions via recording generic curves for the sputtering system used. At optimized conditions these fine grained IrO2films exhibit very high thermal phase stability to at least 800 °C for several hours and a very low roughness. The aim of these investigations is to optimize stability of IrO2films under high temperature conditions for oxygen barrier application in dynamic random access memory--and nonvolatile Fe random access memory cells. copyright 2001 American Vacuum Society. [J1003]

"Structure shape and stability of nanometric sized particles"

Nanoparticles are a state of matter that has properties different from either molecules or bulk solids. In the present work, we review the shape and structure of nanometer-sized particles; several shapes are discussed, such as the octahedron and truncated octahedron, the icosahedron, the Marks decahedron, the truncated "star-like" decahedron, the rounded decahedron and the regular decahedron. Experimental high-resolution

transmission electron microscopy (TEM) images of each type of particle are presented together with the Fast Fourier Transform and a model of the particle. We consider only gold particles grown by vapor deposition or by colloidal methods. High-resolution TEM images of the particles in different orientations are shown. We discuss two basic types of particles uncapped and capped. Data for other metals and semiconductors are reviewed. We have also performed very extensive simulations obtaining the total energy and pair correlation functions for each cluster under study. Furthermore, distributions of single atom energy for every cluster are displayed in order to reveal the effect of surface on the stability of different types and sizes of clusters. We discuss the structure of the particles from 1 to 100 nm. The mechanisms for stress release as the particles grow larger are reviewed and a mechanism is suggested. Finally, we discuss the parameters that define the shape of a nanoparticle and the possible implications in technological applications. copyright 2001 American Vacuum Society. [J1004]

"Highly reliable chemical-mechanical polishing process for organic low-k methylsilsesquioxane"

In this work, chemical-mechanical polishing (CMP) of the organic polymer, methylsilsesquioxane (MSQ), has been investigated. For conventional silicate-based slurry, the CMP removal rate of MSQ is low and many scratches are formed at the surface. Moreover, the dielectric properties of a post-CMP MSQ film are degraded in comparison to the as-cured MSQ. We have proposed a reliable process for the CMP of MSQ which includes a slurry of additive and a post-CMP NH3plasma treatment. Experimental results show that the modified slurry provides a high polishing rate and uniform surface topography. In addition, the NH3plasma process can form a thin nitrogen-containing layer on the post-CMP MSQ surface, which enhances the resistance to moisture absorption and copper diffusion. copyright 2001 American Vacuum Society. [J1005]

"Low-dielectric constant bisbenzo(cyclobutene) and fluorinated poly(arylene)ether films as bottom anti-reflective coating layers for ArF lithography"

In this article, we demonstrate a bottom anti-reflective coating (BARC) layer for ArF lithography. The anti-reflective layers are composed of a commercial low-dielectric constant bisbenzo(cyclobutene) (BCB)- and fluorinated poly(arylene)ether (FLARE)-based films. By adding an optimized etching hard-mask layer, reflectance of less than 1% at the resist/silicon substrate interface can be achieved. BCB and FLARE also have great potential to be used as BARC layers on highly reflective substrates for metal interconnect applications. It is easy to reduce reflectance without adding an extra BARC layer for patterning low-dielectric materials. It is convenient to use this BARC structure in ArF lithography. In this article, suitable etching characteristics and thermal stability of BCB- and FLARE-based BARC layers are also described. copyright 2001 American Vacuum Society. [J1006]

"Piezo-driven metrological multiaxis nanopositioner"

We report on the development of a metrological multiaxis nanopositioning device, which is operated by the piezo-based inertial method, as a sample stage for scanning probe microscopy. It has long moving range, unlimited in principle, and nanometer (microradian) resolution. Two operation methods, inertial sliding and inertial walking, can be applied to the stage and the inertial operating method can make the stage have a simple and compact structure. By the structure and operation method high positioning stability can be obtained which is an important requirement for scanning probe microscopy. For a metrological nanopositioner, a three axes laser interferometric sensing scheme is adopted for planar motion and a 15 channel high voltage amplifier is designed and computer based digital-to-analog conversion is adopted. Therefore the nanopositioner can be feedback controlled with many choices of voltage wave forms and control methods. Design of the nanopositioner and piezo-driver and experimental results are presented. The device provides step sizes of 0.016-10 mcm at frequency up to about 7 kHz. The rotational range is limited by the interferometer alignment, 0.2°, and the step size is 0.17-103 arcsec. copyright 2001 American Institute of Physics. [J1007]

"Formation of metallic surface structures by ion etching using a S-layer template"

Crystalline cell surface layers (S-layer) of the bacteria species Deinococcus Radiodurans are used as a nanometric template for patterning thin ferromagnetic films. A hexagonal pattern of uniform 10-nm-wide dots and a lattice constant of 18 nm is fabricated from 2.5-nm-thick sputter deposited Co, FeCo, Fe, CoNi, and NiFe. Suitable parameters for the subsequent Ar ion etching are elaborated. For successful patterning, the etching energy ranges from 50 to 300 eV and the etching time from 17 to 283 s at an ion current of 1.5-5.5 mu A/cm2.The formation of nanodot arrays is demonstrated by scanning electron and scanning force microscopy. copyright 2001 American Vacuum Society. [J1008]

СПИСОК ЛИТЕРАТУРЫ

J1. Nemirovsky Y. 1/f noise in advanced CMOS transistors. / Nemirovsky Y., Corcos D., Brouk I., Nemirovsky A., Chaudhry S. // IEEE Instrumentation & Measurement Magazine. - 2011. - Vol. 14, No. 1. - P. 14-22.

J2. Gu Yang. Plasmonic metamaterials for ultrasensitive refractive index sensing at near infrared. / Gu Yang, Li Qiuze, Xiao Jie, Wu Kedi, Wang Guo Ping. // Journal of Applied Physics. - 2011. - Vol. 109, No. 2. - P. 023104-023104-6.

J3. Um Han-Don. Highly selective spectral response with enhanced responsivity of n-ZnO /p-Si radial heterojunction nanowire photodiodes. / Um Han-Don, Moiz Syed Abdul, Park Kwang-Tae, Jung Jin-Young, Jee Sang-Won, Ahn Cheol Hyoun, Kim Dong Chan, Cho Hyung Koun, Kim Dong-Wook, Lee Jung-Ho. // Applied Physics Letters. - 2011. - Vol. 98, No. 3. - P. 033102-033102-3.

J4. Sakai Yusuke. Characterization of AlInN/GaN structures on AlN templates for high-performance ultraviolet photodiodes. / Sakai Yusuke, Khai Pum Chian, Ichikawa Junki, Egawa Takashi, Jimbo Takashi. // Journal of Applied Physics. - 2011. - Vol. 109, No. 3. - P. 033512-033512-6.

J5. Wang Ri-Xing. Phase diagram of magnetic multilayers with tilted dual spin torques. / Wang Ri-Xing, He Peng-Bin, Li Zai-Dong, Pan An-Lian, Liu Quan-Hui. // Journal of Applied Physics. - 2011. - Vol. 109, No. 3. - P. 033905-033905-7.

J6. Varghese Neson. Influence of nano-Cu additive on MgB 2 phase formation, processing temperature, and transport properties. / Varghese Neson, Vinod K., Rahul S., Devadas K. M., Thomas Syju, Pradhan S., Syamaprasad U. // Journal of Applied Physics. - 2011. - Vol. 109, No. 3. - P. 033902-033902-4.

J7. Xuesong Han. Analysis elastic??plastic behaviour and anisotropy properties of copper film from nanoindentation using numerical computation method. / Xuesong Han, Shuxin Wang, Gan Y.X., Lianhong Zhang, Siyuan Yu. // IET Micro & Nano Letters. - 2011. - Vol. 6, No. 1. - P. 13-18.

J8. Po-Tsang Huang. A 65 nm 0.165 fJ/Bit/Search 256 144 TCAM Macro Design for IPv6 Lookup Tables. / Po-Tsang Huang, Wei Hwang. // IEEE Journal of Solid-State Circuits. - 2011. - Vol. 46, No. 2. - P. 507-519.

J9. Gouveia L. C. An Asynchronous Spike Event Coding Scheme for Programmable Analog Arrays. / Gouveia L. C., Koickal T. J., Hamilton A. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2011. - Vol. 58, No. 4. - P. 791-799.

J10. Dhane K. Dynamics of Cleaning and Rinsing of Micro and Nano Structures in Single-Wafer Cleaning Tools. / Dhane K., Jeongnam Han, Jun Yan, Mahdavi O., Zamani D., Vermeire B., Shadman F. // IEEE Transactions on Semiconductor Manufacturing. - 2011. - Vol. 24, No. 1. - P. 125-133.

J11. Liu Xue-Chao. Accuracy of thickness measurement for Ge epilayers grown on SiGe/Ge/Si(100) heterostructure by x-ray diffraction and reflectivity. / Liu Xue-Chao, Myronov M., Dobbie A., Nguyen Van H., Leadley D. R. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2011. - Vol. 29, No. 1. - P. 011010-011010-5.

J12. Ahmad M.R. Buckling Nanoneedle for Characterizing Single Cells Mechanics Inside Environmental SEM. / Ahmad M.R., Nakajima M., Kojima S., Homma M., Fukuda T. // IEEE Transactions on Nanotechnology. - 2011. - Vol. 10, No. 2. - P. 226-236.

J13. Pham S.V. Read-Out of Cantilever Bending With a Grated Waveguide Optical Cavity. / Pham S.V., Kauppinen L.J., Dijkstra M., van Wolferen H.A.G.M., de Ridder R.M., Hoekstra H.J.W.M. // IEEE Photonics Technology Letters. - 2011. - Vol. 23, No. 4. - P. 215-217.

J14. Park Bong-Jun. Improving the thermal stability of nickel monosilicide thin films by combining annealing with the use of an interlayer and a capping layer. / Park Bong-Jun, Jeong Sang-Yong, Kim Jun-Ho, Seong Tae-Yeon, Choi Chel-Jong. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2011. - Vol. 29, No. 3. - P. 031503-031503-5.

J15. Hu X. J. n-type conductivity and phase transition in ultrananocrystalline diamond films by oxygen ion implantation and annealing. / Hu X. J., Ye J. S., Liu H. J., Shen Y. G., Chen X. H., Hu H. // Journal of Applied Physics. - 2011. - Vol. 109, No. 5. - P. 053524-053524-7. ↑

J16. He Zhaojian. Asymmetric acoustic gratings. / He Zhaojian, Peng Shasha, Ye Yangtao, Dai Zhongwei, Qiu Chunyin, Ke Manzhu, Liu Zhengyou. // Applied Physics Letters. - 2011. - Vol. 98, No. 8. - P. 083505-083505-3. ↑

J17. Baek Seungmin. Multiple diffraction in two-dimensional magnetophotonic crystals fabricated by the autocloning method. / Baek Seungmin, Baryshev Alexander V., Inoue Mitsuteru. // Journal of Applied Physics. - 2011. - Vol. 109, No. 7. - P. 07B701-07B701-3. ↑

J18. Yamada Takatoshi. Field electron emission properties of n -type (111)-oriented single crystal cubic boron nitride. / Yamada Takatoshi, Nebel Christoph E., Taniguchi Takashi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2011. - Vol. 29, No. 2. - P. 02B115-02B115-5. ↑

J19. Jiang Jie. In-plane-gate indium-tin-oxide thin-film transistors self-assembled on paper substrates. / Jiang Jie, Sun Jia, Dou Wei, Zhou Bin, Wan Qing. // Applied Physics Letters. - 2011. - Vol. 98, No. 11. - P. 113507-113507-3. ↑

J20. Chin-Tien Yang. Single Wavelength Blue-Laser Optical Head-Like Opto-Mechanical System for Turntable Thermal Mode Lithography and Stamper Fabrication. / Chin-Tien Yang, Chih-Yu Chen, Chun-Chieh Huang, Yuan-Chin Lee, Shuen-Chen Chen, Chung-Ta Cheng. // IEEE Transactions on Magnetics. - 2011. - Vol. 47, No. 3. - P. 701-705. ↑

J21. Binda M. High detectivity squaraine-based near infrared photodetector with nA /cm 2 dark current. / Binda M., Iacchetti A., Natali D., Beverina L., Sassi M., Sampietro M. // Applied Physics Letters. - 2011. - Vol. 98, No. 7. - P. 073303-073303-3. ↑

J22. Massaro A. Analytical approaches for nano-plasmonic and micro-millimetric antennas. / Massaro A., Caratelli D., Yarovoy A., Cingolani R. // IET Microwaves, Antennas & Propagation. - 2011. - Vol. 5, No. 3. - P. 349-356. ↑

J23. Mahdavi M. Single electron fault modelling in quantum binary wire. / Mahdavi M., Mirzakuchaki S., Moghaddasi M.N., Amiri M.A. // IET Micro & Nano Letters. - 2011. - Vol. 6, No. 2. - P. 75-77. ↑

J24. Lee Su Yong. Hard x-ray nano patterning using a sectioned multilayer. / Lee Su Yong, Cho In Hwa, Kim Jae Myung, Yan Hanfei, Conley Ray, Liu Chian, Macrander Albert T., Maser Jorg, Stephenson G. Brian, Kang Hyon Chol, Noh Do Young. // Journal of Applied Physics. - 2011. - Vol. 109, No. 4. - P. 044307-044307-5. ↑

J25. {no data available}. GHz amplifiers go nano. Electronics Letters. - 2011. - Vol. 47, No. 4. - P. 227. ↑

J26. Zhu Zhendong. UV-based nanoimprinting lithography with a fluorinated flexible stamp. / Zhu Zhendong, Li Qunqing, Zhang Lihui, Chen Mo, Fan Shoushan. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2011. - Vol. 29, No. 2. - P. 021015-021015-6. ↑

J27. Pierantoni L. RF Nanotechnology-Concept, Birth, Mission, and Perspectives [Member Benefits]. IEEE Microwave Magazine. - 2010. - Vol. 11, No. 4. - P. 130-137. ↑

J28. Zhangming Zhu. An Interconnect-Line-Size Optimization Model Considering Scattering Effect. / Zhangming Zhu, Dajing Wan, Yintang Yang. // IEEE Electron Device Letters. - 2010. - Vol. 31, No. 7. - P. 641-643. ↑

J29. Chen Z. T. Photoluminescence studies of high-quality InAlN layer lattice-matched to GaN grown by metal organic chemical vapor deposition. / Chen Z. T., Sakai Y., Egawa T. // Applied Physics Letters. - 2010. - Vol. 96, No. 19. - P. 191911-191911-3. ↑

J30. Er-Ping Li. Progress Review of Electromagnetic Compatibility Analysis Technologies for Packages, Printed Circuit Boards, and Novel Interconnects. / Er-Ping Li, Xing-Chang Wei, Cangellaris A.C., En-Xiao Liu, Yao-Jiang Zhang, D'Amore M., Joungho Kim, Sudo T. // IEEE Transactions on Electromagnetic Compatibility. - 2010. - Vol. 52, No. 2. - P. 248-265. ↑

J31. Guo Feng. Droplet electric separator microfluidic device for cell sorting. / Guo Feng, Ji Xing-Hu, Liu Kan, He Rong-Xiang, Zhao Li-Bo, Guo Zhi-Xiao, Liu Wei, Guo Shi-Shang, Zhao Xing-Zhong. // Applied Physics Letters. - 2010. - Vol. 96, No. 19. - P. 193701-193701-3. ↑

J32. Jeong Seonju. Improved efficiency of bulk heterojunction poly(3-hexylthiophene):[6,6]-phenyl-C 61 - butyric acid methyl ester photovoltaic devices using discotic liquid crystal additives. / Jeong Seonju, Kwon Younghwan, Choi Byeong-Dae, Ade Harald, Han Yoon Soo. // Applied Physics Letters. - 2010. - Vol. 96, No. 18. - P. 183305-183305-3. ↑

J33. Yu Zhizhou. Transport properties of corrugated graphene nanoribbons. / Yu Zhizhou, Sun L. Z., Zhang C. X., Zhong J. X. // Applied Physics Letters. - 2010. - Vol. 96, No. 17. - P. 173101-173101-3. ↑

J34. Tsao J.Y. Solid-State Lighting: An Integrated Human Factors, Technology, and Economic Perspective. / Tsao J.Y., Coltrin M.E., Crawford M.H., Simmons J.A. // Proceedings of the IEEE. - 2010. - Vol. 98, No. 7. - P. 1162-1179. ↑

J35. Zhuge F. Nonvolatile resistive switching memory based on amorphous carbon. / Zhuge F., Dai W., He C. L., Wang A. Y., Liu Y. W., Li M., Wu Y. H., Cui P., Li Run-Wei. // Applied Physics Letters. - 2010. - Vol. 96, No. 16. - P. 163505-163505-3. ↑

J36. Ahad Faris B. Abdul. Magnetoelectric behavior of carbonyl iron mixed Mn oxide-coated ferrite nanoparticles. / Ahad Faris B. Abdul, Lee Shang-Fan, Hung Dung-Shing, Yao Yeong-Der, Yang Ruey-Bin, Lin Chung-Kwei, Tsay Chien-Yie. // Journal of Applied Physics. - 2010. - Vol. 107, No. 9. - P. 09D904-09D904-3. ↑

J37. Hwang G. Infrared-photovoltaic properties of graphene revealed by electro-osmotic spray direct patterning of electrodes. / Hwang G., Haliyo S., Regnier S. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 2. - P. 140-145. ↑

J38. Li Jiaxing. Giant electrorheological fluid comprising nanoparticles: Carbon nanotube composite. / Li Jiaxing, Gong Xiuqing, Chen Shuyu, Wen Weijia, Sheng Ping. // Journal of Applied Physics. - 2010. - Vol. 107, No. 9. - P. 093507-093507-5. ↑

J39. Michelakis K. Cost-effective fabrication of nanoscale electrode memristors with reproducible electrical response. / Michelakis K., Prodromakis T., Toumazou C. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 2. - P. 91-94. ↑

J40. Tripathi S.K. Fabrication of nano-mechanical switch using focused ion beam for complex nano-electronic circuits. / Tripathi S.K., Shukla N., Rajput N.S., Dhamodaran S., Kulkarni V.N. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 2. - P. 125-130. ↑

J41. Kulkarni J.P. Nano Spiral Inductors for Low-Power Digital Spintronic Circuits. / Kulkarni J.P., Augustine C., Byunghoo Jung, Roy K. // IEEE Transactions on Magnetics. - 2010. - Vol. 46, No. 6. - P. 1898-1901. ↑

J42. Ortega P. A Miniaturized Two Axis Sun Sensor for Attitude Control of Nano-Satellites. / Ortega P., Lo,pez-Rodri,guez G., Ricart J., Domi,nguez M., Castac,er L.M., Quero J.M., Tarrida C.L., Garci,a J., Reina M., Gras A., Angulo M. // IEEE Sensors Journal. - 2010. - Vol. 10, No. 10. - P. 1623-1632. ↑

J43. da Silva Santos C.H. Designing Novel Photonic Devices by Bio-Inspired Computing. / da Silva Santos C.H., Gonз,alves M.S., Herna,ndez-Figueroa H.E. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 15. - P. 1177-1179. ↑

J44. Azam T. Efficient sensor for robust low-power design in nano-CMOS technologies. / Azam T., Cumming D.R.S. // Electronics Letters. - 2010. - Vol. 46, No. 11. - P. 773-775. ↑

J45. Sekiguchi Hiroto. Emission color control from blue to red with nanocolumn diameter of InGaN/GaN nanocolumn arrays grown on same substrate. / Sekiguchi Hiroto, Kishino Katsumi, Kikuchi Akihiko. // Applied Physics Letters. - 2010. - Vol. 96, No. 23. - P. 231104-231104-3. ↑

J46. Che-Kai Lin. Optoelectronic Mixer Based on Composite Transparent Gate InAlAs-InGaAs Metamorphic HEMTs. / Che-Kai Lin, Hsien-Chin Chiu, Chao-Wei Lin, Hsiang-Chun Wang, Yi-Chun Wu. // Journal of Lightwave Technology. - 2010. - Vol. 28, No. 15. - P. 2153-2161. ↑

J47. Jun Song. Analytical Design of Total-Internal-Reflection Grating Demultiplexers With a Low Noise Floor. / Jun Song, Jinfei Ding. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 16. - P. 1229-1231. ↑

J48. Senthil kumar E. Oxygen vacancy controlled tunable magnetic and electrical transport properties of (Li, Ni)-codoped ZnO thin films. / Senthil kumar E., Venkatesh S., Ramachandra Rao M. S. // Applied Physics Letters. - 2010. - Vol. 96, No. 23. - P. 232504-232504-3. ↑

J49. Yao Baodian. Tailoring the luminescence emission of ZnO nanostructures by hydrothermal post-treatment in water. / Yao Baodian, Feng Lin, Cheng Chun, Loy Michael M. T., Wang Ning. // Applied Physics Letters. - 2010. - Vol. 96, No. 22. - P. 223105-223105-3. ↑

J50. Dehee Kim. Multiscale Modeling of Head Disk Interface. / Dehee Kim, Pil Seung Chung, Jain P., Vemuri S.H., Jhon M.S. // IEEE Transactions on Magnetics. - 2010. - Vol. 46, No. 6. - P. 2401-2404. ↑

J51. Pil Seung Chung. Molecular Spreading of Pure and Binary Mixture PFPE Nano Films on Carbon-Overcoated Disks. / Pil Seung Chung, Jhon M.S. // IEEE Transactions on Magnetics. - 2010. - Vol. 46, No. 6. - P. 2405-2408. ↑

J52. Youn Ho Park. Observation of Spin-Orbit Interaction Parameter Over a Wide Temperature Range Using Potentiometric Measurement. / Youn Ho Park, Hyun Cheol Koo, Kyung Ho Kim, Hyung-jun Kim, Joonyeon Chang, Suk Hee Han, Hijung Kim. // IEEE Transactions on Magnetics. - 2010. - Vol. 46, No. 6. - P. 1562-1564. ↑

J53. Hao Zheng. The Effect of Thermal Radiation on Thermal Flying Height Control Sliders. / Hao Zheng, Shuyu Zhang, Wentao Yan, Pust L., Fowler D., Talke F.E. // IEEE Transactions on Magnetics. - 2010. - Vol. 46, No. 6. - P. 2376-2378. ↑

J54. Ramesh V. Strain relaxation effect by nanotexturing InGaN/GaN multiple quantum well. / Ramesh V., Kikuchi A., Kishino K., Funato M., Kawakami Y. // Journal of Applied Physics. - 2010. - Vol. 107, No. 11. - P. 114303-114303-6. ↑

J55. Li Songzhan. Enhancement of ultraviolet electroluminescence based on n-ZnO /n-GaN isotype heterojunction with low threshold voltage. / Li Songzhan, Fang Guojia, Long Hao, Mo Xiaoming, Huang Huihui, Dong Binzhong, Zhao Xingzhong. // Applied Physics Letters. - 2010. - Vol. 96, No. 20. - P. 201111-201111-3. ↑

J56. Alahmad M. Microwave silicon on insulator-based design of a power management system for jet propulsion laboratory's rechargeable micro-scale batteries. / Alahmad M., Hess H. // IET Circuits, Devices & Systems. - 2010. - Vol. 4, No. 3. - P. 261-268. ↑

J57. Ramachandran B. Magnetoimpedance and magnetodielectric properties of single phase 45PMN-20PFW-35PT ceramics. / Ramachandran B., Sudarshan N., Rao M. S. Ramachandra. // Journal of Applied Physics. - 2010. - Vol. 107, No. 9. - P. 09C503-09C503-3. ↑

J58. Yoshida Y. Development of a laser-focused ion beam combination machine. / Yoshida Y., Masuzawa T., Ikeda H., Oguchi K., Yamagishi H., Wakabayashi Y. // Review of Scientific Instruments. - 2010. - Vol. 81, No. 2. - P. 02B702-02B702-3. ↑

J59. Park Byoung Youl. Enhancement of light emission from silicon nanocrystals by post-O 2 -annealing process. / Park Byoung Youl, Lee Sol, Park Kyoungwan, Bae Chang Hyun, Park Seung Min. // Journal of Applied Physics. - 2010. - Vol. 107, No. 1. - P. 014314-014314-4. ↑

J60. Dan S. S. Analysis of Energy Quantization Effects on Single-Electron Transistor Circuits. / Dan S. S., Mahapatra S. // IEEE Transactions on Nanotechnology. - 2010. - Vol. 9, No. 1. - P. 38-45. ↑

J61. Hashempour M. Parallel growth and healing of DNA self-assembly for interconnects. / Hashempour M., Arani Z.M., Lombardi F. // IET Nanobiotechnology. - 2010. - Vol. 4, No. 1. - P. 19-28. ↑

J62. Perdigones F. Characterisation of the fabrication process of freestanding SU-8 microstructures integrated in printing circuit board in microelectromechanical systems. / Perdigones F., Moreno J.M., Luque A., Quero J.M. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 1. - P. 7-13. ↑

J63. Wissenwasser J. Highly sensitive passive radio frequency identification based sensor systems. / Wissenwasser J., Vellekoop M., Heer R. // Review of Scientific Instruments. - 2010. - Vol. 81, No. 2. - P.

025106-025106-5.

J64. Azam T. Robust asymmetric 6T-SRAM cell for low-power operation in nano-CMOS technologies. / Azam T., Cheng B., Roy S., Cumming D.R.S. // Electronics Letters. - 2010. - Vol. 46, No. 4. - P. 273-274.

J65. Varghese Neson. Effect of combined addition of nano-SiC and nano-Ho 2 O 3 on the in-field critical current density of MgB 2 superconductor. / Varghese Neson, Vinod K., Chattopadhyay M. K., Roy S. B., Syamaprasad U. // Journal of Applied Physics. - 2010. - Vol. 107, No. 1. - P. 013907-013907-5.

J66. Bourdel S. A 9-pJ/Pulse 1.42-Vpp OOK CMOS UWB Pulse Generator for the 3.1-10.6-GHz FCC Band. / Bourdel S., Bachelet Y., Gaubert J., Vauche R., Fourquin O., Dehaese N., Barthelemy H. // IEEE Transactions on Microwave Theory and Techniques. - 2010. - Vol. 58, No. 1. - P. 65-73.

J67. De Los Santos H.J. Theory of Nano-Electron-Fluidic Logic (NFL): A New Digital "Electronics" Concept. IEEE Transactions on Nanotechnology. - 2010. - Vol. 9, No. 4. - P. 474-486.

J68. Helfrich B.E. Combined -Feedback Control and Iterative Learning Control Design With Application to Nanopositioning Systems. / Helfrich B.E., Chibum Lee, Bristow D.A., Xiao X.H., Jingyan Dong, Alleyne A.G., Salapaka S.M., Ferreira P.M. // IEEE Transactions on Control Systems Technology. - 2010. - Vol. 18, No. 2. - P. 336-351.

J69. Fujii M. Exploration of Whole Human Body and UWB Radiation Interaction by Efficient and Accurate Two-Debye-Pole Tissue Models. / Fujii M., Fujii R., Yotsuki R., Wuren T., Takai T., Sakagami I. // IEEE Transactions on Antennas and Propagation. - 2010. - Vol. 58, No. 2. - P. 515-524.

J70. Zhang J. C. Low-temperature electroluminescence quenching of AlGaN deep ultraviolet light-emitting diodes. / Zhang J. C., Sakai Y., Egawa T. // Applied Physics Letters. - 2010. - Vol. 96, No. 1. - P. 013503-013503-3.

J71. Singha S. Dielectric Properties of Epoxy- Nanocomposite System for Packaging Applications. / Singha S., Thomas M.J. // IEEE Transactions on Components and Packaging Technologies. - 2010. - Vol. 33, No. 2. - P. 373-385.

J72. Khan O. Thread Relocation: A Runtime Architecture for Tolerating Hard Errors in Chip Multiprocessors. / Khan O., Kundu S. // IEEE Transactions on Computers. - 2010. - Vol. 59, No. 5. - P. 651-665.

J73. Curone D. Smart Garments for Emergency Operators: The ProeTEX Project. / Curone D., Secco E.L., Tognetti A., Loriga G., Dudnik G., Risatti M., Whyte R., Bonfiglio A., Magenes G. // IEEE Transactions on Information Technology in Biomedicine. - 2010. - Vol. 14, No. 3. - P. 694-701.

J74. Moradi Afshin. Comment on "Microwave attenuation of hydrogen plasma in carbon nanotubes" [J. Appl. Phys. 104, 124315 (2008)]. Journal of Applied Physics. - 2010. - Vol. 107, No. 6. - P. 066104-066104-2.

J75. Gharaibeh M. Effective incorporation of nanoceria into polycrystalline MgB 2. / Gharaibeh M., Albiss B. A., Jumah I., Obaidat I. M. // Journal of Applied Physics. - 2010. - Vol. 107, No. 6. - P. 063908-063908-7.

J76. Grekhov I.V. Pulse Power Generation in Nano- and Subnanosecond Range by Means of Ionizing Fronts in Semiconductors: The State of the Art and Future Prospects. IEEE Transactions on Plasma Science. - 2010. - Vol. 38, No. 5. - P. 1118-1123.

J77. Dressler F. Guest editorial bio-inspired networking. / Dressler F., Suda T., Carreras I., Crowcroft J., Murata M. // IEEE Journal on Selected Areas in Communications. - 2010. - Vol. 28, No. 4. - P. 521-523.

J78. Torrens G. Design Hardening of Nanometer SRAMs Through Transistor Width Modulation and Multi-Vt Combination. / Torrens G., Alorda B., Barcelo S., Rossello J.L., Bota S.A., Segura J. // IEEE Transactions on Circuits and Systems II: Express Briefs. - 2010. - Vol. 57, No. 4. - P. 280-284.

J79. Lv H. Y. Enhanced thermoelectric performance of (Sb 0.75 Bi 0.25)2 Te 3 compound from first-principles calculations. / Lv H. Y., Liu H. J., Pan L., Wen Y. W., Tan X. J., Shi J., Tang X. F. // Applied Physics Letters. - 2010. - Vol. 96, No. 14. - P. 142101-142101-3.

J80. Shin ChaeHo. Study of sensitivity and noise in the piezoelectric self-sensing and self-actuating cantilever

with an integrated Wheatstone bridge circuit. / Shin ChaeHo, Jeon InSu, Khim Zheong G., Hong J. W., Nam HyoJin. // Review of Scientific Instruments. - 2010. - Vol. 81, No. 3. - P. 035109-035109-5.

J81. Nagahama Taro. Hot electron transport in magnetic tunnel transistors with an epitaxial MgO tunnel barrier. / Nagahama Taro, Saito Hidekazu, Yuasa Shinji. // Applied Physics Letters. - 2010. - Vol. 96, No. 11. - P. 112509-112509-3.

J82. Maglaveras N. Guest Editorial Special Section on Personal Health Systems. / Maglaveras N., Bonato P., Tamura T. // IEEE Transactions on Information Technology in Biomedicine. - 2010. - Vol. 14, No. 2. - P. 360-363.

J83. Wolter K.-J. Nano- and Biotechniques in Electronic Packaging. / Wolter K.-J., Gerlach G. // IEEE Nanotechnology Magazine. - 2010. - Vol. 4, No. 1. - P. 23-27.

J84. Sungchul Joo. Advanced Package Prototyping Using Nano-Particle Silver Printed Interconnects. / Sungchul Joo, Baldwin D.F. // IEEE Transactions on Electronics Packaging Manufacturing. - 2010. - Vol. 33, No. 2. - P. 129-134.

J85. Wu Di. High-performance CdS:P nanoribbon field-effect transistors constructed with high-kappa dielectric and top-gate geometry. / Wu Di, Jiang Yang, Wang Li, Li Shanying, Wu Bo, Lan Xinzheng, Yu Yongqiang, Wu Chunyan, Wang Zhuangbing, Jie Jiansheng. // Applied Physics Letters. - 2010. - Vol. 96, No. 12. - P. 123118-123118-3.

J86. Sun C. P. Colossal electroresistance and colossal magnetoresistance in spinel multiferroic CdCr 2 S 4. / Sun C. P., Huang C. L., Lin C. C., Her J. L., Ho C. J., Lin J.-Y., Berger H., Yang H. D. // Applied Physics Letters. - 2010. - Vol. 96, No. 12. - P. 122109-122109-3.

J87. Ding Weiqiang. Compact and low crosstalk waveguide crossing using impedance matched metamaterial. / Ding Weiqiang, Tang Donghua, Liu Yan, Chen Lixue, Sun Xiudong. // Applied Physics Letters. - 2010. - Vol. 96, No. 11. - P. 111114-111114-3.

J88. Rowe A. Rate-Harmonized Scheduling and Its Applicability to Energy Management. / Rowe A., Lakshmanan K., Haifeng Zhu, Rajkumar R. // IEEE Transactions on Industrial Informatics. - 2010. - Vol. 6, No. 3. - P. 265-275.

J89. Zhang Yue. The temperature dependence of magnetic properties for cobalt ferrite nanoparticles by the hydrothermal method. / Zhang Yue, Liu Yong, Fei Chunlong, Yang Zhi, Lu Zhihong, Xiong Rui, Yin Di, Shi Jing. // Journal of Applied Physics. - 2010. - Vol. 108, No. 8. - P. 084312-084312-6.

J90. Azimi S. Formation of three-dimensional and nanowall structures on silicon using a hydrogen-assisted high aspect ratio etching. / Azimi S., Mehran M., Amini A., Vali A., Mohajerzadeh S., Fathipour M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. 1125-1131.

J91. Yejin Zhang. Design of Photonic Crystal Semiconductor Optical Amplifier With Polarization Independence. / Yejin Zhang, Wanhua Zheng, Qi Aiyi, Hongwei Qu, Hongling Peng, Shizhong Xie, Lianghui Chen. // Journal of Lightwave Technology. - 2010. - Vol. 28, No. 22. - P. 3207-3211.

J92. Jia Han. Subwavelength imaging by a simple planar acoustic superlens. / Jia Han, Ke Manzhu, Hao Rui, Ye Yangtao, Liu Fengming, Liu Zhengyou. // Applied Physics Letters. - 2010. - Vol. 97, No. 17. - P. 173507-173507-3.

J93. Tripathi S.K. Comprehensive analysis of the deposition caused by scattered Ga ions during focused ion-beam-induced deposition. / Tripathi S.K., Shukla N., Rajput N.S., Singh A.K., Kulkarni V.N. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 5. - P. 254-257.

J94. Kenle Chen. Antibiased Electrostatic RF MEMS Varactors and Tunable Filters. / Kenle Chen, Xiaoguang Liu, Kovacs A., Chappell W.J., Peroulis D. // IEEE Transactions on Microwave Theory and Techniques. - 2010. - Vol. 58, No. 12. - P. 3971-3981.

J95. Miyasako Takaaki. Totally solution-processed ferroelectric-gate thin-film transistor. / Miyasako Takaaki, Trinh Bui Nguyen Quoc, Onoue Masatoshi, Kaneda Toshihiko, Tue Phan Trong, Tokumitsu Eisuke, Shimoda

Tatsuya. // Applied Physics Letters. - 2010. - Vol. 97, No. 17. - P. 173509-173509-3. ↑

J96. Carty A. In It to WIN It. / Carty A., Yeow J.T.W. // IEEE Nanotechnology Magazine. - 2010. - Vol. 4, No. 4. - P. 4-12. ↑

J97. Buchau A. Inductive detection and concentration measurement of nano sized zero valent iron in the subsurface. / Buchau A., Rucker W.M., de Boer C.V., Klaas N. // IET Science, Measurement & Technology. - 2010. - Vol. 4, No. 6. - P. 289-297. ↑

J98. Yu Zhizhou. Novel transport properties of gold-single wall carbon nanotubes composite contacts. / Yu Zhizhou, Sun L. Z., Wei X. L., Zhong J. X. // Journal of Applied Physics. - 2010. - Vol. 108, No. 6. - P. 064318-064318-5. ↑

J99. Ogata Shuji. Stress-induced nano-oxidation of silicon by diamond-tip in moisture environment: A hybrid quantum-classical simulation study. / Ogata Shuji, Abe Yuya, Ohba Nobuko, Kobayashi Ryo. // Journal of Applied Physics. - 2010. - Vol. 108, No. 6. - P. 064313-064313-12. ↑

J100. Jiantao Zheng. Cyclic Magnetic Actuation for Potential Characterization of Interfacial Fatigue Fracture. / Jiantao Zheng, Ostrowicki G., Sitaraman S.K. // IEEE Transactions on Components and Packaging Technologies. - 2010. - Vol. 33, No. 3. - P. 648-654. ↑

J101. Chen Ruling. Dynamic phase transformation of crystalline silicon under the dry and wet impact studied by molecular dynamics simulation. / Chen Ruling, Luo Jianbin, Guo Dan, Lei Hong. // Journal of Applied Physics. - 2010. - Vol. 108, No. 7. - P. 073521-073521-6. ↑

J102. Liu X. J. Inverse Hall-Petch relationship in the nanostructured TiO 2 : Skin-depth energy pinning versus surface preferential melting. / Liu X. J., Yang L. W., Zhou Z. F., Chu Paul K., Sun Chang Q. // Journal of Applied Physics. - 2010. - Vol. 108, No. 7. - P. 073503-073503-5. ↑

J103. Hua Ji. 1.28-Tb/s Demultiplexing of an OTDM DPSK Data Signal Using a Silicon Waveguide. / Hua Ji, Galili M., Hao Hu, Minhao Pu, Oxenlш,we L.K., Yvind K., Hvam J.M., Jeppesen P. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 23. - P. 1762-1764. ↑

J104. Chang I.J. Fast and accurate estimation of SRAM read and hold failure probability using critical point sampling. / Chang I.J., Park J., Kang K., Roy K. // IET Circuits, Devices & Systems. - 2010. - Vol. 4, No. 6. - P. 469-478. ↑

J105. Lee Jung Han. Interface formation between tris(8-hydroxyquinoline) aluminum and ZnO nanowires and film. / Lee Jung Han, Shin Jeong Ho, Song Jae Yong, Yi Yeonjin. // Applied Physics Letters. - 2010. - Vol. 97, No. 26. - P. 263302-263302-3. ↑

J106. Scotti G. Silicon nanograss as micro fuel cell gas diffusion layer. / Scotti G., Kanninen P., Majkinen M., Kallio T., Franssila S. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 6. - P. 382-385. ↑

J107. Guo Feng. Valve-based microfluidic device for droplet on-demand operation and static assay. / Guo Feng, Liu Kan, Ji Xing-Hu, Ding Hui-Jiang, Zhang Meng, Zeng Qian, Liu Wei, Guo Shi-Shang, Zhao Xing-Zhong. // Applied Physics Letters. - 2010. - Vol. 97, No. 23. - P. 233701-233701-3. ↑

J108. Liu Nishuang. High performance ZnO nanorod strain driving transistor based complementary metal-oxide-semiconductor logic gates. / Liu Nishuang, Fang Guojia, Zeng Wei, Zhou Hai, Long Hao, Zou Xiao, Liu Yuping, Zhao Xingzhong. // Applied Physics Letters. - 2010. - Vol. 97, No. 24. - P. 243504-243504-3. ↑

J109. Zhu Chenxin. Performance enhancement of multilevel cell nonvolatile memory by using a bandgap engineered high-kappa trapping layer. / Zhu Chenxin, Huo Zongliang, Xu Zhongguang, Zhang Manhong, Wang Qin, Liu Jing, Long Shibing, Liu Ming. // Applied Physics Letters. - 2010. - Vol. 97, No. 25. - P. 253503-253503-3. ↑

J110. Baby Tessy Theres. Investigation of thermal and electrical conductivity of graphene based nanofluids. / Baby Tessy Theres, Ramaprabhu S. // Journal of Applied Physics. - 2010. - Vol. 108, No. 12. - P. 124308-124308-6. ↑

J111. Georgakopoulos S. Stability of top- and bottom-gate amorphous polymer field-effect transistors. /

Georgakopoulos S., Sparrowe D., Meyer F., Shkunov M. // Applied Physics Letters. - 2010. - Vol. 97, No. 24. - P. 243507-243507-3.

J112. Kometani Reo. Piezoresistive effect in the three-dimensional diamondlike carbon nanostructure fabricated by focused-ion-beam chemical vapor deposition. / Kometani Reo, Yusa Kouki, Warisawa Shinichi, Ishihara Sunao. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. C6F38-C6F41.

J113. Gu Yan Hong. Nonstoichiometric BiFe 0.9 Ti 0.05 O 3 multiferroic ceramics with ultrahigh electrical resistivity. / Gu Yan Hong, Wang Yu, Chen Feng, Chan Helen Lai Wah, Chen Wan Ping. // Journal of Applied Physics. - 2010. - Vol. 108, No. 9. - P. 094112-094112-5.

J114. Atou Toshiyuki. Instantaneous nano-order fragmentation in mullite ceramics triggered by a shock-induced phase transition. / Atou Toshiyuki, Kawai Nobuaki, Ito Shun, Yubuta Kunio, Kikuchi Masae. // Journal of Applied Physics. - 2010. - Vol. 108, No. 9. - P. 093523-093523-4.

J115. Jugessur A. S. Tunable optofluidic nano-Bragg microcavity filter. / Jugessur A. S., Dou J., Aitchison J. S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. C6O8-C6O10.

J116. Zha Jun-Wei. Dielectric properties and effect of electrical aging on space charge accumulation in polyimide/TiO 2 nanocomposite films. / Zha Jun-Wei, Dang Zhi-Min, Song Hong-Tao, Yin Yi, Chen George. // Journal of Applied Physics. - 2010. - Vol. 108, No. 9. - P. 094113-094113-6.

J117. Meng L. J. A quasicore-shell structure of FeCo and FeNi nanoparticles. / Meng L. J., Peng X. Y., Tang C., Zhang K. W., Stocks G. M., Zhong J. X. // Journal of Applied Physics. - 2010. - Vol. 108, No. 10. - P. 104314-104314-5.

J118. Meng X. Q. Structure and properties of InAs/AlAs quantum dots for broadband emission. / Meng X. Q., Jin P., Liang Z. M., Liu F. Q., Wang Z. G., Zhang Z. Y. // Journal of Applied Physics. - 2010. - Vol. 108, No. 10. - P. 103515-103515-5.

J119. Latif Rhonira. Microelectromechanical systems for biomimetical applications. / Latif Rhonira, Mastropaolo Enrico, Bunting Andy, Cheung Rebecca, Koickal Thomas, Hamilton Alister, Newton Michael, Smith Leslie. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. C6N1-C6N6.

J120. Yoshimoto Tomomi. Field emission from diamond micropowders with sharp edges. / Yoshimoto Tomomi, Yui Hisanori, Iwata Tatsuo. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 2. - P. C2B30-C2B33.

J121. Lu Di. Study of the synthesis of tungsten trioxide nanostructured arrays by tungsten hot filament chemical vapor deposition method and their field emission properties. / Lu Di, Liang Bo, Ogino Akihisa, Nagatsu Masaaki. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 2. - P. C2A98-C2A103.

J122. Sugiyama Yasuhiko. Numerical simulations on capture area of gas molecules for high brightness gas field ion source. / Sugiyama Yasuhiko, Kobayashi Yusuke, Morikawa Yuuki, Kajiwara Kazuo, Hata Koichi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 2. - P. C2A83-C2A89.

J123. Li Chaoyang. Comparison of structural and photoluminescence properties of zinc oxide nanostructures influenced by gas ratio and substrate bias during radio frequency sputtering. / Li Chaoyang, Matsuda Tokiyoshi, Kawaharamura Toshiyuki, Furuta Hiroshi, Furuta Mamoru, Hiramatsu Takahiro, Hirao Takashi, Nakanishi Yoichiro, Ichinomiya Keiji. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 2. - P. C2B51-C2B55.

J124. Sheng-Chun Wang. Temperature-Dependent RF Small-Signal and Noise Characteristics of SOI Dynamic Threshold Voltage MOSFETs. / Sheng-Chun Wang, Pin Su, Kun-Ming Chen, Kuo-Hsiang Liao, Bo-Yuan Chen, Sheng-Yi Huang, Cheng-Chou Hung, Guo-Wei Huang. // IEEE Transactions on Microwave Theory and Techniques. - 2010. - Vol. 58, No. 9. - P. 2319-2325.

J125. Li Xiaozhu. Effect of electric field on CuO nanoneedle growth during thermal oxidation and its growth mechanism. / Li Xiaozhu, Zhang Jun, Yuan Yanwen, Liao Lingmin, Pan Chunxu. // Journal of Applied Physics. - 2010. - Vol. 108, No. 2. - P. 024308-024308-6. ↑

J126. He Yuhui. Differential conductance as a promising approach for rapid DNA sequencing with nanopore-embedded electrodes. / He Yuhui, Shao Lubing, Scheicher Ralph H., Grigoriev Anton, Ahuja Rajeev, Long Shibing, Ji Zhuoyu, Yu Zhaoan, Liu Ming. // Applied Physics Letters. - 2010. - Vol. 97, No. 4. - P. 043701-043701-3. ↑

J127. Ahn C. Current-perpendicular-to-plane spin transport properties of CoFe alloys: Spin diffusion length and scattering asymmetry. / Ahn C., Shin K.-H., Loloee R., Bass J., Pratt W. P. // Journal of Applied Physics. - 2010. - Vol. 108, No. 2. - P. 023908-023908-7. ↑

J128. Lau J. W. In situ tunneling measurements in a transmission electron microscope on nanomagnetic tunnel junctions. / Lau J. W., Morrow P., Read J. C., Hoink V., Egelhoff W. F., Huang L., Zhu Y. // Applied Physics Letters. - 2010. - Vol. 96, No. 26. - P. 262508-262508-3. ↑

J129. Zhang Wei. Deposited nanorod films for photonic crystal biosensor applications. / Zhang Wei, Kim Seok-min, Ganesh Nikhil, Block Ian D., Mathias Patrick C., Wu Hsin-Yu, Cunningham Brian T. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2010. - Vol. 28, No. 4. - P. 996-1001. ↑

J130. Mekaru Harutaka. Imprinting of guide structure to weave nylon fibers. / Mekaru Harutaka, Takahashi Masaharu. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2010. - Vol. 28, No. 4. - P. 706-712. ↑

J131. Peng Shasha. Acoustic far-field focusing effect for two-dimensional graded negative refractive-index sonic crystals. / Peng Shasha, He Zhaojian, Jia Han, Zhang Anqi, Qiu Chunyin, Ke Manzhu, Liu Zhengyou. // Applied Physics Letters. - 2010. - Vol. 96, No. 26. - P. 263502-263502-3. ↑

J132. Li S. Electrical field induced direct-to-indirect bandgap transition in ZnO nanowires. / Li S., Li J. L., Jiang Q., Yang G. W. // Journal of Applied Physics. - 2010. - Vol. 108, No. 2. - P. 024302-024302-5. ↑

J133. Takao H. A Versatile Integration Technology of SOI-MEMS/CMOS Devices Using Microbridge Interconnection Structures. / Takao H., Ichikawa T., Nakata T., Sawada K., Ishida M. // Journal of Microelectromechanical Systems. - 2010. - Vol. 19, No. 4. - P. 919-926. ↑

J134. Kim Kyoung Chan. High power single-lateral-mode operation of InAs quantum dot based ridge type laser diodes by utilizing a double bend waveguide structure. / Kim Kyoung Chan, Han Il Ki, Lee Jung Il, Kim Tae Geun. // Applied Physics Letters. - 2010. - Vol. 96, No. 26. - P. 261106-261106-3. ↑

J135. Jung Mina. Correlation between structural and optical properties of a -plane GaN films grown on r -plane sapphire by metal organic chemical-vapor deposition. / Jung Mina, Chang Jiho, Lee Hyunjae, Ha Jun-seok, Park Jin-sub, Park Seungwhan, Fujii Katsushi, Yao Takafumi, Kil Gyung-suk, Lee Seogwoo, Cho Myungwhan, Whang Sungmin, Seo Yong-gon. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 3. - P. 623-626. ↑

J136. Tan S. Metal-organic chemical vapor deposition of quasi-normally-off AlGaN/GaN field-effect transistors on silicon substrates using low-temperature grown AlN cap layers. / Tan S., Selvaraj S. L., Egawa T. // Applied Physics Letters. - 2010. - Vol. 97, No. 5. - P. 053502-053502-3. ↑

J137. Levitsky I.A. Highly Sensitive and Selective Explosive Detector Based on Nanoporous Silicon Photonic Crystal Infiltrated with Emissive Organics [Nanoproducts]. IEEE Nanotechnology Magazine. - 2010. - Vol. 4, No. 3. - P. 24-26. ↑

J138. Yiting Yu. A Strategy to Efficiently Extend the Change Rate of Period for Comb-Drive Micromechanical Pitch-Tunable Gratings. / Yiting Yu, Weizheng Yuan, Ruikang Sun, Dayong Qiao, Bin Yan. // Journal of Microelectromechanical Systems. - 2010. - Vol. 19, No. 5. - P. 1180-1185. ↑

J139. Li Jinwang. A low-temperature crystallization path for device-quality ferroelectric films. / Li Jinwang, Kameda Hiroyuki, Trinh Bui Nguyen Quoc, Miyasako Takaaki, Tue Phan Trong, Tokumitsu Eisuke, Mitani Tadaoki, Shimoda Tatsuya. // Applied Physics Letters. - 2010. - Vol. 97, No. 10. - P. 102905-102905-3. ↑

J140. Balachandran G.K. A Passive UHF RFID Demodulator With RF Overvoltage Protection and Automatic Weighted Threshold Adjustment. / Balachandran G.K., Barnett R.E. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2010. - Vol. 57, No. 9. - P. 2291-2300. ↑

J141. Shin S. J. Si-based ultrasmall multiswitching single-electron transistor operating at room-temperature. / Shin S. J., Jung C. S., Park B. J., Yoon T. K., Lee J. J., Kim S. J., Choi J. B., Takahashi Y., Hasko D. G. // Applied Physics Letters. - 2010. - Vol. 97, No. 10. - P. 103101-103101-3. ↑

J142. Cheng Gang. Full spin-coated multilayer structure hybrid light-emitting devices. / Cheng Gang, Mazzeo Marco, Carallo Sonia, Wang Huiping, Ma Yuguang, Gigli Giuseppe. // Applied Physics Letters. - 2010. - Vol. 97, No. 10. - P. 103107-103107-3. ↑

J143. Dey D. Composite Nano-Antenna Integrated With Quantum Cascade Laser. / Dey D., Kohoutek J., Gelfand R.M., Bonakdar A., Mohseni H. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 21. - P. 1580-1582. ↑

J144. Mogollo. TCAD Simulations on CMOS Propagation Induced Pulse Broadening Effect: Dependence Analysis on the Threshold Voltage. / Mogollo,n J.M., Palomo F.R., Aguirre M.A., Na,poles J., Guzma,n-Miranda H., Garci,a-Sa,nchez E. // IEEE Transactions on Nuclear Science. - 2010. - Vol. 57, No. 4. - P. 1908-1914. ↑

J145. Kovac U. Hierarchical Simulation of Statistical Variability: From 3-D MC With " ab initio" Ionized Impurity Scattering to Statistical Compact Models. / Kovac U., Alexander C., Roy G., Riddet C., Binjie Cheng, Asenov A. // IEEE Transactions on Electron Devices. - 2010. - Vol. 57, No. 10. - P. 2418-2426. ↑

J146. Jianping Guo. A 6- W Chip-Area-Efficient Output-Capacitorless LDO in 90-nm CMOS Technology. / Jianping Guo, Ka Nang Leung. // IEEE Journal of Solid-State Circuits. - 2010. - Vol. 45, No. 9. - P. 1896-1905. ↑

J147. Joshi S. Modeling of MEMS-Based Fuel Cells Using SUGAR and Reliability Calculations. / Joshi S., Pathak R. // IEEE Systems Journal. - 2010. - Vol. 4, No. 3. - P. 334-345. ↑

J148. Neshat M. Performance Analysis of Resonance-Based Transducers in Terahertz Bio-Chips Using Equivalent Surface Impedance Model. / Neshat M., Safavi-Naeini S. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 20. - P. 1512-1514. ↑

J149. Mikula S. Thermal Dynamics of Multicore Integrated Systems. / Mikula S., Kos A. // IEEE Transactions on Components and Packaging Technologies. - 2010. - Vol. 33, No. 3. - P. 524-534. ↑

J150. Scorrano L. Achieving Power Transmission Enhancement by Using Nano-Rings Made of Silver Spheres. / Scorrano L., Bilotti F., Vegni L. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 21. - P. 1595-1597. ↑

J151. Jeongwon Han. Design and Fabrication of Perpendicular Patterned Magnetic Media Using Nanoimprinted Nano Pillar Patterns. / Jeongwon Han, Jung Mo Yang, Sang Chul Shin, Young-Joo Kim, Shinill Kang. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 5. - P. 2288-2291. ↑

J152. Jiseok Lim. Application of Organic/Inorganic Hybrid Photopolymer to Fabricate Ultra-High-Density Patterned Substrate. / Jiseok Lim, Popall M., Kang S. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 5. - P. 2300-2303. ↑

J153. Cheng-Da Wu. Coarse particle dynamics applied to the nanocontact. / Cheng-Da Wu, Jen-Fin Lin, Te-Hua Fang. // IEEE Nanotechnology Magazine. - 2009. - Vol. 3, No. 1. - P. 9-15. ↑

J154. Ssenyange S. Fabrication of arrays of carbon micro- and nanostructures via electrochemical etching. / Ssenyange S., Du R., McDermott M.T. // IET Micro & Nano Letters. - 2009. - Vol. 4, No. 1. - P. 22-26. ↑

J155. Vozniy O. V. Neutralization efficiency estimation in a neutral beam source based on inductively coupled plasma. / Vozniy O. V., Yeom G. Y. // Journal of Applied Physics. - 2009. - Vol. 105, No. 1. - P. 013308-013308-7. ↑

J156. Hwang Kyo Seon. Quantification of disease marker in undiluted serum using an actuating layer-embedded microcantilever. / Hwang Kyo Seon, Jeon Hye Kyung, Lee Sang-Myung, Kim Sang Kyung, Kim Tae Song. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 102017-102017-7. ↑

J157. Sekhar K. C. Structural and ferroelectric properties of spray deposited sodium nitrite:poly(vinyl alcohol) composite films. / Sekhar K. C., Nautiyal Arvind, Nath R. // Journal of Applied Physics. - 2009. - Vol. 105, No. 2. - P. 024109-024109-5. ↑

J158. Chien Wei-Chih. Magnetoimpedance behavior and its equivalent circuit analysis of Co/Cu/Co/Py pseudo-spin-valve with a nano-oxide layer. / Chien Wei-Chih, Yao Yeong-Der, Wu Jiann-Kuo, Lo Chi-Kuen, Hung Ruei-Feng, Lan M. D., Lin Pang. // Journal of Applied Physics. - 2009. - Vol. 105, No. 3. - P. 033915-033915-4. ↑

J159. He Peng-Bin. Current-driven ferromagnetic resonance in magnetic trilayers with a tilted spin polarizer. / He Peng-Bin, Li Zai-Dong, Pan An-Lian, Zhang Qing-Lin, Wan Qiang, Wang Ri-Xing, Wang Yan-Guo, Liu Wu-Ming, Zou Bing-Suo. // Journal of Applied Physics. - 2009. - Vol. 105, No. 4. - P. 043908-043908-7. ↑

J160. Shi Li. Thermal probing of energy dissipation in current-carrying carbon nanotubes. / Shi Li, Zhou Jianhua, Kim Philip, Bachtold Adrian, Majumdar Arun, McEuen Paul L. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 104306-104306-5. ↑

J161. Schroeder P. Morphology alterations during postsynthesis oxidation of Zn nanowires. / Schroeder P., Kast M., Halwax E., Edtmaier C., Bethge O., Bruckl H. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 104307-104307-5. ↑

J162. Krishnamoorthy A.V. Optical Proximity Communication With Passively Aligned Silicon Photonic Chips. / Krishnamoorthy A.V., Cunningham J.E., Xuezhe Zheng, Shubin I., Simons J., Dazeng Feng, Hong Liang, Cheng-Chih Kung, Asghari M. // IEEE Journal of Quantum Electronics. - 2009. - Vol. 45, No. 4. - P. 409-414. ↑

J163. Zhao Yigui. Design and fabrication of surface acoustic wave delay line for surface acoustic wave chemical-agent sensors. / Zhao Yigui, Liu Ming, Li Jingjing, Niu Jiebin, Li Dongmei. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 4. - P. 1821-1824. ↑

J164. Murmu T. Vibration analysis of nano-single-layered graphene sheets embedded in elastic medium based on nonlocal elasticity theory. / Murmu T., Pradhan S. C. // Journal of Applied Physics. - 2009. - Vol. 105, No. 6. - P. 064319-064319-8. ↑

J165. Jin-Woo Park. The Fracture Resistance of Bonded Au Wires for Interconnection. / Jin-Woo Park, Young-Bok Yoon, Joon-Gil Lee. // IEEE Transactions on Components and Packaging Technologies. - 2009. - Vol. 32, No. 1. - P. 106-109. ↑

J166. Schlosser M. Fringing-Induced Drain Current Improvement in the Tunnel Field-Effect Transistor With High- Gate Dielectrics. / Schlosser M., Bhuwalka K.K., Sauter M., Zilbauer T., Sulima T., Eisele I. // IEEE Transactions on Electron Devices. - 2009. - Vol. 56, No. 1. - P. 100-108. ↑

J167. Edwards C. Bionic batteries-[electronics power]. Engineering & Technology. - 2009. - Vol. 4, No. 8. - P. 38-39. ↑

J168. Sen P. A Fast Liquid-Metal Droplet Microswitch Using EWOD-Driven Contact-Line Sliding. / Sen P., Chang-Jin Kim. // Journal of Microelectromechanical Systems. - 2009. - Vol. 18, No. 1. - P. 174-185. ↑

J169. Usman M. Moving Toward Nano-TCAD Through Multimillion-Atom Quantum-Dot Simulations Matching Experimental Data. / Usman M., Hoon Ryu, Insoo Woo, Ebert D.S., Klimeck G. // IEEE Transactions on Nanotechnology. - 2009. - Vol. 8, No. 3. - P. 330-344. ↑

J170. Hee Seok Ahn. Pool Boiling Experiments on a Nano-Structured Surface. / Hee Seok Ahn, Sathyamurthi V., Banerjee D. // IEEE Transactions on Components and Packaging Technologies. - 2009. - Vol. 32, No. 1. - P. 156-165. ↑

J171. Jianwei Dai. Analysis of Defect Tolerance in Molecular Crossbar Electronics. / Jianwei Dai, Lei Wang, Faquir Jain. // IEEE Transactions on Very Large Scale Integration (VLSI) Systems. - 2009. - Vol. 17, No. 4. - P. 529-540. ↑

J172. Jian-Qiang Lu. 3-D Hyperintegration and Packaging Technologies for Micro-Nano Systems. Proceedings of the IEEE. - 2009. - Vol. 97, No. 1. - P. 18-30. ↑

J173. Yupapin P.P. Proposed Nonlinear Microring Resonator Arrangement for Stopping and Storing Light. / Yupapin P.P., Pornsuwancharoen N. // IEEE Photonics Technology Letters. - 2009. - Vol. 21, No. 6. - P. 404-406. ↑

J174. Liu B. Lube-Surfing Recording and Its Feasibility Exploration. / Liu B., Zhang M.S., Yu S.K., Hua W., Ma Y.S., Zhou W.D., Gonzaga L., Man Y.J. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 2. - P. 899-904. ↑

J175. Li M.-J. Ultra-Low Bending Loss Single-Mode Fiber for FTTH. / Li M.-J., Tandon P., Bookbinder D.C., Bickham S.R., McDermott M.A., Desorcie R.B., Nolan D.A., Johnson J.J., Lewis K.A., Englebert J.J. // Journal of Lightwave Technology. - 2009. - Vol. 27, No. 3. - P. 376-382. ↑

J176. Abdul Ahad Faris B. Dielectric constant at x -band microwave frequencies for multiferroic BiFeO 3 thin films. / Abdul Ahad Faris B., Hung D. S., Yao Y. D., Lee S. F., Tu C. S., Wang T. H., Chen Y. Y., Fu Y. P. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07D912-07D912-3. ↑

J177. Vozniy O. V. High-energy negative ion beam obtained from pulsed inductively coupled plasma for charge-free etching process. / Vozniy O. V., Yeom G. Y. // Applied Physics Letters. - 2009. - Vol. 94, No. 23. - P. 231502-231502-3. ↑

J178. Hung-Chun Chen. Polymer Inverter Fabricated by Inkjet Printing and Realized by Transistors Arrays on Flexible Substrates. / Hung-Chun Chen, Chen-Pang Kung, Wen-Gain Houng, Yu-Rung Peng, Yen-Min Hsien, Chun-Cheng Chou, Chi-Jen Kao, Tsung-Hua Yang, Hou J. // Journal of Display Technology. - 2009. - Vol. 5, No. 6. - P. 216-222. ↑

J179. Scheerlinck S. Metal Grating Patterning on Fiber Facets by UV-Based Nano Imprint and Transfer Lithography Using Optical Alignment. / Scheerlinck S., Dubruel P., Bienstman P., Schacht E., Van Thourhout D., Baets R. // Journal of Lightwave Technology. - 2009. - Vol. 27, No. 10. - P. 1415-1420. ↑

J180. Shin ChaeHo. Single nanoparticle alignment by atomic force microscopy indentation. / Shin ChaeHo, Jeon InSu, Jeon SeungHee, Khim Zheong G. // Applied Physics Letters. - 2009. - Vol. 94, No. 16. - P. 163107-163107-3. ↑

J181. Ueda H. Design and Test of Filter of High Gradient Magnetic Separation System for Trapping Immunoglobulin in Serum. / Ueda H., Agatsuma K., Kajikawa K., Furuse M., Fuchino S., Ishiyama A. // IEEE Transactions on Applied Superconductivity. - 2009. - Vol. 19, No. 3. - P. 2157-2161. ↑

J182. Yimin Wang. Optical Ceramic Scintillator for PET. / Yimin Wang, van Loef E., Rhodes W.H., Glodo J., Brecher C., Nguyen L., Lempicki A., Baldoni G., Higgins W.M., Shah K.S. // IEEE Transactions on Nuclear Science. - 2009. - Vol. 56, No. 3. - P. 887-891. ↑

J183. Ono S. Fabrication and Evaluation of Nano-Scale Optical Circuits Using Sol-Gel Materials With Photo-Induced Refractive Index Variation Characteristics. / Ono S., Yoshimura T., Sato T., Oshima J. // Journal of Lightwave Technology. - 2009. - Vol. 27, No. 9. - P. 1229-1235. ↑

J184. Smith R. C. Maximizing the electron field emission performance of carbon nanotube arrays. / Smith R. C., Silva S. R. P. // Applied Physics Letters. - 2009. - Vol. 94, No. 13. - P. 133104-133104-3. ↑

J185. Hung Jenny. Complete photonic bandgaps in the visible range from spherical layer structures in dichromate gelatin emulsions. / Hung Jenny, Kok Mang Hin, Tam Wing Yim. // Applied Physics Letters. - 2009. - Vol. 94, No. 1. - P. 014102-014102-3. ↑

J186. Teweldebrhan D. Modification of graphene properties due to electron-beam irradiation. / Teweldebrhan D., Balandin A. A. // Applied Physics Letters. - 2009. - Vol. 94, No. 1. - P. 013101-013101-3. ↑

J187. Mitatha S. A Simultaneous Short-Wave and Millimeter-Wave Generation Using a Soliton Pulse Within a Nano-Waveguide. / Mitatha S., Pornsuwancharoen N., Yupapin P.P. // IEEE Photonics Technology Letters. - 2009. - Vol. 21, No. 13. - P. 932-934. ↑

J188. Kwon Bong-Joon. Optical properties and carrier dynamics of polarity controlled ZnO films grown on (0001) Al 2 O 3 by Cr-compound intermediate layers. / Kwon Bong-Joon, Sun Yuanping, Chung Jean Soo, Cho Yong-Hoon, Park J. S., Yao T. // Applied Physics Letters. - 2009. - Vol. 94, No. 6. - P. 061918-061918-3. ↑

J189. Solanki Pratima R. Nanostructured zinc oxide platform for cholesterol sensor. / Solanki Pratima R., Kaushik Ajeet, Ansari Anees A., Malhotra B. D. // Applied Physics Letters. - 2009. - Vol. 94, No. 14. - P. 143901-143901-3. ↑

J190. Chang Hsiang-Szu. Origins of nonzero multiple photon emission probability from single quantum dots embedded in photonic crystal nanocavities. / Chang Hsiang-Szu, Chen Wen-Yen, Hsu Tzu-Min, Hsieh Tung-Po, Chyi Jen-Inn, Chang Wen-Hao. // Applied Physics Letters. - 2009. - Vol. 94, No. 16. - P. 163111-163111-3. ↑

J191. Shi Liqiu. Fabrication of functional structures at Si (100) surface by mechanical scribing in the presence of aryl diazonium salts. / Shi Liqiu, Sun Tao, Yan Yongda, Zhao Jianwei, Dong Shen. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1399-1402. ↑

J192. Lee Wen-Hsi. Effect of nanocomposite gate dielectric roughness on pentacene field-effect transistor. / Lee Wen-Hsi, Wang C. C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1116-1121. ↑

J193. Wang Hailing. Inductively coupled plasma etching in fabrication of 2D InP-based photonic crystals. / Wang Hailing, Xing Mingxin, Ren Gang, Zheng Wanhua. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1093-1096. ↑

J194. Thakur Sangeeta. Room temperature ferromagnetic ordering in indium substituted nano-nickel-zinc ferrite. / Thakur Sangeeta, Katyal S. C., Gupta A., Reddy V. R., Singh M. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07A521-07A521-3. ↑

J195. Miyajima Y. Pulsed laser deposited tetrahedral amorphous carbon with high sp3 fractions and low optical bandgaps. / Miyajima Y., Henley S. J., Adamopoulos G., Stolojan V., Garcia-Caurel E., Drevillon B., Shannon J. M., Silva S. R. P. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 073521-073521-8. ↑

J196. Sinha Sudarson Sekhar. A versatile fiber-optic coupled system for sensitive optical spectroscopy in strong ambient light. / Sinha Sudarson Sekhar, Verma Pramod Kumar, Makhal Abhinandan, Pal Samir Kumar. // Review of Scientific Instruments. - 2009. - Vol. 80, No. 5. - P. 053109-053109-4. ↑

J197. Ting Jyh-Hua. Carbon nanotube array vias for interconnect applications. / Ting Jyh-Hua, Chiu Ching-Chieh, Huang Fuang-Yuan. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1086-1092. ↑

J198. Bean Jeffrey A. Thermal infrared detection using dipole antenna-coupled metal-oxide-metal diodes. / Bean Jeffrey A., Tiwari Badri, Bernstein Gary H., Fay P., Porod Wolfgang. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 1. - P. 11-14. ↑

J199. Chen Z. T. Improved performance of InAlN-based Schottky solar-blind photodiodes. / Chen Z. T., Tan S. X., Sakai Y., Egawa T. // Applied Physics Letters. - 2009. - Vol. 94, No. 21. - P. 213504-213504-3. ↑

J200. Lee Seunghun. Reproducible manipulation of spin ordering in ZnCoO nanocrystals by hydrogen mediation. / Lee Seunghun, Cho Yong Chan, Kim Sung-Jin, Cho Chae Ryong, Jeong Se-Young, Kim Su Jae, Kim Jong Pil, Choi Yong Nam, Sur Jean Man. // Applied Physics Letters. - 2009. - Vol. 94, No. 21. - P. 212507-212507-3. ↑

J201. Ma Xiaobo. Enhanced surface blistering of germanium with B + /H + coimplantation. / Ma Xiaobo, Du Xiaofeng, Liu Weili, Chen Chao, Song Zhitang, Lin Chenglu. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1063-1067. ↑

J202. Lee J. W. Dry etching of GaAs in high pressure, capacitively coupled B Cl 3 /N 2 plasmas. / Lee J. W., Kim J. K., Lee J. H., Joo Y. W., Park Y. H., Noh H. S., Pearton S. J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 2. - P. 681-683. ↑

J203. Gao Fei. Enhancement mode GaAs metal-oxide-semiconductor field-effect-transistor integrated with thin AlN surface passivation layer and silicon/phosphorus coimplanted source/drain. / Gao Fei, Lee S. J., Kwong D. L. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 1. - P. 214-217. ↑

J204. Quaranta O. Superconductive Three-Terminal Amplifier/Discriminator. / Quaranta O., Marchetti S., Martucciello N., Pagano S., Ejrnaes M., Cristiano R., Nappi C. // IEEE Transactions on Applied Superconductivity. - 2009. - Vol. 19, No. 3. - P. 367-370. ↑

J205. Hubert G. Operational SER Calculations on the SAC-C Orbit Using the Multi-Scales Single Event Phenomena Predictive Platform (MUSCA). / Hubert G., Duzellier S., Inguimbert C., Boatella-Polo C., Bezerra F., Ecoffet R. // IEEE Transactions on Nuclear Science. - 2009. - Vol. 56, No. 6. - P. 3032-3042. ↑

J206. Gao S. Antennas for Modern Small Satellites. / Gao S., Clark K., Unwin M., Zackrisson J., Shiroma W.A., Akagi J.M., Maynard K., Garner P., Boccia L., Amendola G., Massa G., Underwood C., Brenchley M., Pointer M., Sweeting M.N. // IEEE Antennas and Propagation Magazine. - 2009. - Vol. 51, No. 4. - P. 40-56. ↑

J207. Qi Liu. Improvement of Resistive Switching Properties in -Based ReRAM With Implanted Ti Ions. / Qi Liu, Shibing Long, Wei Wang, Qingyun Zuo, Sen Zhang, Junning Chen, Ming Liu. // IEEE Electron Device Letters. - 2009. - Vol. 30, No. 12. - P. 1335-1337. ↑

J208. Xie Yue E. Electron transport of folded graphene nanoribbons. / Xie Yue E., Chen Yuan Ping, Zhong JianXin. // Journal of Applied Physics. - 2009. - Vol. 106, No. 10. - P. 103714-103714-4. ↑

J209. Ben-Sasson Ariel J. Patterned electrode vertical field effect transistor fabricated using block copolymer nanotemplates. / Ben-Sasson Ariel J., Avnon Eran, Ploshnik Elina, Globerman Oded, Shenhar Roy, Frey Gitti L., Tessler Nir. // Applied Physics Letters. - 2009. - Vol. 95, No. 21. - P. 213301-213301-3. ↑

J210. Suutala A. Inverted method for fabricating a nano-aperture device with subwavelength structures. / Suutala A., Olkkonen J., Cox D. C., Lappalainen J., Jantunen H. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 2457-2461. ↑

J211. Jianyou Li. Intrinsic Polarization of Self-Assembled Guanosine Supramolecules in GaN-Based Metal-Semiconductor-Metal Nano-Structures. / Jianyou Li, Sarkar A., Morkoc H., Neogi A. // Journal of Display Technology. - 2009. - Vol. 5, No. 12. - P. 446-451. ↑

J212. Dadgour H.F. Hybrid NEMS-CMOS integrated circuits: A novel strategy for energy-efficient designs. / Dadgour H.F., Banerjee K. // IET Computers & Digital Techniques. - 2009. - Vol. 3, No. 6. - P. 593-608. ↑

J213. Jha Neetu. Thermal conductivity studies of metal dispersed multiwalled carbon nanotubes in water and ethylene glycol based nanofluids. / Jha Neetu, Ramaprabhu S. // Journal of Applied Physics. - 2009. - Vol. 106, No. 8. - P. 084317-084317-6. ↑

J214. Mori S. Nano-Motion Stage for High-Speed and Precision Positioning on an X-Y Plane. / Mori S., Sato Y., Sakurada A., Naganawa A., Shibuya Y., Obinata G. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 11. - P. 4972-4978. ↑

J215. Novitski Roman. Temperature dependence of buried channel ion sensitive field effect transistors. / Novitski Roman, Einati Hila, Shacham-Diamand Yosi. // Journal of Applied Physics. - 2009. - Vol. 106, No. 9. - P. 094501-094501-10. ↑

J216. Cho Yong Chan. Reversible ferromagnetic spin ordering governed by hydrogen in Co-doped ZnO semiconductor. / Cho Yong Chan, Kim Sung-Jin, Lee Seunghun, Kim Su Jae, Cho Chae Ryong, Nahm Ho-Hyun, Park Chul Hong, Jeong Il Kyoung, Park Sungkyun, Hong Tae Eun, Kuroda Shinji, Jeong Se-Young. // Applied Physics Letters. - 2009. - Vol. 95, No. 17. - P. 172514-172514-3. ↑

J217. Chakraborty R.S. Low-power hybrid complementary metaloxide- semiconductor-nano-electro-mechanical systems field programmable gate array: circuit level analysis and defect-aware mapping. / Chakraborty R.S., Paul S., Zhou Y., Bhunia S. // IET Computers & Digital Techniques. - 2009. - Vol. 3, No. 6. - P. 609-624. ↑

J218. Cook L. P. Enhanced mass transport in ultrarapidly heated Ni/Si thin-film multilayers. / Cook L. P., Cavicchi R. E., Bassim N., Eustis S., Wong-Ng W., Levin I., Kattner U. R., Campbell C. E., Montgomery C. B., Egelhoff W. F., Vaudin M. D. // Journal of Applied Physics. - 2009. - Vol. 106, No. 10. - P. 104909-104909-6. ↑

J219. Park J. Dc--13.4 ghz frequency divider with --20 dbm input power sensitivity in 0.18 µm CMOS. / Park J., Yoo C. // Electronics Letters. - 2009. - Vol. 45, No. 25. - P. 1277-1278. ↑

J220. Chen Yung-Pin. Stitching periodic submicron fringes by utilizing step-and-align interference lithography. / Chen Yung-Pin, Chen Cheng-Hung, Chang Jer-Haur, Chiu Hsin-Chieh, Chen Guan-Yu, Chiang Chieh-Hsiu, Chen Lien-Sheng, Tseng Ching-Tung, Lee Chih-Hsien, Yen Jia-Yush, Wang Lon A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 2951-2957. ↑

J221. Wang G. Molecular beam epitaxy-grown Bi 4 Te 3 nanowires. / Wang G., Lok S. K., Wong G. K. L., Sou I. K. // Applied Physics Letters. - 2009. - Vol. 95, No. 26. - P. 263102-263102-3. ↑

J222. Zhu Y. H. Demonstration on GaN-based light-emitting diodes grown on 3C-SiC/Si(111). / Zhu Y. H., Zhang J. C., Chen Z. T., Egawa T. // Journal of Applied Physics. - 2009. - Vol. 106, No. 12. - P. 124506-124506-4. ↑

J223. Gong Xiuqing. Copolymer solution-based "smart window". / Gong Xiuqing, Li Jiaxing, Chen Shuyu, Wen Weijia. // Applied Physics Letters. - 2009. - Vol. 95, No. 25. - P. 251907-251907-3. ↑

J224. Begum N. Lineshape analysis of Raman scattering from LO and SO phonons in III-V nanowires. / Begum N., Bhatti A. S., Jabeen F., Rubini S., Martelli F. // Journal of Applied Physics. - 2009. - Vol. 106, No. 11. - P. 114317-114317-5. ↑

J225. Yoshida Ken-ichi. Spectral shapes of surface-enhanced resonance Raman scattering sensitive to the refractive index of media around single Ag nanoaggregates. / Yoshida Ken-ichi, Itoh Tamitake, Biju Vasudevanpillai, Ishikawa Mitsuru, Ozaki Yukihiro. // Applied Physics Letters. - 2009. - Vol. 95, No. 26. - P. 263104-263104-3. ↑

J226. Kwon Joonbum. SU-8-based immunoisolative microcontainer with nanoslots defined by nanoimprint lithography. / Kwon Joonbum, Trivedi Krutarth, Krishnamurthy Nemani V., Hu Walter, Lee Jeong-Bong, Gimi Barjor. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 2795-2800. ↑

J227. Ahn Jun-Ku. Thermal stability of GeSbTe thin films deposited by layer-by-layer metalorganic chemical vapor deposition. / Ahn Jun-Ku, Park Kyoung-Woo, Seong Nak-Jin, Yoon Soon-Gil. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. L54-L57. ↑

J228. Falessi C. From radar to nodar. / Falessi C., Fiorello A.M., DiCarlo A., Terranova M.L. // IEEE Aerospace and Electronic Systems Magazine. - 2009. - Vol. 24, No. 12. - P. 4-10. ↑

J229. Schift Helmut. Easy mask-mold fabrication for combined nanoimprint and photolithography. / Schift Helmut, Spreu Christian, Schleunitz Arne, Gobrecht Jens, Klukowska Anna, Reuther Freimut, Gruetzner Gabi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 2850-2853. ↑

J230. Mekaru Harutaka. Thermal imprinting on quartz fiber using glasslike carbon mold. / Mekaru Harutaka, Okuyama Chieko, Ueno Akihisa, Takahashi Masaharu. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 2820-2825. ↑

J231. Mekaru Harutaka. Thermal roller imprint on surface of Teflon perfluoroalkoxy inlet tube. / Mekaru Harutaka, Fukushima Eri, Hiyama Yoshihito, Takahashi Masaharu. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 2814-2819. ↑

J232. Zuo Qingyun. Self-rectifying effect in gold nanocrystal-embedded zirconium oxide resistive memory. / Zuo Qingyun, Long Shibing, Liu Qi, Zhang Sen, Wang Qin, Li Yingtao, Wang Yan, Liu Ming. // Journal of Applied Physics. - 2009. - Vol. 106, No. 7. - P. 073724-073724-5. ↑

J233. Tsurumi T. Size Effect of Barium Titanate and Computer-Aided Design of Multilayered Ceramic Capacitors. / Tsurumi T., Hoshina T., Takeda H., Mizuno Y., Chazono H. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2009. - Vol. 56, No. 8. - P. 1513-1522. ↑

J234. Schultz J. The Design, Fabrication and Test Results of a 1.6 THz Superconducting Hot Electron Bolometer Mixer on SOI. / Schultz J., Herald D.L., Haiyong Xu, Lei Liu, Bass R.B., Weikle R.M., Lichtenberger A.W. // IEEE Transactions on Applied Superconductivity. - 2009. - Vol. 19, No. 3. - P. 297-300. ↑

J235. Ling Hao. Focused Ion Beam NanoSQUIDs as Novel NEMS Resonator Readouts. / Ling Hao, Gallop

J.C., Cox D., Romans E.J., Macfarlane J.C., Jie Chen. // IEEE Transactions on Applied Superconductivity. - 2009. - Vol. 19, No. 3. - P. 693-696.

J236. Tang L. Fundamentals of Nanotechnology (Hornyak, G.I., et al.) [Book reviews]. IEEE Nanotechnology Magazine. - 2009. - Vol. 3, No. 3. - P. 26-27.

J237. Jian Guo. A High Dynamic Range CMOS Image Sensor for Scientific Imaging Applications. / Jian Guo, Sonkusale S. // IEEE Sensors Journal. - 2009. - Vol. 9, No. 10. - P. 1209-1218.

J238. Li Wenjie. Quantitative study of interior nanostructure in hollow zinc oxide particles on the basis of nondestructive x-ray nanotomography. / Li Wenjie, Wang Ning, Chen Jie, Liu Gang, Pan Zhiyun, Guan Yong, Yang Yunhao, Wu Wenquan, Tian Jinping, Wei Shiqiang, Wu Ziyu, Tian Yangchao, Guo Lin. // Applied Physics Letters. - 2009. - Vol. 95, No. 5. - P. 053108-053108-3.

J239. Su J. Characterization of surface damage in AlSi alloys. / Su J., Nie X., Stoilov V., Yang Q. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2009. - Vol. 27, No. 4. - P. 1096-1103.

J240. Cao J. Transmission electron microscopy study of adsorption of colloidal gold nanoparticles on lepidocrocite and kaolinite. / Cao J., Hu X., Jiang D. // IET Micro & Nano Letters. - 2009. - Vol. 4, No. 2. - P. 95-98.

J241. Kyoung Chan Kim. High-Power Single-Mode 1.3- m InGaAsP-InGaAsP Multiple-Quantum-Well Laser Diodes With Wide Apertures. / Kyoung Chan Kim, Dong-Kie Jang, Jung Il Lee, Tae Geun Kim, Woo Won Lee, Jeong Ho Kim, Eun Jeong Yang, Bon Jo Koo, Il Ki Han. // IEEE Photonics Technology Letters. - 2009. - Vol. 21, No. 19. - P. 1438-1440.

J242. Fathi D. Accurate analysis of carbon nanotube interconnects using transmission line model. / Fathi D., Forouzandeh B., Mohajerzadeh S., Sarvari R. // IET Micro & Nano Letters. - 2009. - Vol. 4, No. 2. - P. 116-121.

J243. Dan S.S. Impact of Energy Quantization on the Performance of Current-Biased SET Circuits. / Dan S.S., Mahapatra S. // IEEE Transactions on Electron Devices. - 2009. - Vol. 56, No. 8. - P. 1562-1566.

J244. Chuan Xu. Modeling, Analysis, and Design of Graphene Nano-Ribbon Interconnects. / Chuan Xu, Hong Li, Banerjee K. // IEEE Transactions on Electron Devices. - 2009. - Vol. 56, No. 8. - P. 1567-1578.

J245. Liu Qi. Formation of multiple conductive filaments in the Cu /ZrO 2 :Cu /Pt device. / Liu Qi, Dou Chunmeng, Wang Yan, Long Shibing, Wang Wei, Liu Ming, Zhang Manhong, Chen Junning. // Applied Physics Letters. - 2009. - Vol. 95, No. 2. - P. 023501-023501-3.

J246. Wei-De Ho. Thermal Properties of 12-Fold Quasi-Photonic Crystal Microcavity Laser With Size-Controlled Nano-Post for Electrical Driving. / Wei-De Ho, Tsan-Wen Lu, Yi-Hua Hsiao, Po-Tsung Lee. // Journal of Lightwave Technology. - 2009. - Vol. 27, No. 23. - P. 5302-5307.

J247. Luo Kang. Fabrication of nanometer-spaced superconducting Pb electrodes. / Luo Kang, Yao Zhen. // Applied Physics Letters. - 2009. - Vol. 95, No. 11. - P. 113115-113115-3.

J248. Henley Simon J. Laser-induced self-assembly of iron oxide nanostructures with controllable dimensionality. / Henley Simon J., Mollah Shafikuddin, Giusca Christina E., Silva S. Ravi P. // Journal of Applied Physics. - 2009. - Vol. 106, No. 6. - P. 064309-064309-8.

J249. Nakata T. Multiplication Noise Characterization of InAlAs-APD With Heterojunction. / Nakata T., Ishihara J., Makita K., Kasahara K. // IEEE Photonics Technology Letters. - 2009. - Vol. 21, No. 24. - P. 1852-1854.

J250. Ramachandran B. Low temperature magnetocaloric effect in polycrystalline BiFeO 3 ceramics. / Ramachandran B., Rao M. S. Ramachandra. // Applied Physics Letters. - 2009. - Vol. 95, No. 14. - P. 142505-142505-3.

J251. Yiting Yu. Development of a Micromechanical Grating Optical Modulator for Optical Network. / Yiting Yu, Weizheng Yuan, Bin Yan, Taiping Li. // Journal of Lightwave Technology. - 2009. - Vol. 27, No. 24. - P. 5681-5686.

J252. Tummala R. Nanopackaging research at Georgia Tech. / Tummala R., Wong C.P., Markondeya Raj P. //

IEEE Nanotechnology Magazine. - 2009. - Vol. 3, No. 4. - P. 20-25. ↑

J253. Hoshino K. Near-Field Scanning Nanophotonic Microscopy-Breaking the Diffraction Limit Using Integrated Nano Light-Emitting Probe Tip. / Hoshino K., Gopal A., Xiaojing Zhang. // IEEE Journal of Selected Topics in Quantum Electronics. - 2009. - Vol. 15, No. 5. - P. 1393-1399. ↑

J254. Wu Dong. Self-organization of polymer nanoneedles into large-area ordered flowerlike arrays. / Wu Dong, Chen Qi-Dai, Xu Bin-Bin, Jiao Jian, Xu Ying, Xia Hong, Sun Hong-Bo. // Applied Physics Letters. - 2009. - Vol. 95, No. 9. - P. 091902-091902-3. ↑

J255. Chen Z. T. Effect of strain on quantum efficiency of InAlN-based solar-blind photodiodes. / Chen Z. T., Sakai Y., Zhang J. C., Egawa T., Wu J. J., Miyake H., Hiramatsu K. // Applied Physics Letters. - 2009. - Vol. 95, No. 8. - P. 083504-083504-3. ↑

J256. Tiwari Badri. Controlled etching and regrowth of tunnel oxide for antenna-coupled metal-oxide-metal diodes. / Tiwari Badri, Bean Jeffrey A., Szakmany Gergo, Bernstein Gary H., Fay Patrick, Porod Wolfgang. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 5. - P. 2153-2160. ↑

J257. Wickramasinghe I.P.M. Passivity-Based Stabilization of a 1-DOF Electrostatic MEMS Model With a Parasitic Capacitance. / Wickramasinghe I.P.M., Maithripala D.H.S., Kawade B.D., Berg J.M., Dayawansa W.P. // IEEE Transactions on Control Systems Technology. - 2009. - Vol. 17, No. 1. - P. 249-256. ↑

J258. Rida A. Conductive Inkjet-Printed Antennas on Flexible Low-Cost Paper-Based Substrates for RFID and WSN Applications. / Rida A., Li Yang, Vyas R., Tentzeris M.M. // IEEE Antennas and Propagation Magazine. - 2009. - Vol. 51, No. 3. - P. 13-23. ↑

J259. Kuo C.W. GaN-Based Light-Emitting Diode Prepared on Nano-Inverted Pyramid GaN Template. / Kuo C.W., Chang L.C., Cheng-Huang Kuo. // IEEE Photonics Technology Letters. - 2009. - Vol. 21, No. 21. - P. 1645-1647. ↑

J260. Ota Yasutomo. Enhanced photon emission and absorption of single quantum dot in resonance with two modes in photonic crystal nanocavity. / Ota Yasutomo, Nomura Masahiro, Kumagai Naoto, Watanabe Katsuyuki, Ishida Satomi, Iwamoto Satoshi, Arakawa Yasuhiko. // Applied Physics Letters. - 2008. - Vol. 93, No. 18. - P. 183114-183114-3. ↑

J261. Zha Jun-Wei. Mechanism analysis of improved corona-resistant characteristic in polyimide/Ti O 2 nanohybrid films. / Zha Jun-Wei, Song Hong-Tao, Dang Zhi-Min, Shi Chang-Yong, Bai Jinbo. // Applied Physics Letters. - 2008. - Vol. 93, No. 19. - P. 192911-192911-3. ↑

J262. Kim Jaeho. Microwave-excited atmospheric-pressure plasma jets using a microstrip line. / Kim Jaeho, Katsurai Makoto, Kim Dongmin, Ohsaki Hyroyuki. // Applied Physics Letters. - 2008. - Vol. 93, No. 19. - P. 191505-191505-3. ↑

J263. Lee Jung Han. Direct evidence of Al diffusion into tris-(8-hydroquinoline) aluminum layer: medium energy ion scattering analysis. / Lee Jung Han, Yi Yeonjin, Moon Dae Won. // Applied Physics Letters. - 2008. - Vol. 93, No. 15. - P. 153307-153307-3. ↑

J264. Kwack Ho-Sang. Violet-light spontaneous and stimulated emission from ultrathin In-rich InGaN/GaN multiple quantum wells grown by metalorganic chemical vapor deposition. / Kwack Ho-Sang, Kwon Bong-Joon, Chung Jin-Soo, Cho Yong-Hoon, Kwon Soon-Yong, Kim Hee Jin, Yoon Euijoon. // Applied Physics Letters. - 2008. - Vol. 93, No. 16. - P. 161905-161905-3. ↑

J265. Kwon Taeyun. Micromechanical observation of the kinetics of biomolecular interactions. / Kwon Taeyun, Eom Kilho, Park Jinsung, Yoon Dae Sung, Lee Hong Lim, Kim Tae Song. // Applied Physics Letters. - 2008. - Vol. 93, No. 17. - P. 173901-173901-3. ↑

J266. Guo X. Current percolation in ultrathin channel nanocrystalline silicon transistors. / Guo X., Silva S. R. P., Ishii T. // Applied Physics Letters. - 2008. - Vol. 93, No. 4. - P. 042105-042105-3. ↑

J267. Na Jong H. High field-effect mobility amorphous InGaZnO transistors with aluminum electrodes. / Na Jong H., Kitamura M., Arakawa Y. // Applied Physics Letters. - 2008. - Vol. 93, No. 6. - P. 063501-063501-3. ↑

J268. Chen Yuan Ping. Asymmetric transport in asymmetric T-shaped graphene nanoribbons. / Chen Yuan Ping, Xie Yue E., Sun L. Z., Zhong Jianxin. // Applied Physics Letters. - 2008. - Vol. 93, No. 9. - P. 092104-092104-3. ↑

J269. Ahn M.-W. Gas sensing properties of defect-controlled ZnO-nanowire gas sensor. / Ahn M.-W., Park K.-S., Heo J.-H., Park J.-G., Kim D.-W., Choi K. J., Lee J.-H., Hong S.-H. // Applied Physics Letters. - 2008. - Vol. 93, No. 26. - P. 263103-263103-3. ↑

J270. Zhen Lijuan. Light-induced hysteresis characteristics of copper phthalocyanine organic thin-film transistors. / Zhen Lijuan, Shang Liwei, Liu Ming, Tu Deyu, Ji Zhuoyu, Liu Xinghua, Liu Ge, Liu Jiang, Wang Hong. // Applied Physics Letters. - 2008. - Vol. 93, No. 20. - P. 203302-203302-3. ↑

J271. Cuong Nguyen Duy. An extremely high dielectric constant in bismuth-based pyrochlore multilayer film capacitors combined with percolative structure. / Cuong Nguyen Duy, Ahn Jun-Ku, Park Kyung-Woo, Seong Nak-Jin, Yoon Soon-Gil. // Applied Physics Letters. - 2008. - Vol. 93, No. 21. - P. 212901-212901-3. ↑

J272. Cai Y. Growth behaviors of ultrathin ZnSe nanowires by Au-catalyzed molecular-beam epitaxy. / Cai Y., Wong T. L., Chan S. K., Sou I. K., Su D. S., Wang N. // Applied Physics Letters. - 2008. - Vol. 93, No. 23. - P. 233107-233107-3. ↑

J273. Miyajima Y. Electrical properties of pulsed UV laser irradiated amorphous carbon. / Miyajima Y., Adikaari A. A. D. T., Henley S. J., Shannon J. M., Silva S. R. P. // Applied Physics Letters. - 2008. - Vol. 92, No. 15. - P. 152104-152104-3. ↑

J274. Kok Mang Hin. Lasing from dye-doped photonic crystals with graded layers in dichromate gelatin emulsions. / Kok Mang Hin, Lu Weixin, Lee Jeffrey Chi Wai, Tam Wing Yim, Wong George K. L., Chan C. T. // Applied Physics Letters. - 2008. - Vol. 92, No. 15. - P. 151108-151108-3. ↑

J275. Gwag Jin Seog. Surface nematic bistability at nanoimprinted topography. / Gwag Jin Seog, Kim Jae-Hoon, Yoneya Makoto, Yokoyama Hiroshi. // Applied Physics Letters. - 2008. - Vol. 92, No. 15. - P. 153110-153110-3. ↑

J276. Yang Ya. Controllable fabrication and electromechanical characterization of single crystalline Sb-doped ZnO nanobelts. / Yang Ya, Qi Junjie, Zhang Yue, Liao Qingliang, Tang Lidan, Qin Zi. // Applied Physics Letters. - 2008. - Vol. 92, No. 18. - P. 183117-183117-3. ↑

J277. Chan S. K. Formation mechanism of nanotrenches induced by mobile catalytic nanoparticles. / Chan S. K., Lok S. K., Wang G., Cai Y., Wang Y. J., Wang N., Sou I. K. // Applied Physics Letters. - 2008. - Vol. 92, No. 18. - P. 183102-183102-3. ↑

J278. Liu Qi. Resistive switching memory effect of Zr O 2 films with Zr + implanted. / Liu Qi, Guan Weihua, Long Shibing, Jia Rui, Liu Ming, Chen Junning. // Applied Physics Letters. - 2008. - Vol. 92, No. 1. - P. 012117-012117-3. ↑

J279. Peng Suili. Magnetically responsive elastic microspheres. / Peng Suili, Zhang Mengying, Niu Xize, Wen Weijia, Sheng Ping, Liu Zhengyou, Shi Jing. // Applied Physics Letters. - 2008. - Vol. 92, No. 1. - P. 012108-012108-3. ↑

J280. Wan Qing. Branched Sn O 2 nanowires on metallic nanowire backbones for ethanol sensors application. / Wan Qing, Huang Jin, Xie Zhong, Wang Taihong, Dattoli Eric N., Lu Wei. // Applied Physics Letters. - 2008. - Vol. 92, No. 10. - P. 102101-102101-3. ↑

J281. Hoshino Kazunori. Near-field scanning optical microscopy with monolithic silicon light emitting diode on probe tip. / Hoshino Kazunori, Rozanski Lynn J., Vanden Bout David A., Zhang Xiaojing. // Applied Physics Letters. - 2008. - Vol. 92, No. 13. - P. 131106-131106-3. ↑

J282. Tu Deyu. Asymmetric electrical bistable behavior of an eicosanoic acid/zirconium oxide bilayer system with rectifying effect. / Tu Deyu, Liu Ming, Shang Liwei, Liu Xinghua, Xie Changqing. // Applied Physics Letters. - 2008. - Vol. 92, No. 12. - P. 123302-123302-3. ↑

J283. Zhang J. C. Influence of pulse width on electroluminescence and junction temperature of AlInGaN deep ultraviolet light-emitting diodes. / Zhang J. C., Zhu Y. H., Egawa T., Sumiya S., Miyoshi M., Tanaka M. // Applied

Physics Letters. - 2008. - Vol. 92, No. 19. - P. 191917-191917-3.

J284. Fang Lina Wei-Wei. Band alignment between amorphous Ge 2 Sb 2 Te 5 and prevalent complementary-metal-oxide-semiconductor materials. / Fang Lina Wei-Wei, Pan Ji-Sheng, Zhao Rong, Shi Luping, Chong Tow-Chong, Samudra Ganesh, Yeo Yee-Chia. // Applied Physics Letters. - 2008. - Vol. 92, No. 3. - P. 032107-032107-3.

J285. Jeong Eun. Viewing-angle controllable liquid crystal display using a fringe- and vertical-field driven hybrid aligned nematic liquid crystal. / Jeong Eun, Lim Young Jin, Chin Mi Hyung, Kim Jin Ho, Lee Seung Hee, Ji Seung Hoon, Lee Gi-Dong, Park Kyoung Ho, Choi Hyun Chul, Ahn Byung Chul. // Applied Physics Letters. - 2008. - Vol. 92, No. 26. - P. 261102-261102-3.

J286. Lee C. K. Single-electron-based flexible multivalued logic gates. / Lee C. K., Kim S. J., Shin S. J., Choi J. B., Takahashi Y. // Applied Physics Letters. - 2008. - Vol. 92, No. 9. - P. 093101-093101-3.

J287. Schotter Joerg. Recognition of biomolecular interactions by plasmon resonance shifts in single- and multicomponent magnetic nanoparticles. / Schotter Joerg, Bethge Ole, Maier Thomas, Brueckl Hubert. // Applied Physics Letters. - 2008. - Vol. 93, No. 14. - P. 144105-144105-3.

J288. Zhang J. C. Suppression of the subband parasitic peak by 1 nm i-Al N interlayer in AlGaN deep ultraviolet light-emitting diodes. / Zhang J. C., Zhu Y. H., Egawa T., Sumiya S., Miyoshi M., Tanaka M. // Applied Physics Letters. - 2008. - Vol. 93, No. 13. - P. 131117-131117-3.

J289. Shao Q. High-temperature quenching of electrical resistance in graphene interconnects. / Shao Q., Liu G., Teweldebrhan D., Balandin A. A. // Applied Physics Letters. - 2008. - Vol. 92, No. 20. - P. 202108-202108-3.

J290. Hao L. Measurement and noise performance of nano-superconducting-quantum-interference devices fabricated by focused ion beam. / Hao L., Macfarlane J. C., Gallop J. C., Cox D., Beyer J., Drung D., Schurig T. // Applied Physics Letters. - 2008. - Vol. 92, No. 19. - P. 192507-192507-3.

J291. Senda S. AlInN-based ultraviolet photodiode grown by metal organic chemical vapor deposition. / Senda S., Jiang H., Egawa T. // Applied Physics Letters. - 2008. - Vol. 92, No. 20. - P. 203507-203507-3.

J292. Schwamb Timo. On the effect of the electrical contact resistance in nanodevices. / Schwamb Timo, Burg Brian R., Schirmer Niklas C., Poulikakos Dimos. // Applied Physics Letters. - 2008. - Vol. 92, No. 24. - P. 243106-243106-3.

J293. Niitsuma Jun-ichi. Contact photolithographic micropatterning for bistable nematic liquid crystal displays. / Niitsuma Jun-ichi, Yoneya Makoto, Yokoyama Hiroshi. // Applied Physics Letters. - 2008. - Vol. 92, No. 24. - P. 241120-241120-3.

J294. Kundu Manisha. Effect of sulfurization conditions on structural and electrical properties of copper sulfide films. / Kundu Manisha, Hasegawa Tsuyoshi, Terabe Kazuya, Aono Masakazu. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 073523-073523-7.

J295. Uhrmann T. Characterization of embedded MgO/ferromagnet contacts for spin injection in silicon. / Uhrmann T., Dimopoulos T., Bruckl H., Lazarov V. K., Kohn A., Paschen U., Weyers S., Bar L., Ruhrig M. // Journal of Applied Physics. - 2008. - Vol. 103, No. 6. - P. 063709-063709-5.

J296. Jun Myungsim. Analysis of temperature-dependent barrier heights in erbium-silicided Schottky diodes. / Jun Myungsim, Jang Moongyu, Kim Yarkeon, Choi Cheljong, Kim Taeyoub, Oh Soonyoung, Lee Seongjae. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 1. - P. 137-140.

J297. Tho Luu Van. Investigation of negative coercivity in one layer formation of soft and hard magnetic materials. / Tho Luu Van, Kim Cheol Gi, Kim Chong Oh. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07B906-07B906-3.

J298. Umezu Ikurou. Oxidation processes of surface hydrogenated silicon nanocrystallites prepared by pulsed laser ablation and their effects on the photoluminescence wavelength. / Umezu Ikurou, Sugimura Akira, Makino Toshiharu, Inada Mitsuru, Matsumoto Kimihisa. // Journal of Applied Physics. - 2008. - Vol. 103, No. 2. - P.

024305-024305-8.

J299. Kim Hong Bum. Effect of capacitive to inductive coupling transition in multiple linear U-type antenna on silicon thin film deposition from pure Si H 4 discharges. / Kim Hong Bum, Lee Hyoung Cheol, Kim Kyong Nam, Yeom Geun Young. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2008. - Vol. 26, No. 4. - P. 842-846. ↑

J300. Ochoa E. A. Influence of the microstructure on steel hardening in pulsed plasma nitriding. / Ochoa E. A., Figueroa C. A. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2008. - Vol. 26, No. 3. - P. 328-332. ↑

J301. Huang Wen-Hsien. Fabrication and properties of Cu-Ni mixed-metal periodical array for midinfrared filtering and hydrophobic application. / Huang Wen-Hsien, Yang Yu-Lin, Wu Shich-Chuan. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 5. - P. 1705-1711. ↑

J302. Chen Yung-Pin. Fabrication of concave gratings by curved surface UV-nanoimprint lithography. / Chen Yung-Pin, Lee Yuet-Ping, Chang Jer-Haur, Wang Lon A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 5. - P. 1690-1695. ↑

J303. Sahu B. S. Interfacial and electrical properties of Zr x Ti 1-x O 4 (x=0.66) films deposited by liquid-delivery metal organic chemical vapor deposition to be used as high-k gate dielectric. / Sahu B. S., Pammi S. V. N., Seong Nak-Jin, Yoon Soon-Gil. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 4. - P. 1338-1343. ↑

J304. Hur Sung-Gi. Characterization of photoconductive CdS thin films prepared on glass substrates for photoconductive-sensor applications. / Hur Sung-Gi, Kim Eui-Tae, Lee Ji-Hong, Kim Geun-Hong, Yoon Soon-Gil. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 4. - P. 1334-1337. ↑

J305. Larcheri Silvia. X-ray excited optical luminescence detection by scanning near-field optical microscope: A new tool for nanoscience. / Larcheri Silvia, Rocca Francesco, Jandard Frank, Pailharey Daniel, Graziola Roberto, Kuzmin Alexei, Purans Juris. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 1. - P. 013702-013702-9. ↑

J306. Sand-Jespersen T. Tunable double dots and Kondo enhanced Andreev transport in InAs nanowires. / Sand-Jespersen T., Aagesen M., Sш,rensen C. B., Lindelof P. E., Nygard J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 4. - P. 1609-1612. ↑

J307. Ahn Jun-Ku. Structural and electrical properties of Bi 1.5 Mg 1.0 Nb 1.5 O 7 thin films deposited on Pt /TiO 2 /SiO 2 /Si substrates by rf-magnetron sputtering. / Ahn Jun-Ku, Cuong Nguyen Duy, Yoon Soon-Gil, Kim Chang-Soo. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 4. - P. 1277-1280. ↑

J308. Solmaz M. Patterning chalcogenide glass by direct resist-free thermal nanoimprint. / Solmaz M., Park H., Madsen C. K., Cheng X. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 2. - P. 606-610. ↑

J309. Liu Weili. Fabrication of single-crystalline Li Ta O 3 film on silicon substrate using thin film transfer technology. / Liu Weili, Zhan Da, Ma Xiaobo, Song Zhitang, Feng Songlin. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 1. - P. 206-208. ↑

J310. Venkat S. Effect of substrate temperature on structural and electrical properties of liquid-delivery metal organic chemical vapor deposited indium oxide thin films on silicon. / Venkat S., Pammi N., Sahu B. S., Seong Nak-Jin, Yoon Soon-Gil. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 3. - P. 909-913. ↑

J311. Smith R. C. In situ field emission characterization of multiwalled carbon nanotubes. / Smith R. C., Cox D. C., Silva S. R. P. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 2. - P. 842-846. ↑

J312. Palumbo Marco. A fast sonochemical approach for the synthesis of solution processable ZnO rods. / Palumbo Marco, Henley S. J., Lutz T., Stolojan V., Silva S. R. P. // Journal of Applied Physics. - 2008. - Vol.

104, No. 7. - P. 074906-074906-6.

J313. Miyajima Y. Electronic state modification in laser deposited amorphous carbon films by the inclusion of nitrogen. / Miyajima Y., Adamopoulos G., Henley S. J., Stolojan V., Tison Y., Garcia-Caurel E., Drevillon B., Shannon J. M., Silva S. R. P. // Journal of Applied Physics. - 2008. - Vol. 104, No. 6. - P. 063701-063701-9.

J314. Michaelson Sh. Hydrogenation and thermal stability of nano- and microcrystalline diamond films studied by vibrational electron spectroscopy. / Michaelson Sh., Akhvlediani R., Hoffman A. // Journal of Applied Physics. - 2008. - Vol. 104, No. 8. - P. 083527-083527-7.

J315. Park Jae Beom. Plasma etching of SiO 2 using remote-type pin-to-plate dielectric barrier discharge. / Park Jae Beom, Kyung Se Jin, Yeom Geun Young. // Journal of Applied Physics. - 2008. - Vol. 104, No. 8. - P. 083302-083302-5.

J316. Tripathy S. GaN-based microdisk light emitting diodes on (111)-oriented nanosilicon-on-insulator templates. / Tripathy S., Sale T. E., Dadgar A., Lin V. K. X., Zang K. Y., Teo S. L., Chua S. J., Blasing J., Krost A. // Journal of Applied Physics. - 2008. - Vol. 104, No. 5. - P. 053106-053106-7.

J317. Li Huifeng. Optical antennas: A boost for infrared detection. / Li Huifeng, Cheng Xing. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. 2156-2159.

J318. Kojima A. Sub-50 nm resolution surface electron emission lithography using nano-Si ballistic electron emitter. / Kojima A., Ohyi H., Koshida N. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. 2064-2068.

J319. Cui Dehu. Improving organic thin-film transistor performance by nanoimprint-induced chain ordering. / Cui Dehu, Li Huifeng, Park Hyunsoo, Cheng Xing. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. 2404-2409.

J320. Ko Hyungduk. Light transmission through a metallic/dielectric nano-optic lens. / Ko Hyungduk, Kim Hyun Chul, Cheng Mosong. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. 2188-2191.

J321. Irimpan Litty. Visible luminescence mechanism in nano ZnO under weak confinement regime. / Irimpan Litty, Nampoori V. P. N., Radhakrishnan P. // Journal of Applied Physics. - 2008. - Vol. 104, No. 11. - P. 113112-113112-5.

J322. Irimpan Litty. Effect of annealing on the spectral and nonlinear optical characteristics of thin films of nano-ZnO. / Irimpan Litty, Ambika D., Kumar V., Nampoori V. P. N., Radhakrishnan P. // Journal of Applied Physics. - 2008. - Vol. 104, No. 3. - P. 033118-033118-9.

J323. Liu Qi. Resistance switching of Au-implanted-ZrO 2 film for nonvolatile memory application. / Liu Qi, Guan Weihua, Long Shibing, Liu Ming, Zhang Sen, Wang Qin, Chen Junning. // Journal of Applied Physics. - 2008. - Vol. 104, No. 11. - P. 114514-114514-5.

J324. Tang Chao. Molecular dynamics study of ripples in graphene nanoribbons on 6H-SiC (0001) : Temperature and size effects. / Tang Chao, Meng Lijun, Sun Lizhong, Zhang Kaiwang, Zhong Jianxin. // Journal of Applied Physics. - 2008. - Vol. 104, No. 11. - P. 113536-113536-6.

J325. Ogawa T. Numerical and experimental investigation of wedge tip radius effect on wedge plasmons. / Ogawa T., Pile D. F. P., Okamoto T., Haraguchi M., Fukui M., Gramotnev D. K. // Journal of Applied Physics. - 2008. - Vol. 104, No. 3. - P. 033102-033102-6.

J326. Chin Hock-Chun. Study of surface passivation of strained indium gallium arsenide by vacuum annealing and silane treatment. / Chin Hock-Chun, Wang Benzhong, Lim Poh-Chong, Tang Lei-Jun, Tung Chih-Hang, Yeo Yee-Chia. // Journal of Applied Physics. - 2008. - Vol. 104, No. 9. - P. 093527-093527-5.

J327. Olsson F. Epitaxial lateral overgrowth of InP on Si from nano-openings: Theoretical and experimental indication for defect filtering throughout the grown layer. / Olsson F., Xie M., Lourdudoss S., Prieto I., Postigo P. A. // Journal of Applied Physics. - 2008. - Vol. 104, No. 9. - P. 093112-093112-6.

J328. Aki Atsushi. Capture of nonmagnetic particles and living cells using a microelectromagnetic system. / Aki Atsushi, Ito Osamu, Morimoto Hisao, Nagaoka Yutaka, Nakajima Yoshikata, Mizuki Toru, Hanajiri Tatsuro, Usami Ron, Maekawa Toru. // Journal of Applied Physics. - 2008. - Vol. 104, No. 9. - P. 094509-094509-5. ↑

J329. Li Jin. Tunable bandgap structures of two-dimensional boron nitride. / Li Jin, Gui Gui, Zhong Jianxin. // Journal of Applied Physics. - 2008. - Vol. 104, No. 9. - P. 094311-094311-5. ↑

J330. Al-Moayed N.N. Nano Ferrites Microwave Complex Permeability and Permittivity Measurements by T/R Technique in Waveguide. / Al-Moayed N.N., Afsar M.N., Khan U.A., McCooey S., Obol M. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 7. - P. 1768-1772. ↑

J331. Chen J.J. Enhanced Output Power of GaN-Based LEDs With Nano-Patterned Sapphire Substrates. / Chen J.J., Su Y.K., Lin C.L., Chen S.M., Li W.L., Kao C.C. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 13. - P. 1193-1195. ↑

J332. Wang S.X. Advances in Giant Magnetoresistance Biosensors With Magnetic Nanoparticle Tags: Review and Outlook. / Wang S.X., Guanxiong Li. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 7. - P. 1687-1702. ↑

J333. Yanli Qu. Ultra-Low-Powered Aqueous Shear Stress Sensors Based on Bulk EG-CNTs Integrated in Microfluidic Systems. / Yanli Qu, Chow W.W.Y., Mengxing Ouyang, Tung S.C.H., Li W.J., Xuliang Han. // IEEE Transactions on Nanotechnology. - 2008. - Vol. 7, No. 5. - P. 565-572. ↑

J334. Kajiwara K. Characterization of Distribution of Trap States in Silicon-on-Insulator Layers by Front-Gate Characteristics in n-Channel SOI MOSFETs. / Kajiwara K., Nakajima Y., Hanajiri T., Toyabe T., Sugano T. // IEEE Transactions on Electron Devices. - 2008. - Vol. 55, No. 7. - P. 1702-1707. ↑

J335. Luo Y. Guest Editorial on Nano-Optoelectronics and Applications. / Luo Y., Deppe D. G., Jagadish C. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 11. - P. 1365-1366. ↑

J336. Ching-Hua Chiu. Nano-Processing Techniques Applied in GaN-Based Light-Emitting Devices With Self-Assembly Ni Nano-Masks. / Ching-Hua Chiu, Ming-Hua Lo, Tien-Chang Lu, Peichen Yu, Huang H.W., Hao-Chung Kuo, Shing-Chung Wang. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 11. - P. 1445-1454. ↑

J337. Gong-Ru Lin. Microwatt MOSLED Using With Buried Si Nanocrystals on Si Nano-Pillar Array. / Gong-Ru Lin, Yi-Hao Pai, Cheng-Tao Lin. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 11. - P. 1486-1491. ↑

J338. Ledentsov N.N. Progress in Epitaxial Growth and Performance of Quantum Dot and Quantum Wire Lasers. / Ledentsov N.N., Bimberg D., Alferov Zh.I. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 11. - P. 1540-1555. ↑

J339. Shan He. Enhanced Terahertz Emission From ZnSe Nano-Grain Surface. / Shan He, Xiaoshu Chen, Xiaojun Wu, Gang Wang, Fuli Zhao. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 11. - P. 1519-1523. ↑

J340. Nakajima Y. Drive Current Enhancement in Silicon-on-Quartz MOSFETs. / Nakajima Y., Sasaki K., Hanajiri T., Toyabe T., Sugano T. // IEEE Electron Device Letters. - 2008. - Vol. 29, No. 8. - P. 944-945. ↑

J341. Aggarwal A.O. Thermomechanical Reliability of Nickel Pillar Interconnections Replacing Flip-Chip Solder Without Underfill. / Aggarwal A.O., Raj P.M., Baik-Woo Lee, Myung Jin Yim, Iyer M., Wong C.P., Tummala R.R. // IEEE Transactions on Electronics Packaging Manufacturing. - 2008. - Vol. 31, No. 4. - P. 341-354. ↑

J342. Vempati S.R. Bed of Nails-100- m-Pitch Wafer-Level Interconnections Process. / Vempati S.R., Tay A.A.O., Kripesh V., Seung Wook Yoon. // IEEE Transactions on Electronics Packaging Manufacturing. - 2008. - Vol. 31, No. 4. - P. 333-340. ↑

J343. Abid Z. Design of a transmission gate based CMOL memory array. / Abid Z., Barua M., Alma'aitah A. // IET Micro & Nano Letters. - 2008. - Vol. 3, No. 3. - P. 70-76. ↑

J344. Martinelli G. Circuit modelling of nano-devices. Electronics Letters. - 2008. - Vol. 44, No. 22. - P. 1294-1295. ↑

J345. Huasi Hu. Study on Composite Material for Shielding Mixed Neutron and -Rays. / Huasi Hu, Qunshu Wang, Juan Qin, Yuelei Wu, Tiankui Zhang, Zhongsheng Xie, Xinbiao Jiang, Guoguang Zhang, Hu Xu, Xiangyang Zheng, Jing Zhang, Wenhao Liu, Zhenghong Li, Boping Zhang, Linbo Li, Zhaohui Song, Xiaoping Ouyang, Jun Zhu, Yaolin Zhao, Xiaoqin Mi, Zhengping Dong, Cheng Li, Zhenyu Jiang, Yuanping Zhan. // IEEE Transactions on Nuclear Science. - 2008. - Vol. 55, No. 4. - P. 2376-2384. ↑

J346. Kang G.B. Fabrication and characterisation of CMOS compatible silicon nanowire biosensor. / Kang G.B., Park J.M., Kim S.G., Koo J.G., Park J.H., Sohn Y.-S., Kim Y.T. // Electronics Letters. - 2008. - Vol. 44, No. 16. - P. 953-955. ↑

J347. Jung Hwa Jeong. Junction Temperature Measurement of InAs Quantum-Dot Laser Diodes by Utilizing Voltage-Temperature Method. / Jung Hwa Jeong, Kyoung Chan Kim, Jung Il Lee, Hyun Jae Kim, Il Ki Han. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 16. - P. 1354-1356. ↑

J348. Shea J.J. Book Reviews [8 book reviews]. IEEE Electrical Insulation Magazine. - 2008. - Vol. 24, No. 3. - P. 61-64. ↑

J349. Gang Ren. Mode Analysis and Design of a Low-Loss Photonic Crystal 60 Waveguide Bend. / Gang Ren, Wanhua Zheng, Yejin Zhang, Ke Wang, Xiaoyu Du, Mingxin Xing, Lianghui Chen. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 14. - P. 2215-2218. ↑

J350. Zhang R. Loss-Reduction in Flexibly Vertical Coupled Ring Lasers Through Asymmetric Double Shallow Ridge and ICP/ICP Cascade Etching. / Zhang R., Ren Z., Yu S. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 22. - P. 1821-1823. ↑

J351. Fukatsu K. 30 Gb/s Over 100-m MMFs Using 1.1- m Range VCSELs and Photodiodes. / Fukatsu K., Shiba K., Suzuki Y., Suzuki N., Anan T., Hatakeyama H., Yashiki K., Tsuji M. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 11. - P. 909-911. ↑

J352. Lucente M. Experimental Missions in W -Band: A Small LEO Satellite Approach. / Lucente M., Rossi T., Jebril A., Ruggieri M., Pulitano S., Iera A., Molinaro A., Sacchi C., Zuliani L. // IEEE Systems Journal. - 2008. - Vol. 2, No. 1. - P. 90-103. ↑

J353. Joonmo Park. Improved Light Output of Photonic Crystal Light-Emitting Diode Fabricated by Anodized Aluminum Oxide Nano-Patterns. / Joonmo Park, Jin-Kyoung Oh, Kwang-Woo Kwon, Young-Ho Kim, Sung-Soo Jo, Jun Key Lee, Sang-Wan Ryu. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 4. - P. 321-323. ↑

J354. Yun Seon Do. A Study on the Measurement Technique of Image Retention in AC Plasma Display Panels. / Yun Seon Do, Sang Ho Kim, Kyung Cheol Choi. // Journal of Display Technology. - 2008. - Vol. 4, No. 2. - P. 238-244. ↑

J355. Ning Shi. Local properties at interfaces in nanodielectrics: An ab initio computational study. / Ning Shi, Ramprasad R. // IEEE Transactions on Dielectrics and Electrical Insulation. - 2008. - Vol. 15, No. 1. - P. 170-177. ↑

J356. Bimberg D. Quantum dot based nanophotonics and nanoelectronics. Electronics Letters. - 2008. - Vol. 44, No. 3. - P. 168-171. ↑

J357. Tien-Yu Lo. A 40-MHz Double Differential-Pair CMOS OTA With IM3. / Tien-Yu Lo, Chung-Chih Hung. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2008. - Vol. 55, No. 1. - P. 258-265. ↑

J358. Yi Zhao. Profile Control in Silicon Nanostructures Using Fluorine-Enhanced Oxide Passivation. / Yi Zhao, Xin Zhang. // IEEE Transactions on Nanotechnology. - 2008. - Vol. 7, No. 1. - P. 40-47. ↑

J359. Hoshino K. Direct Fabrication of Nanoscale Light Emitting Diode on Silicon Probe Tip for Scanning Microscopy. / Hoshino K., Rozanski L.J., Vanden Bout D.A., Xiaojing Zhang. // Journal of Microelectromechanical Systems. - 2008. - Vol. 17, No. 1. - P. 4-10. ↑

J360. Lin J.C. Improved External Quantum Efficiency of GaN p-i-n Photodiodes With a TiO2 Roughened Surface. / Lin J.C., Su Y.K., Chang S.J., Lan W.H., Huang K.C., Cheng Y.C., Lin W.J. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 4. - P. 285-287. ↑

J361. Ross P.E. Loser: Nanotechnology-Still Waiting for Nanotube Memory Chip. IEEE Spectrum. - 2008. - Vol. 45, No. 1. - P. 61-62. ↑

J362. Yangyang Sun. A Novel Nanocomposite With Photo-Polymerization for Wafer Level Application. / Yangyang Sun, Hongjin Jiang, Lingbo Zhu, Wong C.P. // IEEE Transactions on Components and Packaging Technologies. - 2008. - Vol. 31, No. 1. - P. 135-142. ↑

J363. Hwang J.M. Efficiency Enhancement of Light Extraction in LED With a Nano-Porous GaP Surface. / Hwang J.M., Hung W.H., Hwang H.L. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 8. - P. 608-610. ↑

J364. Yonghao Cui. Silicon-Based 2-D Slab Photonic Crystal TM Polarizer at Telecommunication Wavelength. / Yonghao Cui, Qi Wu, Schonbrun E., Tinker M., Lee J.-B., Won Park. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 8. - P. 641-643. ↑

J365. Sapatnekar Sachin. Building your yield of dreams [review of Design for Manufacturability and Yield for Nano-Scale CMOS by Charles Chiang and Jamil Kawa; 2007]. IEEE Design & Test of Computers. - 2008. - Vol. 25, No. 2. - P. 194-195. ↑

J366. Chengkuo Lee. Design and Modeling of a Nanomechanical Sensor Using Silicon Photonic Crystals. / Chengkuo Lee, Radhakrishnan R., Chii-Chang Chen, Jing Li, Thillaigovindan J., Balasubramanian N. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 7. - P. 839-846. ↑

J367. Prewett P.O. Stress-induced curvature of focused ion beam fabricated microcantilevers. / Prewett P.O., Anthony C.J., Cheneler D., Ward M.C.L. // IET Micro & Nano Letters. - 2008. - Vol. 3, No. 1. - P. 25-28. ↑

J368. Lall P. Nano-Underfills for High-Reliability Applications in Extreme Environments. / Lall P., Islam S., Guoyun Tian, Suhling J.C. // IEEE Transactions on Components and Packaging Technologies. - 2008. - Vol. 31, No. 1. - P. 114-125. ↑

J369. Yea-Chen Lee. Enhancing the Light Extraction of (Alx Ga1 − x) 0.5 In0.5 P-Based Light-Emitting Diode Fabricated via Geometric Sapphire Shaping. / Yea-Chen Lee, Chia-En Lee, Hao-Chung Kuo, Tien-Chang Lu, Shing-Chung Wang. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 5. - P. 369-371. ↑

J370. Reichelt M. Optical Forces on a Quantum Dot in Metallic Bowtie Structures. / Reichelt M., Dineen C., Koch S.W., Moloney J.V. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 6. - P. 431-433. ↑

J371. Mohanty S.P. Simultaneous scheduling and binding for low gate leakage nano-complementary metaloxide-semiconductor data path circuit behavioural synthesis. / Mohanty S.P., Kougianos E., Pradhan D.K. // IET Computers & Digital Techniques. - 2008. - Vol. 2, No. 2. - P. 118-131. ↑

J372. Chien-Chun Wang. Improved Extraction Efficiency of Light-Emitting Diodes by Modifying Surface Roughness With Anodic Aluminum Oxide Film. / Chien-Chun Wang, Hung-Chi Lu, Chien-Chih Liu, Fenq-Lin Jenq, Yeong-Her Wang, Mau-Phon Houng. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 6. - P. 428-430. ↑

J373. Cespedes O. Fabrication of Magnetic Force Microscopy Tips via Electrodeposition and Focused Ion Beam Milling. / Cespedes O., Luu A., Rhen F., Coey J. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 11. - P. 3248-3251. ↑

J374. Gomez P. Calculation of Minimum Parameters Required for Low-Field Low-Size Nano Nuclear Magnetic Resonance (NanoNMR). / Gomez P., Litvinov D., Khizroev S. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 11. - P. 4464-4467. ↑

J375. Lin Y. Ultracompact AWG Using Air-Trench Bends With Perfluorocyclobutyl Polymer Waveguides. / Lin Y., Rahmanian N., Seunghyun Kim, Nordin G.P., Topping C., Smith D.W., Ballato J. // Journal of Lightwave Technology. - 2008. - Vol. 26, No. 17. - P. 3062-3070. ↑

J376. Mavis D.G. Multiple Bit Upsets and Error Mitigation in Ultra-Deep Submicron SRAMS. / Mavis D.G., Eaton P.H., Sibley M.D., Lacoe R.C., Smith E.J., Avery K.A. // IEEE Transactions on Nuclear Science. - 2008. - Vol. 55, No. 6. - P. 3288-3294. ↑

J377. Baek S.S. Reducing Contact Resistance Using Compliant Nickel Nanowire Arrays. / Baek S.S., Fearing R.S. // IEEE Transactions on Components and Packaging Technologies. - 2008. - Vol. 31, No. 4. - P. 859-868. ↑

J378. Tao Dai. Light Extraction Improvement From GaN-Based Light-Emitting Diodes With Nano-Patterned Surface Using Anodic Aluminum Oxide Template. / Tao Dai, Bei Zhang, Xiang Ning Kang, Kui Bao, Wen Zhu Zhao, Dong Sheng Xu, Guo Yi Zhang, Zi Zhao Gan. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 23. - P. 1974-1976. ↑

J379. Lilley C. An anchor for nanoscale science and engineering. / Lilley C., Wong M., Chang R.P.H. // IEEE Nanotechnology Magazine. - 2008. - Vol. 2, No. 2. - P. 5-6. ↑

J380. Maffucci A. Performance Comparison Between Metallic Carbon Nanotube and Copper Nano-Interconnects. / Maffucci A., Miano G., Villone F. // IEEE Transactions on Advanced Packaging. - 2008. - Vol. 31, No. 4. - P. 692-699. ↑

J381. Alexander C. Random-Dopant-Induced Drain Current Variation in Nano-MOSFETs: A Three-Dimensional Self-Consistent Monte Carlo Simulation Study Using "Ab Initio " Ionized Impurity Scattering. / Alexander C., Roy G., Asenov A. // IEEE Transactions on Electron Devices. - 2008. - Vol. 55, No. 11. - P. 3251-3258. ↑

J382. Rahaman M.D. High cleanliness of portable clean-unit-box to unite clean-unit system platforms (CUSPs) and CUSP units. / Rahaman M.D., Gomita K., Kawaguchi N., Kaiju H., Kondo K., Ishibashi A. // Electronics Letters. - 2007. - Vol. 43, No. 24. - P. 1356-1357. ↑

J383. Fallahi A. QoS provisioning in wireless video sensor networks: a dynamic power management framework. / Fallahi A., Hossain E. // IEEE Wireless Communications. - 2007. - Vol. 14, No. 6. - P. 40-49. ↑

J384. Jun Myungsim. Analysis of interface trap states at Schottky diode by using equivalent circuit modeling. / Jun Myungsim, Jang Moongyu, Kim Yarkyeon, Choi Cheljong, Kim Taeyoub, Park Byungchul, Lee Seongjae. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 1. - P. 82-85. ↑

J385. Paladino D. Spectral Behavior in Nano-Coated Tilted Fiber Bragg Gratings: Effect of Thickness and External Refractive Index. / Paladino D., Cusano A., Pilla P., Campopiano S., Caucheteur C., Megret P. // IEEE Photonics Technology Letters. - 2007. - Vol. 19, No. 24. - P. 2051-2053. ↑

J386. Lau C. Guest Editorial. / Lau C., Orailoglu A., Roy K. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2007. - Vol. 54, No. 11. - P. 2342-2344. ↑

J387. Fujita S. 3-D Nanoarchitectures With Carbon Nanotube Mechanical Switches for Future On-Chip Network Beyond CMOS Architecture. / Fujita S., Nomura K., Abe K., Lee T.H. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2007. - Vol. 54, No. 11. - P. 2472-2479. ↑

J388. Moritz C.A. Fault-Tolerant Nanoscale Processors on Semiconductor Nanowire Grids. / Moritz C.A., Teng Wang, Narayanan P., Leuchtenburg M., Yao Guo, Dezan C., Bennaser M. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2007. - Vol. 54, No. 11. - P. 2422-2437. ↑

J389. Choi Sang-Jun. Novel Samsung advanced resist for thermal flow process material for nano-processing. Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 1. - P. 152-155. ↑

J390. Li Wen-Ping. Three dimension analysis of ЕЧВ mass separator. / Li Wen-Ping, Han Li, Gu Wen-Qi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 1. - P. 194-198. ↑

J391. Ma Xiaobo. Void-free low-temperature silicon direct-bonding technique using plasma activation. / Ma Xiaobo, Liu Weili, Song Zhitang, Li Wei, Lin Chenglu. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 1. - P. 229-234. ↑

J392. Arumuganathar S. Aerodynamically assisted jetting: a rapidly emerging microfabrication methodology. / Arumuganathar S., Jayasinghe S.N., Suter N. // IET Micro & Nano Letters. - 2007. - Vol. 2, No. 4. - P. 78-84. ↑

J393. Grad P. Micro goes nano. Engineering & Technology. - 2007. - Vol. 2, No. 6. - P. 34-37. ↑

J394. Cheng M. H. Influence of oxygen diffusion on residual stress for tantalum thin films. / Cheng M. H., Cheng T. C., Huang W. J., Chang M. N., Chung M. K. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 1. - P. 147-151. ↑

J395. Jung D.J. Key integration technologies for nanoscale FRAMs. / Jung D.J., Hyun-Ho Kim, Kim K. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2007. - Vol. 54, No. 12. - P. 2535-2540. ↑

J396. Chakraborty R.S. Hybridization of CMOS With CNT-Based Nano-Electromechanical Switch for Low Leakage and Robust Circuit Design. / Chakraborty R.S., Narasimhan S., Bhunia S. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2007. - Vol. 54, No. 11. - P. 2480-2488. ↑

J397. Min-Hsiung Hsieh. Accelerated Discrete Degradation Models for Leakage Current of Ultra-Thin Gate Oxides. / Min-Hsiung Hsieh, Shuen-Lin Jeng. // IEEE Transactions on Reliability. - 2007. - Vol. 56, No. 3. - P. 369-380. ↑

J398. Shuen-Lin Jeng. A Review of Reliability Research on Nanotechnology. / Shuen-Lin Jeng, Jye-Chyi Lu, Kaibo Wang. // IEEE Transactions on Reliability. - 2007. - Vol. 56, No. 3. - P. 401-410. ↑

J399. Machover Carl. Tools and Products. / Machover Carl, Kasik David J. // IEEE Computer Graphics and Applications. - 2007. - Vol. 27, No. 5. - P. 104-91. ↑

J400. Karn B. Nano Particles Without Macroproblems. / Karn B., Matthews H.S. // IEEE Spectrum. - 2007. - Vol. 44, No. 9. - P. 55-58. ↑

J401. Birner S. nextnano: General Purpose 3-D Simulations. / Birner S., Zibold T., Andlauer T., Kubis T., Sabathil M., Trellakis A., Vogl P. // IEEE Transactions on Electron Devices. - 2007. - Vol. 54, No. 9. - P. 2137-2142. ↑

J402. Mok K.R.C. Predictive Simulation of Advanced Nano-CMOS Devices Based on kMC Process Simulation. / Mok K.R.C., Colombeau B.., Benistant F.., Teo R.S., Yeong S.H., Yang B.., Jaraiz M.., Chu S.-F.S. // IEEE Transactions on Electron Devices. - 2007. - Vol. 54, No. 9. - P. 2155-2163. ↑

J403. Fang-shi Lai. On-Chip Voltage Down Converter to Improve SRAM Read/Write Margin and Static Power for Sub-Nano CMOS Technology. / Fang-shi Lai, Chia-Fu Lee. // IEEE Journal of Solid-State Circuits. - 2007. - Vol. 42, No. 9. - P. 2061-2070. ↑

J404. Galatsis K. A Review of Metrology for Nanoelectronics. / Galatsis K., Potok R., Wang K.L. // IEEE Transactions on Semiconductor Manufacturing. - 2007. - Vol. 20, No. 4. - P. 542-548. ↑

J405. Blum A.S. Electronic Properties of Molecular Memory Circuits on a Nanoscale Scaffold. / Blum A.S., Soto C.M., Wilson C.D., Amsinck C., Franzon P., Ratna B.R. // IEEE Transactions on NanoBioscience. - 2007. - Vol. 6, No. 4. - P. 270-274. ↑

J406. Clark Beverly. Nanoscale optical imaging of pigment particles in paint with near-field scanning optical microscopy. / Clark Beverly, Gurguis Gamil, Hallen H. D. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 1. - P. 54-57. ↑

J407. Kui Bao. Improvement of Light Extraction From Patterned Polymer Encapsulated GaN-Based Flip-Chip Light-Emitting Diodes by Imprinting. / Kui Bao, Xiang Ning Kang, Bei Zhang, Tao Dai, Chang Xiong, Hang Ji, Guo Yi Zhang, Yong Chen. // IEEE Photonics Technology Letters. - 2007. - Vol. 19, No. 22. - P. 1840-1842. ↑

J408. Shi F. Fabrication of arched MEMS electric contactor with Cu-based carbon nanofibre composite film. / Shi F., Guifu D., Yuchao W., Huiqing W., Hong W. // IET Micro & Nano Letters. - 2007. - Vol. 2, No. 3. - P. 58-62. ↑

J409. Ogasahara Y. Validation of a Full-Chip Simulation Model for Supply Noise and Delay Dependence on Average Voltage Drop With On-Chip Delay Measurement. / Ogasahara Y., Enami T., Hashimoto M., Sato T., Onoye T. // IEEE Transactions on Circuits and Systems II: Express Briefs. - 2007. - Vol. 54, No. 10. - P. 868-872. ↑

J410. Okui Toshiko. Surface treatments of SiGe for scanning tunneling microscopy/spectroscopy and characterization of SiGe p-n junction. / Okui Toshiko, Tanaka Yuma, Shiraki Yasuhiro. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 1. - P. 29-32. ↑

J411. Seol Jae Hun. Measurement and analysis of thermopower and electrical conductivity of an indium antimonide nanowire from a vapor-liquid-solid method. / Seol Jae Hun, Moore Arden L., Saha Sanjoy K., Zhou Feng, Shi Li, Ye Qi Laura, Scheffler Raymond, Mingo Natalio, Yamada Toshishige. // Journal of Applied Physics. - 2007. - Vol. 101, No. 2. - P. 023706-023706-6. ↑

J412. Lee Szetsen. Spectroscopic study of carbonaceous dust particles grown in benzene plasma. / Lee Szetsen, Chen Hsiu-Feng, Chin Chien-Ju. // Journal of Applied Physics. - 2007. - Vol. 101, No. 11. - P. 113303-113303-8. ↑

J413. Mao S. C. The nano- and mesoscopic cooperative collective mechanisms of inhomogenous elastic-plastic transitions in polycrystalline TiNi shape memory alloys. / Mao S. C., Han X. D., Zhang Z., Wu M. H. // Journal of Applied Physics. - 2007. - Vol. 101, No. 10. - P. 103522-103522-8. ↑

J414. Wang Hongmei. The effect of transverse wave vector and magnetic fields on resonant tunneling times in double-barrier structures. / Wang Hongmei, Zhang Yafei, Xu Huaizhe. // Journal of Applied Physics. - 2007. - Vol. 101, No. 2. - P. 023712-023712-5. ↑

J415. Ahmad I.S. Honey I shrunk the world. / Ahmad I.S., Cunningham B.T. // IEEE Nanotechnology Magazine. - 2007. - Vol. 1, No. 2. - P. 4-10. ↑

J416. Jinyong Chung. Korean minds eye nanotechnology. IEEE Nanotechnology Magazine. - 2007. - Vol. 1, No. 2. - P. 20-27. ↑

J417. Hallam T. Scanning tunneling microscope based fabrication of nano- and atomic scale dopant devices in silicon: The crucial step of hydrogen removal. / Hallam T., Reusch T. C. G., Oberbeck L., Curson N. J., Simmons M. Y. // Journal of Applied Physics. - 2007. - Vol. 101, No. 3. - P. 034305-034305-6. ↑

J418. Hsieh Chin-Tang. Effect of growth conditions on the structure and properties of tungsten films prepared using a thermal evaporation process. / Hsieh Chin-Tang, Ting Jyh-Ming. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2007. - Vol. 25, No. 6. - P. 1552-1556. ↑

J419. Hwang Wan Sik. Low energy N 2 ion bombardment for removal of (Hf O 2)x (Si O N)1-x in dilute HF. / Hwang Wan Sik, Cho Byung-Jin, Chan Daniel S. H., Yoo Won Jong. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2007. - Vol. 25, No. 4. - P. 1056-1061. ↑

J420. Mavrokefalos Anastassios. Four-probe measurements of the in-plane thermoelectric properties of nanofilms. / Mavrokefalos Anastassios, Pettes Michael T., Zhou Feng, Shi Li. // Review of Scientific Instruments. - 2007. - Vol. 78, No. 3. - P. 034901-034901-6. ↑

J421. Okuda Keisuke. Micro-nano mixture patterning by thermal-UV novel nanoimprint. / Okuda Keisuke, Niimi Naoyuki, Kawata Hiroaki, Hirai Yoshihiko. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 6. - P. 2370-2372. ↑

J422. Aubin Keith L. Microfluidic encapsulated nanoelectromechanical resonators. / Aubin Keith L., Huang Jingqing, Park Seung-Min, Yang Yanou, Kondratovich Marianna, Craighead Harold G., Ilic Bojan R. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 4. - P. 1171-1174. ↑

J423. Park Hyunsoo. Optimizing nanoimprint and transfer-bonding techniques for three-dimensional polymer microstructures. / Park Hyunsoo, Li Huifeng, Cheng Xing. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 6. - P. 2325-2328. ↑

J424. Chaix N. Nanoimprint lithography processes on 200 mm Si wafer for optical application: Residual thickness etching anisotropy. / Chaix N., Gourgon C., Perret C., Landis S., Leveder T. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 6. - P. 2346-2351. ↑

J425. Thanh N. T. Thickness dependence of parallel and perpendicular anisotropic resistivity in Ta/NiFe/IrMn/Ta multilayer studied by anisotropic magnetoresistance and planar Hall effect. / Thanh N. T., Tu L.

T., Ha N. D., Kim C. O., Kim CheolGi, Shin K. H., Parvatheeswara Rao B. // Journal of Applied Physics. - 2007. - Vol. 101, No. 5. - P. 053702-053702-5.

J426. Gwag Jin Seog. Advanced nanoimprint lithography using a graded functional imprinting material tailored for liquid crystal alignment. / Gwag Jin Seog, Oh-e Masahito, Yoneya Makoto, Yokoyama Hiroshi, Satou H., Itami S. // Journal of Applied Physics. - 2007. - Vol. 102, No. 6. - P. 063501-063501-5.

J427. Huang Chong. Annealing of nanostructured silver films produced by supersonic deposition of nanoparticles. / Huang Chong, Becker Michael F., Keto John W., Kovar Desiderio. // Journal of Applied Physics. - 2007. - Vol. 102, No. 5. - P. 054308-054308-8.

J428. Sahu B. S. Structural and electrical properties of high-kappa Bi 2 Mg 2/3 Nb 4/3 O7 pyrochlore films on silicon for possible gate dielectric applications. / Sahu B. S., Ahn Jun-Ku, Seong Nak-Jin, Yoon Soon-Gil. // Journal of Applied Physics. - 2007. - Vol. 102, No. 5. - P. 054103-054103-8.

J429. Liu X. J. Growth mechanism from nano-ordered clusters to nanocrystals in a deeply undercooled melt of Zr-Ni-Ti metallic glass. / Liu X. J., Chen G. L., Hui X. D., Hou H. Y., Yao K. F., Liu C. T. // Journal of Applied Physics. - 2007. - Vol. 102, No. 6. - P. 063515-063515-5.

J430. Schmitt H. UV nanoimprint materials: Surface energies, residual layers, and imprint quality. / Schmitt H., Frey L., Ryssel H., Rommel M., Lehrer C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 3. - P. 785-790.

J431. Abdi Yaser. Embedded vertically grown carbon nanotubes for field emission applications. / Abdi Yaser, Koohshorkhi Javad, Mohajerzadeh Shams, Darbari Sara, Sanaee Zeinab. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 3. - P. 822-828.

J432. Prasher Ravi. Thermal radiation in dense nano- and microparticulate media. Journal of Applied Physics. - 2007. - Vol. 102, No. 7. - P. 074316-074316-9.

J433. Feng J. Crystallization process and amorphous state stability of Si-Sb-Te films for phase change memory. / Feng J., Zhang Z. F., Zhang Y., Cai B. C., Lin Y. Y., Tang T. A., Chen Bomy. // Journal of Applied Physics. - 2007. - Vol. 101, No. 7. - P. 074502-074502-5.

J434. Saha Sanjoy K. Molecular dynamics simulation of thermal transport at a nanometer scale constriction in silicon. / Saha Sanjoy K., Shi Li. // Journal of Applied Physics. - 2007. - Vol. 101, No. 7. - P. 074304-074304-7.

J435. Roh Cheong Hyun. Characterization of the morphology and optical properties of In As /Al As quantum dots with a GaAs insertion layer. / Roh Cheong Hyun, Song Hong Joo, Kim Dong Ho, Park Joon Soo, Choi Yeon-Shik, Kim Hoon, Hahn Cheol-Koo. // Journal of Applied Physics. - 2007. - Vol. 101, No. 6. - P. 064320-064320-7.

J436. Caldas M. J. Trimming Si surfaces for molecular electronics. / Caldas M. J., Calzolari A., Cucinotta C. S. // Journal of Applied Physics. - 2007. - Vol. 101, No. 8. - P. 081719-081719-5.

J437. Kang Shishou. Microstructures and magnetic alignment of L10 FePt nanoparticles. / Kang Shishou, Shi Shifan, Jia Zhiyong, Thompson G. B., Nikles David E., Harrell J. W., Li Daren, Poudyal Narayan, Nandwana Vikas, Liu J. Ping. // Journal of Applied Physics. - 2007. - Vol. 101, No. 9. - P. 09J113-09J113-3.

J438. Lee Jae-Chul. Current-induced magnetic switching in nanopillar spin-valve systems with double free layers. / Lee Jae-Chul, You Chun-Yeol, Choe Sug-Bong, Lee Kyung-Jin, Shin Kyung-Ho. // Journal of Applied Physics. - 2007. - Vol. 101, No. 9. - P. 09A512-09A512-3.

J439. Xian Cheng-Ji. Effect of thickness on electrical properties of bismuth-magnesium niobate pyrochlore thin films deposited at low temperature. / Xian Cheng-Ji, Park Jong-Hyun, Yoon Soon-Gil, Moon Jin Seok, Lim Sung Taek, Sohn Seung Hyun, Jung Hyung Mi, Shin Yee-na, Kim Woon Chun, Jeon Min-Ku, Woo Seong-Ihl. // Journal of Applied Physics. - 2007. - Vol. 101, No. 8. - P. 084114-084114-4.

J440. Ying Wu. Iterative Control Approach to Compensate for Both the Hysteresis and the Dynamics Effects of Piezo Actuators. / Ying Wu, Qingze Zou. // IEEE Transactions on Control Systems Technology. - 2007. - Vol. 15, No. 5. - P. 936-944.

J441. Liu Liyu. Paperlike thermochromic display. / Liu Liyu, Peng Suili, Wen Weijia, Sheng Ping. // Applied Physics Letters. - 2007. - Vol. 90, No. 21. - P. 213508-213508-3. ↑

J442. Kwon Tae Yun. In situ real-time monitoring of biomolecular interactions based on resonating microcantilevers immersed in a viscous fluid. / Kwon Tae Yun, Eom Kilho, Park Jae Hong, Yoon Dae Sung, Kim Tae Song, Lee Hong Lim. // Applied Physics Letters. - 2007. - Vol. 90, No. 22. - P. 223903-223903-3. ↑

J443. Drake C. Band gap energy modifications observed in trivalent In substituted nanocrystalline Sn O 2. / Drake C., Seal S. // Applied Physics Letters. - 2007. - Vol. 90, No. 23. - P. 233117-233117-3. ↑

J444. Sawano K. Strained Si n -channel metal-oxide-semiconductor field-effect transistors formed on very thin SiGe relaxed layer fabricated by ion implantation technique. / Sawano K., Fukumoto A., Hoshi Y., Shiraki Y., Yamanaka J., Nakagawa K. // Applied Physics Letters. - 2007. - Vol. 90, No. 20. - P. 202101-202101-3. ↑

J445. Adikaari A. A. D. T. Efficient laser textured nanocrystalline silicon-polymer bilayer solar cells. / Adikaari A. A. D. T., Dissanayake D. M. N. M., Hatton R. A., Silva S. R. P. // Applied Physics Letters. - 2007. - Vol. 90, No. 20. - P. 203514-203514-3. ↑

J446. Chen W.-Y. Temperature stability of single-photon emission from InGaAs quantum dots in photonic crystal nanocavities. / Chen W.-Y., Chang H.-S., Hsu T. M., Hsieh T.-P., Chyi J.-I. // Applied Physics Letters. - 2007. - Vol. 90, No. 21. - P. 211114-211114-3. ↑

J447. Liu Aihua. Switchable titanate-nanotube electrode sensitive to nitrate. / Liu Aihua, Zhou Haoshen, Honma Itaru, Ichihara Masaki. // Applied Physics Letters. - 2007. - Vol. 90, No. 25. - P. 253112-253112-3. ↑

J448. Gwag Jin Seog. In-plane bistable nematic liquid crystal devices based on nanoimprinted surface relief. / Gwag Jin Seog, Fukuda Jun-ichi, Yoneya Makoto, Yokoyama Hiroshi. // Applied Physics Letters. - 2007. - Vol. 91, No. 7. - P. 073504-073504-3. ↑

J449. Fu X. Q. Anomalous photoconductivity of Ce O 2 nanowires in air. / Fu X. Q., Wang C., Feng P., Wang T. H. // Applied Physics Letters. - 2007. - Vol. 91, No. 7. - P. 073104-073104-3. ↑

J450. Huang Jin. Branched growth of degenerately Sb-doped Sn O 2 nanowires. / Huang Jin, Lu Aixia, Zhao Bin, Wan Qing. // Applied Physics Letters. - 2007. - Vol. 91, No. 7. - P. 073102-073102-3. ↑

J451. Liu Liyu. Micro thermoindicators and optical-electronic temperature control for microfluidic applications. / Liu Liyu, Peng Suili, Wen Weijia, Sheng Ping. // Applied Physics Letters. - 2007. - Vol. 91, No. 9. - P. 093513-093513-3. ↑

J452. Shi Haofei. Focal length modulation based on a metallic slit surrounded with grooves in curved depths. / Shi Haofei, Du Chunlei, Luo Xiangang. // Applied Physics Letters. - 2007. - Vol. 91, No. 9. - P. 093111-093111-3. ↑

J453. Myronov M. Observation of two-dimensional hole gas with mobility and carrier density exceeding those of two-dimensional electron gas at room temperature in the SiGe heterostructures. / Myronov M., Sawano K., Shiraki Y., Mouri T., Itoh K. M. // Applied Physics Letters. - 2007. - Vol. 91, No. 8. - P. 082108-082108-3. ↑

J454. Toh Eng-Huat. Performance enhancement of n -channel impact-ionization metal-oxide-semiconductor transistor by strain engineering. / Toh Eng-Huat, Wang Grace Huiqi, Lo Guo-Qiang, Chan Lap, Samudra Ganesh, Yeo Yee-Chia. // Applied Physics Letters. - 2007. - Vol. 90, No. 2. - P. 023505-023505-3. ↑

J455. Yan Z. ZnO-based film bulk acoustic resonator for high sensitivity biosensor applications. / Yan Z., Zhou X. Y., Pang G. K. H., Zhang T., Liu W. L., Cheng J. G., Song Z. T., Feng S. L., Lai L. H., Chen J. Z., Wang Y. // Applied Physics Letters. - 2007. - Vol. 90, No. 14. - P. 143503-143503-3. ↑

J456. Sohn Jaecheon. Si-based electromagnetic noise suppressors integrated with a magnetic thin film. / Sohn Jaecheon, Han S. H., Yamaguchi Masahiro, Lim S. H. // Applied Physics Letters. - 2007. - Vol. 90, No. 14. - P. 143520-143520-3. ↑

J457. Ma Rui. Erratum: "Wide bandgap photonic structures in dichromate gelatin emulsions" [Appl. Phys. Lett. 89, 081116 (2006)]. / Ma Rui, Xu Jun, Tam Wing Yim. // Applied Physics Letters. - 2007. - Vol. 90, No. 16. - P. 169901-169901-1. ↑

J458. Nanditha D. M. Operation of a reversed pentacene-fullerene discrete heterojunction photovoltaic device. / Nanditha D. M., Dissanayake M., Hatton Ross A., Curry Richard J., Silva S. R. P. // Applied Physics Letters. - 2007. - Vol. 90, No. 11. - P. 113505-113505-3.

J459. Jiang H. High quality AlGaN solar-blind Schottky photodiodes fabricated on AlN/sapphire template. / Jiang H., Egawa T. // Applied Physics Letters. - 2007. - Vol. 90, No. 12. - P. 121121-121121-3.

J460. Xia J. S. Observation of whispering-gallery modes in Si microdisks at room temperature. / Xia J. S., Ikegami Y., Nemoto K., Shiraki Y. // Applied Physics Letters. - 2007. - Vol. 90, No. 14. - P. 141102-141102-3.

J461. Adikaari A. A. D. T. Use of an asymmetric pulse profile for higher crystalline volumes from excimer laser crystallization of amorphous silicon. / Adikaari A. A. D. T., Mudugamuwa N. K., Silva S. R. P. // Applied Physics Letters. - 2007. - Vol. 90, No. 17. - P. 171912-171912-3.

J462. Shim Jae-Hyeok. Screw dislocation assisted martensitic transformation of a bcc Cu precipitate in bcc Fe. / Shim Jae-Hyeok, Cho Young Whan, Kwon Sang Chul, Kim Whung Whoe, Wirth Brian D. // Applied Physics Letters. - 2007. - Vol. 90, No. 2. - P. 021906-021906-3.

J463. Koo Hyun Cheol. Electrical spin injection and detection in an InAs quantum well. / Koo Hyun Cheol, Yi Hyunjung, Ko Jae-Beom, Chang Joonyeon, Han Suk-Hee, Jung Donghwa, Huh Seon-Gu, Eom Jonghwa. // Applied Physics Letters. - 2007. - Vol. 90, No. 2. - P. 022101-022101-3.

J464. Miller Anthony J. Carbon nanotubes grown on In 2 O 3 :Sn glass as large area electrodes for organic photovoltaics. / Miller Anthony J., Hatton Ross A., Chen G. Y., Silva S. Ravi P. // Applied Physics Letters. - 2007. - Vol. 90, No. 2. - P. 023105-023105-3.

J465. Selvaraj S. Lawrence. Al N /Al Ga N /Ga N metal-insulator-semiconductor high-electron-mobility transistor on 4 in. silicon substrate for high breakdown characteristics. / Selvaraj S. Lawrence, Ito Tsuneo, Terada Yutaka, Egawa Takashi. // Applied Physics Letters. - 2007. - Vol. 90, No. 17. - P. 173506-173506-3.

J466. Cuong Nguyen Duy. Ti(N) thin film resistors for 20 dB Pi -type attenuator applications. / Cuong Nguyen Duy, Yoon Soon-Gil, Kim Dong-Jin, Kang Byoung-Don. // Applied Physics Letters. - 2007. - Vol. 90, No. 18. - P. 183506-183506-3.

J467. Myronov M. Enhancement of room-temperature hole conductivity in narrow and strained Ge quantum well by double-side modulation doping. / Myronov M., Shiraki Y., Mouri T., Itoh K. M. // Applied Physics Letters. - 2007. - Vol. 90, No. 19. - P. 192108-192108-3.

J468. Seong Nak-Jin. Effect of excess bismuth concentration on dielectric and electrical properties of fully crystallized Bi 2 Mg 2/3 Nb 4/3 O 7 thin films. / Seong Nak-Jin, Park Jong-Hyun, Yoon Soon-Gil. // Applied Physics Letters. - 2007. - Vol. 91, No. 7. - P. 072904-072904-3.

J469. Xia J. S. Silicon-based light emitters fabricated by embedding Ge self-assembled quantum dots in microdisks. / Xia J. S., Nemoto K., Ikegami Y., Shiraki Y., Usami N. // Applied Physics Letters. - 2007. - Vol. 91, No. 1. - P. 011104-011104-3.

J470. She J. C. Laser welding of a single tungsten oxide nanotip on a handleable tungsten wire: A demonstration of laser-weld nanoassembly. / She J. C., An S., Deng S. Z., Chen Jun, Xiao Z. M., Zhou J., Xu N. S. // Applied Physics Letters. - 2007. - Vol. 90, No. 7. - P. 073103-073103-3.

J471. Dai Chengda. Shock compression response of nanoiron powder compact. / Dai Chengda, Eakins Daniel, Thadhani Naresh, Liu J. Ping. // Applied Physics Letters. - 2007. - Vol. 90, No. 7. - P. 071911-071911-3.

J472. Molina S. I. Direct imaging of quantum wires nucleated at diatomic steps. / Molina S. I., Varela M., Sales D. L., Ben T., Pizarro J., Galindo P. L., Fuster D., Gonzalez Y., Gonzalez L., Pennycook S. J. // Applied Physics Letters. - 2007. - Vol. 91, No. 14. - P. 143112-143112-3.

J473. Dissanayake D. M. N. M. A PbS nanocrystal-C 60 photovoltaic device for infrared light harvesting. / Dissanayake D. M. N. M., Hatton Ross A., Lutz Thierry, Giusca Cristina E., Curry Richard J., Silva S. R. P. // Applied Physics Letters. - 2007. - Vol. 91, No. 13. - P. 133506-133506-3.

J474. Jeon C. Chemical phase transitions of a Si oxide film on SiC by MeV electron beam irradiation. / Jeon

C., Nam J. H., Song W., Park C.-Y., Ahn J. R., Jung M.-C., Shin H. J., Han Y. H., Lee B. C. // Applied Physics Letters. - 2007. - Vol. 91, No. 11. - P. 111910-111910-3. ↑

J475. Xian Cheng-Ji. Electrical properties of Bi 2 Mg 2/3 Nb 4/3 O 7 (BMN) pyrochlore thin films deposited on Pt and Cu metal at low temperatures for embedded capacitor applications. / Xian Cheng-Ji, Park Jong-Hyun, Ahn Kyung-Chan, Yoon Soon-Gil, Lee Jeong-Won, Kim Woon-Chun, Lim Sung-Taek, Sohn Seung-Hyun, Moon Jin-Seok, Jung Hyung-Mi, Lee Seung-Eun, Lee In-Hyung, Chung Yul-Kyo, Jeon Min-Ku, Woo Seong-Ihl. // Applied Physics Letters. - 2007. - Vol. 90, No. 5. - P. 052903-052903-3. ↑

J476. Owen J. Organic photovoltaic devices with Ga-doped Zn O electrode. / Owen J., Son M. S., Yoo K.-H., Ahn B. D., Lee S. Y. // Applied Physics Letters. - 2007. - Vol. 90, No. 3. - P. 033512-033512-3. ↑

J477. Tam Wing Yim. Erratum: "Icosahedral quasicrystals by optical interference holography" [Appl. Phys. Lett. 89, 251111 (2006)]. Applied Physics Letters. - 2007. - Vol. 90, No. 26. - P. 269902-269902-1. ↑

J478. Dissanayake D. M. Nanditha M. Nanoimprinted large area heterojunction pentacene-C 60 photovoltaic device. / Dissanayake D. M. Nanditha M., Adikaari A. A. D. T., Curry Richard J., Hatton Ross A., Silva S. R. P. // Applied Physics Letters. - 2007. - Vol. 90, No. 25. - P. 253502-253502-3. ↑

J479. Tu Deyu. Electrical bistable behavior of an organic thin film through proton transfer. / Tu Deyu, Shang Liwei, Liu Ming, Wang Congshun, Jiang Guiyuan, Song Yanlin. // Applied Physics Letters. - 2007. - Vol. 90, No. 5. - P. 052111-052111-3. ↑

J480. Liu Y. G. Room-temperature oxygen sensitivity of ZnS nanobelts. / Liu Y. G., Feng P., Xue X. Y., Shi S. L., Fu X. Q., Wang C., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2007. - Vol. 90, No. 4. - P. 042109-042109-3. ↑

J481. Yu X. B. Improved hydrogen storage properties of Li B H 4 destabilized by carbon. / Yu X. B., Wu Z., Chen Q. R., Li Z. L., Weng B. C., Huang T. S. // Applied Physics Letters. - 2007. - Vol. 90, No. 3. - P. 034106-034106-3. ↑

J482. Cho B. Coherent and intense multibeam generation by the apex of sharp nano-objects: Electron half-circular prism. / Cho B., Ishikawa T., Oshima C. // Applied Physics Letters. - 2007. - Vol. 91, No. 16. - P. 163102-163102-3. ↑

J483. Kitamura Masatoshi. Low-voltage-operating complementary inverters with C 60 and pentacene transistors on glass substrates. / Kitamura Masatoshi, Arakawa Yasuhiko. // Applied Physics Letters. - 2007. - Vol. 91, No. 5. - P. 053505-053505-3. ↑

J484. Arita M. AlN air-bridge photonic crystal nanocavities demonstrating high quality factor. / Arita M., Ishida S., Kako S., Iwamoto S., Arakawa Y. // Applied Physics Letters. - 2007. - Vol. 91, No. 5. - P. 051106-051106-3. ↑

J485. Li C. C. Surface-depletion controlled gas sensing of ZnO nanorods grown at room temperature. / Li C. C., Du Z. F., Li L. M., Yu H. C., Wan Q., Wang T. H. // Applied Physics Letters. - 2007. - Vol. 91, No. 3. - P. 032101-032101-3. ↑

J486. Gu Wenhua. Comprehensive model for fine Coulomb fission of liquid droplets charged to Rayleigh limit. / Gu Wenhua, Heil Philip Edward, Choi Hyungsoo, Kim Kyekyoon. // Applied Physics Letters. - 2007. - Vol. 91, No. 6. - P. 064104-064104-3. ↑

J487. Gao J. R. Monocrystalline NbN nanofilms on a 3C-Si C /Si substrate. / Gao J. R., Hajenius M., Tichelaar F. D., Klapwijk T. M., Voronov B., Grishin E., Goltsman G., Zorman C. A., Mehregany M. // Applied Physics Letters. - 2007. - Vol. 91, No. 6. - P. 062504-062504-3. ↑

J488. Guan Weihua. Nonvolatile resistive switching memory utilizing gold nanocrystals embedded in zirconium oxide. / Guan Weihua, Long Shibing, Jia Rui, Liu Ming. // Applied Physics Letters. - 2007. - Vol. 91, No. 6. - P. 062111-062111-3. ↑

J489. Thakur Sangeeta. Improvement in electric and dielectric properties of nanoferrite synthesized via reverse micelle technique. / Thakur Sangeeta, Katyal S. C., Singh M. // Applied Physics Letters. - 2007. - Vol. 91, No. 26. - P. 262501-262501-3. ↑

J490. Xu Ting. Subwavelength imaging by metallic slab lens with nanoslits. / Xu Ting, Du Cunlei, Wang Changtao, Luo Xiangang. // Applied Physics Letters. - 2007. - Vol. 91, No. 20. - P. 201501-201501-3.

J491. Henley S. J. Laser direct write of silver nanoparticles from solution onto glass substrates for surface-enhanced Raman spectroscopy. / Henley S. J., Silva S. R. P. // Applied Physics Letters. - 2007. - Vol. 91, No. 2. - P. 023107-023107-3.

J492. Xue X. Y. Extremely high oxygen sensing of individual Zn Sn O 3 nanowires arising from grain boundary barrier modulation. / Xue X. Y., Feng P., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2007. - Vol. 91, No. 2. - P. 022111-022111-3.

J493. Zhang J. C. Quantum-well and localized state emissions in AlInGaN deep ultraviolet light-emitting diodes. / Zhang J. C., Zhu Y. H., Egawa T., Sumiya S., Miyoshi M., Tanaka M. // Applied Physics Letters. - 2007. - Vol. 91, No. 22. - P. 221906-221906-3.

J494. Chang Chia-Ching. Direct visualization of triplex DNA molecular dynamics by fluorescence resonance energy transfer and atomic force microscopy measurements. / Chang Chia-Ching, Lin Po-Yen, Chen Yen-Fu, Chang Chia-Seng, Kan Lou-Sing. // Applied Physics Letters. - 2007. - Vol. 91, No. 20. - P. 203901-203901-3.

J495. Cuong Nguyen Duy. Realization of Pi -type attenuator using Ti(N) thin films for the fourth generation of mobile telecommunications. / Cuong Nguyen Duy, Yoon Soon-Gil, Kim Dong-Jin. // Applied Physics Letters. - 2007. - Vol. 91, No. 20. - P. 203502-203502-3.

J496. Xiaodong Che. Recording Performance Study of PMR Media With Patterned Tracks. / Xiaodong Che, Yawshing Tang, Hyung Jai Lee, Shuyu Zhang, Ki-Seok Moon, Na-Young Kim, Soo-Youl Hong, Takahashi N., Moneck M., Jian-Gang Zhu. // IEEE Transactions on Magnetics. - 2007. - Vol. 43, No. 6. - P. 2292-2294.

J497. Iakovidis I. Biomedical Engineering and eHealth min Europe-Outcomes and Challenges of Past and Current EU Research Programs. / Iakovidis I., Le Dour O., Karp P. // IEEE Engineering in Medicine and Biology Magazine. - 2007. - Vol. 26, No. 3. - P. 26-28.

J498. Min-Hang Weng. A Hairpin Line Diplexer for Direct Sequence Ultra-Wideband Wireless Communications. / Min-Hang Weng, Cheng-Yuan Hung, Yan-Kuin Su. // IEEE Microwave and Wireless Components Letters. - 2007. - Vol. 17, No. 7. - P. 519-521.

J499. Kao C.-C. Light–Output Enhancement of Nano-Roughened GaN Laser Lift-Off Light-Emitting Diodes Formed by ICP Dry Etching. / Kao C.-C., Kuo H. C., Yeh K. F., Chu J. T., Peng W. L., Huang H. W., Lu T. C., Wang S. C. // IEEE Photonics Technology Letters. - 2007. - Vol. 19, No. 11. - P. 849-851.

J500. A. Bindal. Exploratory study on power-efficient silicon nano-wire dynamic NMOSFET/PMESFET logic. / A. Bindal, S. Hamedi-Hagh. // IET Science, Measurement & Technology. - 2007. - Vol. 1, No. 2. - P. 121-130.

J501. Roska T. Cellular wave computers for nanotera- scale technology---beyond boolean, spatial-temporal logic in million processor devices. Electronics Letters. - 2007. - Vol. 43, No. 8. - P. 427-429.

J502. Shimizu K. Experimental Study on Breakdown of Mobility Universality in -Directed (110)-Oriented pMOSFETs. / Shimizu K., Tsutsui G., Januar D., Saraya T., Hiramoto T. // IEEE Transactions on Nanotechnology. - 2007. - Vol. 6, No. 3. - P. 358-361.

J503. Tu D. Three-dimensional CMOL: three-dimensional integration of CMOS/nanomaterial hybrid digital circuits. / Tu D., Liu M., Wang W., Haruehanroengra S. // IET Micro & Nano Letters. - 2007. - Vol. 2, No. 2. - P. 40-45.

J504. Jiang C.H. Jc Enhancement in Nano-Si 3 N 4 Doped MgB 2 /Fe Tapes Prepared by a Short Pre-Annealing and Intermediate Rolling Process. / Jiang C.H., Nakane T., Kumakura H. // IEEE Transactions on Applied Superconductivity. - 2007. - Vol. 17, No. 2. - P. 2818-2821.

J505. Libaers D.P. Role and Contribution of Foreign-Born Scientists and Engineers to the Public U.S. Nanoscience and Technology Research Enterprise. IEEE Transactions on Engineering Management. - 2007. - Vol. 54, No. 3. - P. 423-432.

J506. Hao L. Spatial Resolution Assessment of Nano-SQUIDs Made by Focused Ion Beam. / Hao L.,

Macfarlane J. C., Gallop J. C., Romans E., Cox D., Hutson D., Chen J. // IEEE Transactions on Applied Superconductivity. - 2007. - Vol. 17, No. 2. - P. 742-745. ↑

J507. Oechsner R. Approach for a Standardized Methodology for Multisite Processing of 300-mm Wafers at R&D Sites. / Oechsner R., Pfeffer M., Frickinger J., Schellenberger M., Roeder G., Pfitzner L., Ryssel H., Fritzsche M., Kaushik V., Renaud D., Danel A., Claeys C., Bearda T., Lering M., Graef M., Murphy B., Walther H., Hury S. // IEEE Transactions on Semiconductor Manufacturing. - 2007. - Vol. 20, No. 3. - P. 215-221. ↑

J508. Wang D. Ultrahigh Frequency Carbon Nanotube Transistor Based on a Single Nanotube. / Wang D., Yu Z., McKernan S., Burke P.J. // IEEE Transactions on Nanotechnology. - 2007. - Vol. 6, No. 4. - P. 400-403. ↑

J509. Shakir H. Multiscale Control for Nanoprecision Positioning Systems With Large Throughput. / Shakir H., Won-jong Kim. // IEEE Transactions on Control Systems Technology. - 2007. - Vol. 15, No. 5. - P. 945-951. ↑

J510. Devasia S. A Survey of Control Issues in Nanopositioning. / Devasia S., Eleftheriou E., Moheimani S.O.R. // IEEE Transactions on Control Systems Technology. - 2007. - Vol. 15, No. 5. - P. 802-823. ↑

J511. Lyth S. M. Efficient field emission from Li-salt functionalized multiwall carbon nanotubes on flexible substrates. / Lyth S. M., Hatton R. A., Silva S. R. P. // Applied Physics Letters. - 2007. - Vol. 90, No. 1. - P. 013120-013120-3. ↑

J512. Bhatti A. S. Anomalous photoluminescence behavior from amorphous Ge quantum dots produced by buffer-layer-assisted growth. / Bhatti A. S., Antonov V. N., Swaminathan P., Palmer J. S., Weaver J. H. // Applied Physics Letters. - 2007. - Vol. 90, No. 1. - P. 011903-011903-3. ↑

J513. Duc T. C. Piezoresistive Cantilever Beam for Force Sensingin Two Dimensions. / Duc T. C., Creemer J. F., Sarro P. M. // IEEE Sensors Journal. - 2007. - Vol. 7, No. 1. - P. 96-104. ↑

J514. Kim Han-Ki. High-quality thin-film passivation by catalyzer-enhanced chemical vapor deposition for organic light-emitting diodes. / Kim Han-Ki, Kim Myung Soo, Kang Jae-Wook, Kim Jang-Joo, Yi Min-Su. // Applied Physics Letters. - 2007. - Vol. 90, No. 1. - P. 013502-013502-3. ↑

J515. Kwon Jae Hyun. Channel width effect on the spin-orbit interaction parameter in a two-dimensional electron gas. / Kwon Jae Hyun, Koo Hyun Cheol, Chang Joonyeon, Han Suk-Hee, Eom Jonghwa. // Applied Physics Letters. - 2007. - Vol. 90, No. 11. - P. 112505-112505-3. ↑

J516. Yang Jinhu. Electrochemical route to the synthesis of ultrathin ZnO nanorod/nanobelt arrays on zinc substrate. / Yang Jinhu, Liu Guangming, Lu Jun, Qiu Yongfu, Yang Shihe. // Applied Physics Letters. - 2007. - Vol. 90, No. 10. - P. 103109-103109-3. ↑

J517. Kang Sueng-Hee. Co clustering and ferromagnetism in chemical vapor deposited Ti 1-x Co x O 2-delta thin films. / Kang Sueng-Hee, Quynh Hoa Nguyen Thi, Yoon Soon-Gil, Kim Eui-Tae, Lee Zonghoon, Radmilovic Velimir. // Applied Physics Letters. - 2007. - Vol. 90, No. 10. - P. 102504-102504-3. ↑

J518. Jamei M. The Preparation of Nanocrystalline Silicon by Plasma-Enhanced Hydrogenation for the Fabrication of Light-Emitting Diodes. / Jamei M., Karbassian F., Mohajerzadeh S., Abdi Y., Robertson M.D., Yuill S. // IEEE Electron Device Letters. - 2007. - Vol. 28, No. 3. - P. 207-210. ↑

J519. Hyunsoo Kim. High-Reflectance and Thermally Stable AgCu Alloy p-Type Reflectors for GaN-Based Light-Emitting Diodes. / Hyunsoo Kim, Kwang Hyeon Baik, Jaehee Cho, Jeong Wook Lee, Sukho Yoon, Hyungkun Kim, Sung-Nam Lee, Cheolsoo Sone, Yongjo Park, Tae-Yeon Seong. // IEEE Photonics Technology Letters. - 2007. - Vol. 19, No. 5. - P. 336-338. ↑

J520. De Michielis M. Analytical Models for the Insight Into the Use of Alternative Channel Materials in Ballistic nano-MOSFETs. / De Michielis M., Esseni D., Driussi F. // IEEE Transactions on Electron Devices. - 2007. - Vol. 54, No. 1. - P. 115-123. ↑

J521. Rossi D. Modeling Crosstalk Effects in CNT Bus Architectures. / Rossi D., Cazeaux J.M., Metra C., Lombardi F. // IEEE Transactions on Nanotechnology. - 2007. - Vol. 6, No. 2. - P. 133-145. ↑

J522. Naka K. Micro and nano structures of carbonised polymer through pyrolytic transformation from polymer structures. / Naka K., Konishi S. // IET Micro & Nano Letters. - 2006. - Vol. 1, No. 2. - P. 79-82. ↑

J523. Wang J. J. Nano- and Microlens Arrays Grown Using Atomic-Layer Deposition. / Wang J. J., Nikolov A., Wu Q. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 24. - P. 2650-2652. ↑

J524. Densmore A. A Silicon-on-Insulator Photonic Wire Based Evanescent Field Sensor. / Densmore A., Xu D.-X., Waldron P., Janz S., Cheben P., Lapointe J., Delage A., Lamontagne B., Schmid J.H., Post E. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 23. - P. 2520-2522. ↑

J525. Taikyeong T. Jeong. Power efficiency system for flight application (pesfa) mission. / Taikyeong T. Jeong, Anthony P. Ambler. // IEEE Transactions on Aerospace and Electronic Systems. - 2006. - Vol. 42, No. 4. - P. 1515-1520. ↑

J526. Christiansen S.H. Wafer Direct Bonding: From Advanced Substrate Engineering to Future Applications in Micro/Nanoelectronics. / Christiansen S.H., Singh R., Gosele U. // Proceedings of the IEEE. - 2006. - Vol. 94, No. 12. - P. 2060-2106. ↑

J527. Joo Moon Sig. Interface configuration and Fermi-level pinning of fully silicided gate and high-K dielectric stack. / Joo Moon Sig, Park Chang Seo, Cho Byung Jin, Balasubramanian N., Kwong Dim-Lee. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 3. - P. 1341-1343. ↑

J528. Park Kyung Ho. Statistical modeling of field-enhancement-factor distribution of nanostructured carbon films. / Park Kyung Ho, Lee Soonil, Koh Ken Ha. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 2. - P. 898-902. ↑

J529. Lee Chang Woo. Effects of N H 3 pulse plasma on atomic layer deposition of tungsten nitride diffusion barrier. / Lee Chang Woo, Kim Yong Tae. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 3. - P. 1432-1435. ↑

J530. Park Kyung Ho. High current field emission behavior of carbon nanofiber film: Adsorbate effects. / Park Kyung Ho, Lee Soonil, Koh Ken Ha. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 3. - P. 1353-1357. ↑

J531. Filip L. D. Quantum size dependence of electron distribution on carbon nanotubes and its influence on field emission. / Filip L. D., Nicolaescu D., Silva S. R. P. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 2. - P. 874-880. ↑

J532. Shimada Masahiro. Electrical resistivity of polycrystalline Cu interconnects with nano-scale linewidth. / Shimada Masahiro, Moriyama Miki, Ito Kazuhiro, Tsukimoto Susumu, Murakami Masanori. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 1. - P. 190-194. ↑

J533. Carlstrom C. F. Cl 2 /O 2 -inductively coupled plasma etching of deep hole-type photonic crystals in InP. / Carlstrom C. F., van der Heijden R., Karouta F., van der Heijden R. W., Salemink H. W. M., van der Drift E. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 1. - P. L6-L9. ↑

J534. Yang W.-S. Surface roughness of Ti :Li Nb O 3 etched by Ar /C 3 F 8 plasma and annealing effect. / Yang W.-S., Kim W. K., Yoon D. H., Lim J.-W., Isshiki M., Lee H.-Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 2. - P. 675-677. ↑

J535. Lu Jiang. Physical and electrical properties of Ta-N, Mo-N, and W-N electrodes on Hf O 2 high-k gate dielectric. / Lu Jiang, Kuo Yue, Chatterjee Somenath, Tewg Jun-Yen. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 1. - P. 349-357. ↑

J536. Huang F.-T. Formation of nanostructured cobalt wires with Chinese caterpillar type structure. / Huang F.-T., Liu R. S., Hu S. F., Lee C.-L., Li A. K. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 3. - P. 1440-1443. ↑

J537. Hwang Wan Sik. Effects of Si O 2 /Si 3 N 4 hard masks on etching properties of metal gates. / Hwang Wan Sik, Cho Byung-Jin, Chan Daniel S. H., Bliznetsov Vladimir, Yoo Won Jong. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 6. - P. 2689-2694. ↑

J538. Rahmanian Nazli. Anisotropic high aspect ratio etch for perfluorcyclobutyl polymers with stress relief

technique. / Rahmanian Nazli, Kim Seunghyun, Nordin Gregory P. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 6. - P. 2672-2677. ↑

J539. Li Xiaona. Study of overlay metrology in atomic force microscope lithography (overlaying lithography with atomic force microscope). / Li Xiaona, Han Li, Gu Wenqi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 6. - P. 3101-3104. ↑

J540. Della Torre A. Interconnecting single nano-objects on surfaces for transport experiments. / Della Torre A., Pompa P. P., del Mercato L. L., Cingolani R., Rinaldi R., Shiv Shankar S., Sastry M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 6. - P. 2765-2768. ↑

J541. Kadam Ashwini R. Comparison of microcantilever Hg sensing behavior with thermal higher order modes for as-deposited sputtered and thermally evaporated Au films. / Kadam Ashwini R., Nordin Gregory P., George Michael A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 5. - P. 2271-2275. ↑

J542. Ting Jyh-Hua. Dependence of field emission properties of carbon nanotube films on their graphitization. / Ting Jyh-Hua, Li Tsung-Lung, Hong Ying-Chi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 4. - P. 1794-1798. ↑

J543. Bilenberg B. Comparison of high resolution negative electron beam resists. / Bilenberg B., Schш,ler M., Shi P., Schmidt M. S., Bш,ggild P., Fink M., Schuster C., Reuther F., Gruetzner C., Kristensen A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 4. - P. 1776-1779. ↑

J544. Woo Lee Chang. Erratum "Effects of NH 3 pulse plasma on atomic layer deposition of tungsten nitride diffusion barrier [J. Vac. Sci. Technol. B 24, 1432 (2006)]". / Woo Lee Chang, Tae Kim Yong. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 4. - P. 1956. ↑

J545. Chen Sun Zen. Study of nanoimprint pattern transfer on hydrogen silsesquioxane. / Chen Sun Zen, Liu Jen Fu, Chen Henry J. H., Huang Fon Shan. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 4. - P. 1934-1940. ↑

J546. Okada H. Removal of Aerosol by Magnetic Separation. / Okada H., Okuyama H., Uda M., Hirota N. // IEEE Transactions on Applied Superconductivity. - 2006. - Vol. 16, No. 2. - P. 1084-1087. ↑

J547. Qiu Xiaoqing. Nature of the abnormal band gap narrowing in highly crystalline Zn 1-x Co x O nanorods. / Qiu Xiaoqing, Li Liping, Li Guangshe. // Applied Physics Letters. - 2006. - Vol. 88, No. 11. - P. 114103-114103-3. ↑

J548. Jiang H. AlGaN solar-blind Schottky photodiodes fabricated on 4H-SiC. / Jiang H., Egawa T., Ishikawa H. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 12. - P. 1353-1355. ↑

J549. Yuelin Wang. Nanofabrication based on MEMS technology. / Yuelin Wang, Xinxin Li, Tie Li, Heng Yang, Jiwei Jiao. // IEEE Sensors Journal. - 2006. - Vol. 6, No. 3. - P. 686-690. ↑

J550. Zhou W.M. Field-effect transistor based on β-SiC nanowire. / Zhou W.M., Fang F., Hou Z.Y., Yan L.J., Zhang Y.F. // IEEE Electron Device Letters. - 2006. - Vol. 27, No. 6. - P. 463-465. ↑

J551. Liu Kun. Electrical breakthrough effect for end pointing in 90 and 45 nm node circuit edit. / Liu Kun, Soskov Alex, Scipioni Larry, Bassom Neil, Sijbrandij Sybren, Smith Gerald. // Applied Physics Letters. - 2006. - Vol. 88, No. 12. - P. 124104-124104-3. ↑

J552. Li S. Q. In 2 O 3 nanowires grown from Au /In film on glass. / Li S. Q., Liang Y. X., Wang C., Fu X. Q., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 88, No. 16. - P. 163111-163111-3. ↑

J553. Ku Jang-Hae. Effective spin injection in Au film from Permalloy. / Ku Jang-Hae, Chang Joonyeon, Kim Hijung, Eom Jonghwa. // Applied Physics Letters. - 2006. - Vol. 88, No. 17. - P. 172510-172510-3. ↑

J554. Niu Xize. Active microfluidic mixer chip. / Niu Xize, Liu Liyu, Wen Weijia, Sheng Ping. // Applied Physics Letters. - 2006. - Vol. 88, No. 15. - P. 153508-153508-3. ↑

J555. Cho N. K. Comparison of structural and optical properties of InAs quantum dots grown by migration-enhanced molecular-beam epitaxy and conventional molecular-beam epitaxy. / Cho N. K., Ryu S. P., Song J. D., Choi W. J., Lee J. I., Jeon Heonsu. // Applied Physics Letters. - 2006. - Vol. 88, No. 13. - P. 133104-133104-3. ↑

J556. Feng P. Individual beta -Ga 2 O 3 nanowires as solar-blind photodetectors. / Feng P., Zhang J. Y., Li Q. H., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 88, No. 15. - P. 153107-153107-3. ↑

J557. Ming-Dou Ker. Overview on electrostatic discharge protection designs for mixed-voltage I/O interfaces: design concept and circuit implementations. / Ming-Dou Ker, Lin K.-H. // IEEE Transactions on Circuits and Systems I: Regular Papers. - 2006. - Vol. 53, No. 2. - P. 235-246. ↑

J558. Dong-Ming Yeh. Control of the color contrast of a polychromatic light-emitting device with CdSe-ZnS nano-crystals on an InGaN-GaN quantum-well structure. / Dong-Ming Yeh, Chi-Feng Huang, Horng-Shyang Chen, Tsung-Yi Tang, Chih-Feng Lu, Yen-Cheng Lu, Huang J.-J., Yang C.C., I-Shuo Liu, Wei-Fang Su. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 5. - P. 712-714. ↑

J559. {no data available}. Special issue on dynamics & control of micro and nano scale systems. IEEE Transactions on Control Systems Technology. - 2006. - Vol. 14, No. 1. - P. 187. ↑

J560. S. Junique. A Modulating retro-reflector for free-space optical communication. / S. Junique, D. Agren, Qin Wang, S. Almqvist, B. Noharet, J.Y. Andersson. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 1. - P. 85-87. ↑

J561. Guangya Zhou. Helical wave-front laser beam generated with a microelectromechanical systems (MEMS)-based device. / Guangya Zhou, Fook Siong Chau. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 1. - P. 292-294. ↑

J562. Wang K. Nanofluidic channels fabrication and manipulation of DNA molecules. / Wang K., Yue S., Wang L., Jin A., Gu C., Wang P., Wang H., Xu X., Wang Y., Niu H. // IEE Proceedings - Nanobiotechnology. - 2006. - Vol. 153, No. 1. - P. 11-15. ↑

J563. Chang-Ching Tu. Design and fabrication of a photosensing nanodevice structure with CdSe and Au nanoparticles on a silicon chip. / Chang-Ching Tu, Yaw-Kuen Li, Teng-Ming Chen, Chung-Yu Wu. // IEEE Transactions on Nanotechnology. - 2006. - Vol. 5, No. 3. - P. 284-290. ↑

J564. {no data available}. Nano-Net 2006: 1st International Conference on Nano-Networks. Journal of Lightwave Technology. - 2006. - Vol. 24, No. 5. - P. 2264. ↑

J565. Fu Z. Nano-Watt silicon-on-sapphire ADC using 2C-1C capacitor chain. / Fu Z., Weerakoon P., Culurciello E. // Electronics Letters. - 2006. - Vol. 42, No. 6. - P. 341-343. ↑

J566. Yangyang Sun. Study and characterization on the nanocomposite underfill for flip chip applications. / Yangyang Sun, Zhuqing Zhang, Wong C.P. // IEEE Transactions on Components and Packaging Technologies. - 2006. - Vol. 29, No. 1. - P. 190-197. ↑

J567. Mukhopadhyay S. A novel high-performance and robust sense amplifier using independent gate control in sub-50-nm double-gate MOSFET. / Mukhopadhyay S., Mahmoodi H., Roy K. // IEEE Transactions on Very Large Scale Integration (VLSI) Systems. - 2006. - Vol. 14, No. 2. - P. 183-192. ↑

J568. Li S. Q. Nonlinear characteristics of the Fowler-Nordheim plot for field emission from In 2 O 3 nanowires grown on InAs substrate. / Li S. Q., Liang Y. X., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 88, No. 5. - P. 053107-053107-3. ↑

J569. Lee H.-J. Hydrogen-induced ferromagnetism in ZnCoO. / Lee H.-J., Park C. H., Jeong S.-Y., Yee K.-J., Cho C. R., Jung M.-H., Chadi D. J. // Applied Physics Letters. - 2006. - Vol. 88, No. 6. - P. 062504-062504-3. ↑

J570. Wang Xia. Realization of optical periodic quasicrystals using holographic lithography. / Wang Xia, Xu Jun, Lee Jeffrey Chi Wai, Pang Yee Kwong, Tam Wing Yim, Chan C. T., Sheng Ping. // Applied Physics Letters. - 2006. - Vol. 88, No. 5. - P. 051901-051901-3. ↑

J571. Myronov M. Enhancement of hole mobility and carrier density in Ge quantum well of SiGe

heterostructure via implementation of double-side modulation doping. / Myronov M., Sawano K., Shiraki Y. // Applied Physics Letters. - 2006. - Vol. 88, No. 25. - P. 252115-252115-3.

J572. Cheng T. C. Hydrogen plasma dry etching method for field emission application. / Cheng T. C., Shieh J., Huang W. J., Yang M. C., Cheng M. H., Lin H. M., Chang M. N. // Applied Physics Letters. - 2006. - Vol. 88, No. 26. - P. 263118-263118-3.

J573. She J.P.M. Nanotechnology-Enabled Wireless Sensor Networks: From a Device Perspective. / She J.P.M., Yeow J.T.W. // IEEE Sensors Journal. - 2006. - Vol. 6, No. 5. - P. 1331-1339.

J574. Lu C.-F. Junction Temperature-Controlled Spectrum in a Two-Color InGaN–GaN Quantum-Well Light-Emitting Diode. / Lu C.-F., Yeh D.-M., Chen H.-S., Huang C.-F., Huang J.-J., Yang C. C. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 24. - P. 2671-2673.

J575. Chakravarty S. Electrically Injected Quantum-Dot Photonic Crystal Microcavity Light-Emitting Arrays With Air-Bridge Contacts. / Chakravarty S., Bhattacharya P., Mi Z. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 24. - P. 2665-2667.

J576. Way Kuo. Challenges Related to Reliability in Nano Electronics. IEEE Transactions on Reliability. - 2006. - Vol. 55, No. 4. - P. 569-570.

J577. Joon-Young Soh. Experimental and Simulation Study to Identify Current-Confined Path in Cu–Al Space Layer for CPP-GMR Spin-Valve Applications. / Joon-Young Soh, Sang-Pil Kim, Young Keun Kim, Kwang-Ryeol Lee, Yong-Chae Chung, Kawasaki S., Miyake K., Doi M., Sahashi M. // IEEE Transactions on Magnetics. - 2006. - Vol. 42, No. 10. - P. 2633-2635.

J578. Mustafa J. A Novel Reference Scheme for Reading Passive Resistive Crossbar Memories. / Mustafa J., Waser R. // IEEE Transactions on Nanotechnology. - 2006. - Vol. 5, No. 6. - P. 687-691.

J579. Di Spigna N.H. Deterministic nanowire fanout and interconnect without any critical translational alignment. / Di Spigna N.H., Nackashi D.P., Amsinck C.J., Sonkusale S.R., Franzon P.D. // IEEE Transactions on Nanotechnology. - 2006. - Vol. 5, No. 4. - P. 356-361.

J580. Lahtonen K. Instrumentation and analytical methods of an x-ray photoelectron spectroscopy-scanning tunneling microscopy surface analysis system for studying nanostructured materials. / Lahtonen K., Lampimaki M., Jussila P., Hirsimaki M., Valden M. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 8. - P. 083901-083901-9.

J581. Xue X. Y. Electronic transport characteristics through individual Zn Sn O 3 nanowires. / Xue X. Y., Chen Y. J., Li Q. H., Wang C., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 88, No. 18. - P. 182102-182102-3.

J582. Pan A. L. Phonon-assisted stimulated emission from single CdS nanoribbons at room temperature. / Pan A. L., Liu R. B., Zou B. S. // Applied Physics Letters. - 2006. - Vol. 88, No. 17. - P. 173102-173102-3.

J583. Liu Liyu. Electrorheological fluid-actuated flexible platform. / Liu Liyu, Niu Xize, Wen Weijia, Sheng Ping. // Applied Physics Letters. - 2006. - Vol. 88, No. 17. - P. 173505-173505-3.

J584. Liang Y. X. In situ synthesis of In 2 O 3 nanowires with different diameters from indium film. / Liang Y. X., Li S. Q., Nie L., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 88, No. 19. - P. 193119-193119-3.

J585. Wong C.K.Y. A New Approach in Measuring Cu–EMC Adhesion Strength by AFM. / Wong C.K.Y., Hongwei Gu, Bing Xu, Yuen M.M.F. // IEEE Transactions on Components and Packaging Technologies. - 2006. - Vol. 29, No. 3. - P. 543-550.

J586. Lin C.-F. Hydrogen and calcium ion electrochemical detecting systems using microfluidic technology. / Lin C.-F., Wang C.-H., Liao W.-Y., Chou T.-C., Lee G.-B. // IET Micro & Nano Letters. - 2006. - Vol. 1, No. 1. - P. 29-33.

J587. Mureau Natacha. In situ and real time determination of metallic and semiconducting single-walled carbon nanotubes in suspension via dielectrophoresis. / Mureau Natacha, Mendoza Ernest, Silva S. R. P., Hoettges Kai

F., Hughes Michael P. // Applied Physics Letters. - 2006. - Vol. 88, No. 24. - P. 243109-243109-3. ↑

J588. Hsiao Wen-Chu. Secondary emission of strain-induced dopant contrast in the source/drain regions of metal-oxide-semiconductor devices. / Hsiao Wen-Chu, Liu Chuan-Pu, Wang Ying-Lang. // Applied Physics Letters. - 2006. - Vol. 88, No. 21. - P. 212104-212104-3. ↑

J589. Wan Q. Comment on "A transparent metal: Nb-doped anatase Ti O 2 " [Appl. Phys. Lett. 86, 252101 (2005)]. / Wan Q., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 88, No. 22. - P. 226102-226102-1. ↑

J590. Shen Cai. Wetting-induced electrorheological effect. / Shen Cai, Wen Weijia, Yang Shihe, Sheng Ping. // Journal of Applied Physics. - 2006. - Vol. 99, No. 10. - P. 106104-106104-3. ↑

J591. Xue X. Y. Extremely stable field emission from AlZnO nanowire arrays. / Xue X. Y., Li L. M., Yu H. C., Chen Y. J., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 89, No. 4. - P. 043118-043118-3. ↑

J592. Zimmerman Neil M. Electrostatically gated Si devices: Coulomb blockade and barrier capacitance. / Zimmerman Neil M., Fujiwara Akira, Inokawa Hiroshi, Takahashi Yasuo. // Applied Physics Letters. - 2006. - Vol. 89, No. 5. - P. 052102-052102-3. ↑

J593. Lu Hai. High temperature Hall effect sensors based on Al Ga N /Ga N heterojunctions. / Lu Hai, Sandvik Peter, Vertiatchikh Alexei, Tucker Jesse, Elasser Ahmed. // Journal of Applied Physics. - 2006. - Vol. 99, No. 11. - P. 114510-114510-4. ↑

J594. Nam Chunghee. Influence of thermal annealing on the bulk scattering in giant-magnetoresistance spin-valve with nano-oxide layers. / Nam Chunghee, Jang Youngman, Lee Ki-Su, Shim Jungjin, Cho B. K. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 083906-083906-5. ↑

J595. Ghosh B. ac conductivity analysis for a metal core-silver orthosilicate shell nanostructure. / Ghosh B., Chakravorty D., Macdonald J. R., Das G. C. // Journal of Applied Physics. - 2006. - Vol. 99, No. 6. - P. 064307-064307-4. ↑

J596. Liu Y. Al composition dependent properties of quaternary AlInGaN Schottky diodes. / Liu Y., Jiang H., Egawa T., Zhang B., Ishikawa H. // Journal of Applied Physics. - 2006. - Vol. 99, No. 12. - P. 123702-123702-7. ↑

J597. Hou Zhongyu. Application of carbon nanotubes to human breath dynamics characterization. / Hou Zhongyu, Cai Bingchu, Xu Dong. // Applied Physics Letters. - 2006. - Vol. 89, No. 5. - P. 053105-053105-3. ↑

J598. Chen Y. J. Linear ethanol sensing of Sn O 2 nanorods with extremely high sensitivity. / Chen Y. J., Nie L., Xue X. Y., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 88, No. 8. - P. 083105-083105-3. ↑

J599. Kuramochi Hiromi. Self-synchronized voltage pulse application for dynamic force microscope nano-oxidation. / Kuramochi Hiromi, Ando Kazunori, Tokizaki Takashi, Yokoyama Hiroshi. // Applied Physics Letters. - 2006. - Vol. 88, No. 9. - P. 093109-093109-3. ↑

J600. Jose Rajan. White-light-emitting CdSe quantum dots synthesized at room temperature. / Jose Rajan, Zhelev Zhivko, Bakalova Rumiana, Baba Yoshinobu, Ishikawa Mitsuru. // Applied Physics Letters. - 2006. - Vol. 89, No. 1. - P. 013115-013115-3. ↑

J601. Henley S. J. Laser-nanostructured Ag films as substrates for surface-enhanced Raman spectroscopy. / Henley S. J., Carey J. D., Silva S. R. P. // Applied Physics Letters. - 2006. - Vol. 88, No. 8. - P. 081904-081904-3. ↑

J602. Smith R. C. In situ electrode manipulation for three terminal field emission characterization of individual carbon nanotubes. / Smith R. C., Carey J. D., Cox D. C., Silva S. R. P. // Applied Physics Letters. - 2006. - Vol. 89, No. 6. - P. 063111-063111-3. ↑

J603. Ma Rui. Wide band gap photonic structures in dichromate gelatin emulsions. / Ma Rui, Xu Jun, Tam Wing Yim. // Applied Physics Letters. - 2006. - Vol. 89, No. 8. - P. 081116-081116-3. ↑

J604. Wan Q. Structural and magnetic properties of manganese and phosphorus codoped ZnO films on (0001)

sapphire substrates. Applied Physics Letters. - 2006. - Vol. 89, No. 8. - P. 082515-082515-3.

J605. Iovan A. Rectification of current for tunneling through metallic nano-particles. / Iovan A., Korenivski V., Haviland D. B. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08E502-08E502-3.

J606. Tam Wing Yim. Icosahedral quasicrystals by optical interference holography. Applied Physics Letters. - 2006. - Vol. 89, No. 25. - P. 251111-251111-3.

J607. Gu Wenhua. Universal approach to accurate resistivity measurement for a single nanowire: Theory and application. / Gu Wenhua, Choi Hyungsoo, Kim Kyekyoon (Kevin). // Applied Physics Letters. - 2006. - Vol. 89, No. 25. - P. 253102-253102-3.

J608. Kamei Toshihiro. Intrinsic crystalline-to-amorphous transition above 400 °C in plasma-deposited Si thin films. Applied Physics Letters. - 2006. - Vol. 89, No. 26. - P. 262121-262121-3.

J609. Feng P. Highly sensitive ethanol sensors based on {100}-bounded In 2 O 3 nanocrystals due to face contact. / Feng P., Xue X. Y., Liu Y. G., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 89, No. 24. - P. 243514-243514-3.

J610. Hou Zhongyu. Publisher's Note: "Application of carbon nanotubes to human breath dynamics characterization" [Appl. Phys. Lett. 89, 053105 (2006)]. / Hou Zhongyu, Cai Bingchu, Xu Dong. // Applied Physics Letters. - 2006. - Vol. 89, No. 23. - P. 239901-239901-1.

J611. Hao M. Highly efficient GaN-based light emitting diodes with micropits. / Hao M., Egawa T., Ishikawa H. // Applied Physics Letters. - 2006. - Vol. 89, No. 24. - P. 241907-241907-3.

J612. Henley S. J. Silver-nanoparticle-decorated carbon nanoscaffolds: Application as a sensing platform. / Henley S. J., Carey J. D., Silva S. R. P. // Applied Physics Letters. - 2006. - Vol. 89, No. 18. - P. 183120-183120-3.

J613. Nguyen Hoang Yen Thi. Exchange biased spin polarizer with an embedded nano-oxide layer for a substantially lower switching current density. / Nguyen Hoang Yen Thi, Yi Hyunjung, Joo Sung-Jung, Shin Kyung-Ho, Lee Kyung-Jin, Dieny Bernard. // Applied Physics Letters. - 2006. - Vol. 89, No. 9. - P. 094103-094103-3.

J614. Na Kyoung-Won. Microfluxgate sensor with amorphous cobalt (Co-Nb-Zr) soft magnetic core for electronic compass. / Na Kyoung-Won, Yuan Jingli, Ji Joon-Ho, Choi Sang-On. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08M306-08M306-3.

J615. Takano Fumiyoshi. Characterization of room temperature ferromagnetic Mn-Si compound synthesized on SiC substrate. / Takano Fumiyoshi, Akinaga Hiro, Ofuchi Hironori, Kuroda Shinji, Takita Koki. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08J506-08J506-3.

J616. Ku J. Electrical spin injection and accumulation in ferromagnetic/Au/ferromagnetic lateral spin valves. / Ku J., Chang J., Han S., Ha J., Eom J. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08H705-08H705-3.

J617. Miyasaka Jin. Fe 3 O 4+delta films prepared by "one-liquid" spin spray ferrite plating for gigahertz-range noise suppressors. / Miyasaka Jin, Tada Masaru, Abe Masanori, Matsushita Nobuhiro. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08M916-08M916-3.

J618. Ye J. T. Optical characterizations of iodine molecular wires formed inside the one-dimensional channels of an AlPO 4 -5 single crystal. / Ye J. T., Tang Z. K., Siu G. G. // Applied Physics Letters. - 2006. - Vol. 88, No. 7. - P. 073114-073114-3.

J619. Kamiyama S. Extremely high quantum efficiency of donor-acceptor-pair emission in N-and-B-doped 6H-Si C. / Kamiyama S., Maeda T., Nakamura Y., Iwaya M., Amano H., Akasaki I., Kinoshita H., Furusho T., Yoshimoto M., Kimoto T., Suda J., Henry A., Ivanov I. G., Bergman J. P., Monemar B., Onuma T., Chichibu S. F. // Journal of Applied Physics. - 2006. - Vol. 99, No. 9. - P. 093108-093108-4.

J620. Lyons E. S. Effect of nano-patterning on anisotropy of Cu /Ni /Cu nanolines. / Lyons E. S., OHandley Robert C., Ross C. A. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08R105-08R105-3.

J621. Prasher Ravi. Transverse thermal conductivity of porous materials made from aligned nano- and microcylindrical pores. Journal of Applied Physics. - 2006. - Vol. 100, No. 6. - P. 064302-064302-7. ↑

J622. Selvaraj S. Lawrence. Enhancement of drain current density by inserting 3 nm Al layer in the gate of Al Ga N /Ga N high-electron-mobility transistors on 4 in. silicon. / Selvaraj S. Lawrence, Egawa Takashi. // Applied Physics Letters. - 2006. - Vol. 89, No. 19. - P. 193508-193508-3. ↑

J623. Wan Q. Comment on "Low resistivity p-Zn O films fabricated by sol-gel spin coating" [Appl. Phys. Lett. 88, 251116 (2006)]. Applied Physics Letters. - 2006. - Vol. 89, No. 17. - P. 176103-176103-1. ↑

J624. Xue X. Y. Electrical transport through individual nanowires with transverse grain boundaries. / Xue X. Y., Feng P., Wang C., Chen Y. J., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 89, No. 2. - P. 022115-022115-3. ↑

J625. Bhattacharyya Somnath. Semiconducting phase of amorphous carbon-nickel composite films. / Bhattacharyya Somnath, Henley S. J., Lock D., Blanchard N. P., Silva S. R. P. // Applied Physics Letters. - 2006. - Vol. 89, No. 2. - P. 022113-022113-3. ↑

J626. Miller Anthony J. Interpenetrating multiwall carbon nanotube electrodes for organic solar cells. / Miller Anthony J., Hatton Ross A., Silva S. Ravi P. // Applied Physics Letters. - 2006. - Vol. 89, No. 13. - P. 133117-133117-3. ↑

J627. Miller Anthony J. Water-soluble multiwall-carbon-nanotube-polythiophene composite for bilayer photovoltaics. / Miller Anthony J., Hatton Ross A., Silva S. Ravi P. // Applied Physics Letters. - 2006. - Vol. 89, No. 12. - P. 123115-123115-3. ↑

J628. Sawano K. Magnetotransport properties of Ge channels with extremely high compressive strain. / Sawano K., Kunishi Y., Shiraki Y., Toyama K., Okamoto T., Usami N., Nakagawa K. // Applied Physics Letters. - 2006. - Vol. 89, No. 16. - P. 162103-162103-3. ↑

J629. Bellouard Yves. Thermal conductivity contrast measurement of fused silica exposed to low-energy femtosecond laser pulses. / Bellouard Yves, Dugan Mark, Said Ali A., Bado Philippe. // Applied Physics Letters. - 2006. - Vol. 89, No. 16. - P. 161911-161911-3. ↑

J630. Fang Baizeng. Lithium doping of pentacene for electrochemical hydrogen storage. / Fang Baizeng, Zhou Haoshen, Honma Itaru. // Applied Physics Letters. - 2006. - Vol. 89, No. 2. - P. 023102-023102-3. ↑

J631. Park Jong-Hyun. Realization of a high capacitance density in Bi 2 Mg 2/3 Nb 4/3 O 7 pyrochlore thin films deposited directly on polymer substrates for embedded capacitor applications. / Park Jong-Hyun, Xian Cheng-Ji, Seong Nak-Jin, Yoon Soon-Gil, Son Seung-Hyun, Chung Hyung-Mi, Moon Jin-Suck, Jin Hyun-Joo, Lee Seung-Eun, Lee Jeong-Won, Kang Hyung-Dong, Chung Yeoul-Kyo, Oh Yong-Soo. // Applied Physics Letters. - 2006. - Vol. 89, No. 23. - P. 232910-232910-3. ↑

J632. Imura M. Microstructure of epitaxial lateral overgrown AlN on trench-patterned AlN template by high-temperature metal-organic vapor phase epitaxy. / Imura M., Nakano K., Kitano T., Fujimoto N., Narita G., Okada N., Balakrishnan K., Iwaya M., Kamiyama S., Amano H., Akasaki I., Shimono K., Noro T., Takagi T., Bandoh A. // Applied Physics Letters. - 2006. - Vol. 89, No. 22. - P. 221901-221901-2. ↑

J633. Liu Liyu. Electrorheological fluid-actuated microfluidic pump. / Liu Liyu, Chen Xiaoqing, Niu Xize, Wen Weijia, Sheng Ping. // Applied Physics Letters. - 2006. - Vol. 89, No. 8. - P. 083505-083505-3. ↑

J634. Chen Jinghao. Effects of N 2, O 2, and Ar plasma treatments on the removal of crystallized HfO 2 film. / Chen Jinghao, Yoo Won Jong, Chan Daniel S. H. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2006. - Vol. 24, No. 1. - P. 133-140. ↑

J635. Cha Young-Kwan. Effect of hydrogenation on the memory properties of Si nanocrystals obtained by inductively coupled plasma chemical vapor deposition. / Cha Young-Kwan, Park Sangjin, Park Youngsoo, Yoo In-Kyeong, Cha Daigil, Shin Jung H., Choi Suk-Ho. // Applied Physics Letters. - 2006. - Vol. 89, No. 20. - P. 202112-202112-3. ↑

J636. Xia J. S. Strong resonant luminescence from Ge quantum dots in photonic crystal microcavity at room temperature. / Xia J. S., Ikegami Y., Shiraki Y., Usami N., Nakata Y. // Applied Physics Letters. - 2006. - Vol. 89,

No. 20. - P. 201102-201102-3.

J637. Hou Zhongyu. Ionization gas sensing in a microelectrode system with carbon nanotubes. / Hou Zhongyu, Xu Dong, Cai Bingchu. // Applied Physics Letters. - 2006. - Vol. 89, No. 21. - P. 213502-213502-3.

J638. Ahn Suho. Continuous ultraviolet roll nanoimprinting process for replicating large-scale nano- and micropatterns. / Ahn Suho, Cha Joowon, Myung Ho, Kim Seok-min, Kang Shinill. // Applied Physics Letters. - 2006. - Vol. 89, No. 21. - P. 213101-213101-3.

J639. Auciello Orlando. Science and technology of thin films and interfacial layers in ferroelectric and high-dielectric constant heterostructures and application to devices. Journal of Applied Physics. - 2006. - Vol. 100, No. 5. - P. 051614-051614-15.

J640. Liang Fang. One-step solution fabrication of magnetic chains consisting of jingle-bell-shaped cobalt mesospheres. / Liang Fang, Guo Lin, Zhong QunPeng, Wen Xiaogang, Yang Shihe, Zheng Wangzhi, Chen Chinping, Zhang Nina, Chu Weiguo. // Applied Physics Letters. - 2006. - Vol. 89, No. 10. - P. 103105-103105-3.

J641. Watts Paul C. P. Polymer supported carbon nanotube arrays for field emission and sensor devices. / Watts Paul C. P., Lyth Stephen M., Mendoza Ernest, Silva S. Ravi P. // Applied Physics Letters. - 2006. - Vol. 89, No. 10. - P. 103113-103113-3.

J642. Prasher Ravi. Thermal conductivity of composites of aligned nanoscale and microscale wires and pores. Journal of Applied Physics. - 2006. - Vol. 100, No. 3. - P. 034307-034307-9.

J643. Sohn Jaecheon. Electromagnetic noise suppression characteristics of a coplanar waveguide transmission line integrated with a magnetic thin film. / Sohn Jaecheon, Han S. H., Yamaguchi Masahiro, Lim S. H. // Journal of Applied Physics. - 2006. - Vol. 100, No. 12. - P. 124510-124510-6.

J644. Zong Zong. Nano- and microscale adhesion energy measurement for Au-Au contacts in microswitch structures. / Zong Zong, Cao Yifang, Rahbar Nima, Soboyejo Wole. // Journal of Applied Physics. - 2006. - Vol. 100, No. 10. - P. 104313-104313-10.

J645. Sohn Jaecheon. Tunable electromagnetic noise suppressor integrated with a magnetic thin film. / Sohn Jaecheon, Han S. H., Yamaguchi M., Lim S. H. // Applied Physics Letters. - 2006. - Vol. 89, No. 10. - P. 103501-103501-3.

J646. Feng P. Achieving fast oxygen response in individual beta -Ga 2 O 3 nanowires by ultraviolet illumination. / Feng P., Xue X. Y., Liu Y. G., Wan Q., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 89, No. 11. - P. 112114-112114-3.

J647. Pokatilov E. P. Electron mobility enhancement in Al N /Ga N /Al N heterostructures with InGaN nanogrooves. / Pokatilov E. P., Nika D. L., Balandin A. A. // Applied Physics Letters. - 2006. - Vol. 89, No. 11. - P. 112110-112110-3.

J648. Wan Q. Vertically aligned tin-doped indium oxide nanowire arrays: Epitaxial growth and electron field emission properties. / Wan Q., Feng P., Wang T. H. // Applied Physics Letters. - 2006. - Vol. 89, No. 12. - P. 123102-123102-3.

J649. Kim Seong-Hoon. Spin transport in polycrystalline Sb films. / Kim Seong-Hoon, Eom Jonghwa, Chang Joonyeon, Han Suk-Hee. // Applied Physics Letters. - 2006. - Vol. 89, No. 12. - P. 122116-122116-3.

J650. Harton S. E. Secondary ion mass spectrometry depth profiling of amorphous polymer multilayers using O 2 + and Cs + ion bombardment with a magnetic sector instrument. / Harton S. E., Stevie F. A., Ade H. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2006. - Vol. 24, No. 2. - P. 362-368.

J651. Lee Jam-Wem. Punchthrough effects on the electrostatic discharge robustness of ultrathin silicon films on insulator devices. / Lee Jam-Wem, Tang Howard. // Applied Physics Letters. - 2006. - Vol. 89, No. 10. - P. 103508-103508-3.

J652. Morecroft D. Study of the size dependence of exchange bias using in situ magnetoresistance measurements. / Morecroft D., Prieto J. L., Blamire M. G. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10.

- P. 10C518-10C518-3.

J653. Eminente S. Understanding quasi-ballistic transport in nano-MOSFETs: part II-Technology scaling along the ITRS. / Eminente S., Esseni D., Palestri P., Fiegna C., Selmi L., Sangiorgi E. // IEEE Transactions on Electron Devices. - 2005. - Vol. 52, No. 12. - P. 2736-2743. ↑

J654. Nam Chunghee. Enhancement of magnetoresistance with low interlayer coupling by insertion of a nano-oxide layer into a free magnetic layer. / Nam Chunghee, Lee Ki-Su, Cho B. K. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 10C510-10C510-3. ↑

J655. Karabacak Tansel. Stress reduction in sputter deposited films using nanostructured compliant layers by high working-gas pressures. / Karabacak Tansel, Senkevich Jay. J., Wang Gwo-Ching, Lu Toh-Ming. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 4. - P. 986-990. ↑

J656. Hwang Wan Sik. Investigation of etching properties of metal nitride/high-k gate stacks using inductively coupled plasma. / Hwang Wan Sik, Chen Jinghao, Yoo Won Jong, Bliznetsov Vladimir. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 4. - P. 964-970. ↑

J657. Tanaka K. Simulation of transmission characteristics of nanometric bend circuits with open-type surface-plasmon gap waveguides. / Tanaka K., Tanaka M., Sugiyama T. // Journal of Lightwave Technology. - 2005. - Vol. 23, No. 11. - P. 3857-3863. ↑

J658. Kim K. H. Design of a bidirectional actuator for a nanopositioning system with a permanent magnet and an electromagnet. / Kim K. H., Gweon D. G. // Review of Scientific Instruments. - 2005. - Vol. 76, No. 12. - P. 125105-125105-8. ↑

J659. Nguyen T. H. Y. Reduction in critical current of current-induced switching in exchange-biased spin valves. / Nguyen T. H. Y., Yi H. J., Joo S. J., Lee J. H., Shin K. H., Kim T. W. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 10C712-10C712-3. ↑

J660. Li S. Q. Electric-field-aligned vertical growth and field emission properties of In 2 O 3 nanowires. / Li S. Q., Liang Y. X., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 87, No. 14. - P. 143104-143104-3. ↑

J661. Anderson Mark S. Surface enhanced infrared absorption by coupling phonon and plasmon resonance. Applied Physics Letters. - 2005. - Vol. 87, No. 14. - P. 144102-144102-3. ↑

J662. Sawano K. Compressive strain dependence of hole mobility in strained Ge channels. / Sawano K., Abe Y., Satoh H., Shiraki Y., Nakagawa K. // Applied Physics Letters. - 2005. - Vol. 87, No. 19. - P. 192102-192102-3. ↑

J663. Kim Sungwook. Self-assembled monolayer cleaning methods: Towards fabrication of clean high-temperature superconductor nanostructures. / Kim Sungwook, Chang In Soon, McDevitt John T. // Applied Physics Letters. - 2005. - Vol. 86, No. 15. - P. 154104-154104-3. ↑

J664. Smith R. C. Electron field emission from a single carbon nanotube: Effects of anode location. / Smith R. C., Cox D. C., Silva S. R. P. // Applied Physics Letters. - 2005. - Vol. 87, No. 10. - P. 103112-103112-3. ↑

J665. Liu Liyu. Parallel-field electrorheological clutch: Enhanced high shear rate performance. / Liu Liyu, Huang Xixiang, Shen Cai, Liu Zhengyou, Shi Jing, Wen Weijia, Sheng Ping. // Applied Physics Letters. - 2005. - Vol. 87, No. 10. - P. 104106-104106-3. ↑

J666. Kim Tae-Ho. Enhanced electroluminescence and color purity in conjugated polymer with nano-porous morphology. / Kim Tae-Ho, Im Sang Hyuk, Park O Ok. // Applied Physics Letters. - 2005. - Vol. 87, No. 22. - P. 221114-221114-3. ↑

J667. Sawant Prashant D. Line and two-dimensional fractal analysis of micrographs obtained by atomic force microscopy of surface-immobilized oligonucleotide nano-aggregates. / Sawant Prashant D., Nicolau Dan V. // Applied Physics Letters. - 2005. - Vol. 87, No. 22. - P. 223117-223117-3. ↑

J668. Chen Y. J. Synthesis and ethanol sensing characteristics of single crystalline SnO 2 nanorods. / Chen Y. J., Xue X. Y., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 87, No. 23. - P. 233503-233503-3. ↑

J669. Chang M. N. Approach to nonphotoperturbed differential capacitance measurements: A front-wing cantilever. / Chang M. N., Chen C. Y., Huang W. J., Cheng T. C. // Applied Physics Letters. - 2005. - Vol. 87, No. 2. - P. 023102-023102-3.

J670. Ying M. J. Interface engineering for lattice-matched epitaxy of ZnO on (La ,Sr)(Al ,Ta)O 3 (111) substrate. / Ying M. J., Du X. L., Liu Y. Z., Zhou Z. T., Zeng Z. Q., Mei Z. X., Jia J. F., Chen H., Xue Q. K., Zhang Z. // Applied Physics Letters. - 2005. - Vol. 87, No. 20. - P. 202107-202107-3.

J671. Feng P. Contact-controlled sensing properties of flowerlike ZnO nanostructures. / Feng P., Wan Q., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 87, No. 21. - P. 213111-213111-3.

J672. Gao T. CdS nanobelts as photoconductors. / Gao T., Li Q. H., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 86, No. 17. - P. 173105-173105-3.

J673. Yu Choongho. Integration of metal oxide nanobelts with microsystems for nerve agent detection. / Yu Choongho, Hao Qing, Saha Sanjoy, Shi Li, Kong Xiangyang, Wang Z. L. // Applied Physics Letters. - 2005. - Vol. 86, No. 6. - P. 063101-063101-3.

J674. Li Q. H. Abnormal temperature dependence of conductance of single Cd-doped ZnO nanowires. / Li Q. H., Wan Q., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 86, No. 26. - P. 263101-263101-3.

J675. Fang Baizeng. Electrochemical lithium doping of a pentacene molecule semiconductor. / Fang Baizeng, Zhou Haoshen, Honma Itaru. // Applied Physics Letters. - 2005. - Vol. 86, No. 26. - P. 261909-261909-3.

J676. Bai Ming. Instability of 0.4 nm carbon nanotubes in a zeolite template under ultraviolet laser irradiation. / Bai Ming, Li Irene L., Tang Z. K., Xiao Xudong. // Applied Physics Letters. - 2005. - Vol. 86, No. 9. - P. 093108-093108-3.

J677. Jung Suyong. Organic field-effect transistors with single and double pentacene layers. / Jung Suyong, Yao Zhen. // Applied Physics Letters. - 2005. - Vol. 86, No. 8. - P. 083505-083505-3.

J678. Zhang Baijun. Thin-film InGaN multiple-quantum-well light-emitting diodes transferred from Si (111) substrate onto copper carrier by selective lift-off. / Zhang Baijun, Egawa Takashi, Ishikawa Hiroyasu, Liu Yang, Jimbo Takashi. // Applied Physics Letters. - 2005. - Vol. 86, No. 7. - P. 071113-071113-3.

J679. Chen Liang-Yih. Visible electroluminescence from silicon nanocrystals embedded in amorphous silicon nitride matrix. / Chen Liang-Yih, Chen Wen-Hua, Hong Franklin Chau-Nan. // Applied Physics Letters. - 2005. - Vol. 86, No. 19. - P. 193506-193506-3.

J680. Li Q. H. Optoelectronic characteristics of single CdS nanobelts. / Li Q. H., Gao T., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 86, No. 19. - P. 193109-193109-3.

J681. Sun Z. G. Enhanced coercive field of cobalt film deposited on noodle-like porous silicon substrates. / Sun Z. G., Akinaga H. // Applied Physics Letters. - 2005. - Vol. 86, No. 18. - P. 181904-181904-3.

J682. Xue X. Y. Synthesis and ethanol sensing properties of ZnSnO 3 nanowires. / Xue X. Y., Chen Y. J., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 86, No. 23. - P. 233101-233101-3.

J683. Liu Y. Demonstration of undoped quaternary Al In Ga N /Ga N heterostructure field-effect transistor on sapphire substrate. / Liu Y., Jiang H., Arulkumaran S., Egawa T., Zhang B., Ishikawa H. // Applied Physics Letters. - 2005. - Vol. 86, No. 22. - P. 223510-223510-3.

J684. Zribi Anis. C O 2 detection using carbon nanotube networks and micromachined resonant transducers. / Zribi Anis, Knobloch Aaron, Rao Rashmi. // Applied Physics Letters. - 2005. - Vol. 86, No. 20. - P. 203112-203112-3.

J685. Prasher Ravi S. Thermal transport due to transverse phonons in nano and micro particulate media. Journal of Applied Physics. - 2005. - Vol. 97, No. 6. - P. 064313-064313-8.

J686. Manago T. Perpendicular magnetic properties of CoCr films on GaAs. / Manago T., Kuramochi H., Akinaga H. // Journal of Applied Physics. - 2005. - Vol. 97, No. 2. - P. 023907-023907-4.

J687. Wolfman J. Low resistance AL 2 O 3 magnetic tunnel junctions optimized through in situ conductance measurements. / Wolfman J., Mauri D., Lin T., Yang J., Chen T. // Journal of Applied Physics. - 2005. - Vol. 97, No. 12. - P. 123713-123713-7. ↑

J688. Li Q. H. Adsorption and desorption of oxygen probed from ZnO nanowire films by photocurrent measurements. / Li Q. H., Gao T., Wang Y. G., Wang T. H. // Applied Physics Letters. - 2005. - Vol. 86, No. 12. - P. 123117-123117-3. ↑

J689. Wang T. Fabrication and optical investigation of a high-density GaN nanowire array. / Wang T., Ranalli F., Parbrook P. J., Airey R., Bai J., Rattlidge R., Hill G. // Applied Physics Letters. - 2005. - Vol. 86, No. 10. - P. 103103-103103-3. ↑

J690. Kim Jin-Hyock. Film growth model of atomic layer deposition for multicomponent thin films. / Kim Jin-Hyock, Kim Ja-Yong, Kang Sang-Won. // Journal of Applied Physics. - 2005. - Vol. 97, No. 9. - P. 093505-093505-5. ↑

J691. Abe Masanori. Magneto-optical enhancement by surface plasmon resonance in magnetic "nano-onions" with multicore-shell structures. / Abe Masanori, Takeshi Suwa. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 10M514-10M514-2. ↑

J692. Kim W. Y. Enhanced Hall voltage in a gate-controlled InSb Hall device. / Kim W. Y., Chang Joonyeon, Han S. H., Lee W. Y., Chang S. G. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 10D507-10D507-3. ↑

J693. Yi Hyunjung. Spin transport in an InAs based two-dimensional electron gas nanochannel. / Yi Hyunjung, Koo H. C., Kim W. Y., Chang Joonyeon, Han S. H., Lim S. H. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 10D502-10D502-3. ↑

J694. Soderberg Hans. Nanostructure formation during deposition of TiN /SiN x nanomultilayer films by reactive dual magnetron sputtering. / Soderberg Hans, Oden Magnus, Molina-Aldareguia Jon M., Hultman Lars. // Journal of Applied Physics. - 2005. - Vol. 97, No. 11. - P. 114327-114327-8. ↑

J695. Poa C. H. P. Growth and field emission properties of vertically aligned carbon nanofibers. / Poa C. H. P., Henley S. J., Chen G. Y., Adikaari A. A. D. T., Giusca C. E., Silva S. R. P. // Journal of Applied Physics. - 2005. - Vol. 97, No. 11. - P. 114308-114308-6. ↑

J696. Adikaari A. A. D. T. Thickness dependence of properties of excimer laser crystallized nano-polycrystalline silicon. / Adikaari A. A. D. T., Silva S. R. P. // Journal of Applied Physics. - 2005. - Vol. 97, No. 11. - P. 114305-114305-7. ↑

J697. Arulkumaran S. Enhancement of breakdown voltage by AlN buffer layer thickness in Al Ga N /Ga N high-electron-mobility transistors on 4 in. diameter silicon. / Arulkumaran S., Egawa T., Matsui S., Ishikawa H. // Applied Physics Letters. - 2005. - Vol. 86, No. 12. - P. 123503-123503-3. ↑

J698. Feng P. Anomalous electrorheological behavior of ZnO nanowires. / Feng P., Wan Q., Fu X. Q., Wang T. H., Tian Y. // Applied Physics Letters. - 2005. - Vol. 87, No. 3. - P. 033114-033114-3. ↑

J699. Lee Young Jong. Probing a molecular interface in a functioning organic diode. / Lee Young Jong, Park So-Jung, Gesquiere Andre J., Barbara Paul F. // Applied Physics Letters. - 2005. - Vol. 87, No. 5. - P. 051906-051906-3. ↑

J700. Chen W.-Y. Enhanced light emission from InAs quantum dots in single-defect photonic crystal microcavities at room temperature. / Chen W.-Y., Chang W.-H., Chang H.-S., Hsu T. M., Lee Chien-Chieh, Chen Chii-Chang, Luan P. G., Chang J.-Y., Hsieh T.-P., Chyi J.-I. // Applied Physics Letters. - 2005. - Vol. 87, No. 7. - P. 071111-071111-3. ↑

J701. Jiang H. Reduction of threading dislocations in AlGaN layers grown on AlN /sapphire templates using high-temperature GaN interlayer. / Jiang H., Egawa T., Hao M., Liu Y. // Applied Physics Letters. - 2005. - Vol. 87, No. 24. - P. 241911-241911-3. ↑

J702. Chen G. Y. Deployment of titanium thermal barrier for low-temperature carbon nanotube growth. / Chen G. Y., Poa C. H. P., Henley S. J., Stolojan V., Silva S. R. P., Haq Sajad. // Applied Physics Letters. - 2005. - Vol.

87, No. 25. - P. 253115-253115-3.

J703. Cox D. C. Study of the current stressing in nanomanipulated three-dimensional carbon nanotube structures. / Cox D. C., Forrest R. D., Smith P. R., Stolojan V., Silva S. R. P. // Applied Physics Letters. - 2005. - Vol. 87, No. 3. - P. 033102-033102-3.

J704. Wang Y. G. In situ growth of nanowire on the tip of a carbon nanotube under strong electric field. / Wang Y. G., Li Q. H., Wang T. H., Lin X. W., Dravid V. P., Zhou S. X. // Applied Physics Letters. - 2005. - Vol. 86, No. 13. - P. 133103-133103-3.

J705. Chang W.-H. Electroreflectance studies of InAs quantum dots with In x Ga 1-x As capping layer grown by metalorganic chemical vapor deposition. / Chang W.-H., Chen Hsiang-Yu, Chang H.-S., Chen W.-Y., Hsu T. M., Hsieh T.-P., Chyi J.-I., Yeh N.-T. // Applied Physics Letters. - 2005. - Vol. 86, No. 13. - P. 131917-131917-3.

J706. Qian Linmao. Erratum: "Anomalous relationship between hardness and wear properties of a superelastic nickel-titanium alloy" [Appl. Phys. Lett. 84, 1076 (2004)]. / Qian Linmao, Xiao Xudong, Sun Qingping, Yu Tongxi. // Applied Physics Letters. - 2005. - Vol. 86, No. 12. - P. 129901-129901-1.

J707. Xu Jianwen. Low-loss percolative dielectric composite. / Xu Jianwen, Wong C. P. // Applied Physics Letters. - 2005. - Vol. 87, No. 8. - P. 082907-082907-3.

J708. Wan Q. Enhanced photocatalytic activity of ZnO nanotetrapods. / Wan Q., Wang T. H., Zhao J. C. // Applied Physics Letters. - 2005. - Vol. 87, No. 8. - P. 083105-083105-3.

J709. Lee Fuk Kay. Erratum: "Continuous liquid crystal pretilt control through textured substrates" [Appl. Phys. Lett. 85, 5556 (2004)]. / Lee Fuk Kay, Zhang Baoshe, Sheng Ping, Kwok Hoi Sing, Tsui Ophelia K. C. // Applied Physics Letters. - 2005. - Vol. 86, No. 14. - P. 149903-149903-1.

J710. Palestri P. Understanding quasi-ballistic transport in nano-MOSFETs: part I-scattering in the channel and in the drain. / Palestri P., Esseni D., Eminente S., Fiegna C., Sangiorgi E., Selmi L. // IEEE Transactions on Electron Devices. - 2005. - Vol. 52, No. 12. - P. 2727-2735.

J711. Krikke J. T-Engine: Japan's ubiquitous computing architecture is ready for prime time. IEEE Pervasive Computing. - 2005. - Vol. 4, No. 2. - P. 4-9.

J712. Poa C. H. P. Influence of mechanical stress on electron field emission of multiwalled carbon nanotube-polymer composites. / Poa C. H. P., Smith R. C., Silva S. R. P., Sun C. Q. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 2. - P. 698-701.

J713. Seassal C. InP bonded membrane photonics components and circuits: toward 2.5 dimensional micro-nano-photonics. / Seassal C., Monat C., Mouette J., Touraille E., Bakir B.B., Hattori H.T., Leclercq J.-L., Letartre X., Rojo-Romeo P., Viktorovitch P. // IEEE Journal of Selected Topics in Quantum Electronics. - 2005. - Vol. 11, No. 2. - P. 395-407.

J714. Thompson Keith. Millisecond microwave annealing: Driving microelectronics nano. / Thompson Keith, Booske J. H., Ives R. L., Lohr J., Gorelov Yurii, Kajiwara Ken. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 3. - P. 970-978.

J715. Kang Jong Hyuk. Characterization of nano-size YVO 4 :Eu and (Y ,Gd)VO 4 :Eu phosphors by low voltage cathodo- and photoluminescence. / Kang Jong Hyuk, Nazarov Michael, Im Won Bin, Kim Jin Young, Jeon Duk Young. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 2. - P. 843-848.

J716. Yiang K. Y. Effect of electric field on chemical bonds of carbon-doped silicon oxide as evidenced by in situ Fourier transform infrared spectroscopy. / Yiang K. Y., Yoo W. J., Krishnamoorthy Ahila. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 2. - P. 433-436.

J717. Hsieh Tung-Po. Selective growth of InAs quantum dots on patterned GaAs. / Hsieh Tung-Po, Chiu Pei-Chin, Liu Yu-Chuan, Yeh Nien-Tze, Ho Wen-Jeng, Chyi Jen-Inn. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 1. - P. 262-266.

J718. Ma Dongjoon. Low temperature crystallization of high permittivity Ta oxide using an Nb oxide thin film for metal/insulator/metal capacitors in dynamic random access memory applications. / Ma Dongjoon, Park Sungho, Seo Bum-Seok, Choi SangJun, Lee Naesung, Lee Jung-Hyun. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 1. - P. 80-83. ↑

J719. Kometani Reo. Performance of nanomanipulator fabricated on glass capillary by focused-ion-beam chemical vapor deposition. / Kometani Reo, Hoshino Takayuki, Kondo Kazushige, Kanda Kazuhiro, Haruyama Yuichi, Kaito Takashi, Fujita Jun-ichi, Ishida Masahiko, Ochiai Yukinori, Matsui Shinji. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 1. - P. 298-301. ↑

J720. Ishikawa Yasushi. Reduction of plasma-induced damage in SiO 2 films during pulse-time-modulated plasma irradiation. / Ishikawa Yasushi, Okigawa Mitsuru, Samukawa Seiji, Yamasaki Satoshi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 2. - P. 389-394. ↑

J721. Yi Hyunjung. Fabrication of a nanosized current-driven spin valve device using proximity correction in electron-beam lithography. / Yi Hyunjung, Nguyen T. H. Y., Chang Joonyeon, Shin K. H. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 2. - P. 339-343. ↑

J722. Xu K. Fundamental study of the removal mechanisms of nano-sized particles using brush scrubber cleaning. / Xu K., Vos R., Vereecke G., Doumen G., Fyen W., Mertens P. W., Heyns M. M., Vinckier C., Fransaer J., Kovacs F. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 5. - P. 2160-2175. ↑

J723. Lee Woo-Sung. Effect of film thickness on the ferroelectric properties of Pb (Zr 0.2 Ti 0.8)O 3 thin films for nano-data storage applications. / Lee Woo-Sung, Ahn Kyoung-Chan, Yoon Soon-Gil, Kim Chang Soo. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 5. - P. 1901-1904. ↑

J724. Lee Heon. Erratum: "Effect of imprinting pressure on residual layer thickness in UV nano-imprint lithography" [J. Vac. Sci. Technol. B 23, 1102 (2005)]. Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 5. - P. 2176. ↑

J725. Watanabe Genta. Magnetoresistance of patterned NiFe thin films with structures modified by atomic force microscope nanolithography. / Watanabe Genta, Koizumi Sinichi, Yamada Tsutomu, Takemura Yasushi, Shirakashi Jun-ichi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2390-2393. ↑

J726. Samanta S. K. Self-assembled tungsten nanocrystals in high-k dielectric for nonvolatile memory application. / Samanta S. K., Tan Zerlinda Y. L., Yoo Won Jong, Samudra Ganesh, Lee Sungjoo, Bera L. K., Balasubramanian N. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2278-2283. ↑

J727. Vanamu G. Growth of high quality Ge /Si 1-x Ge x on nano-scale patterned Si structures. / Vanamu G., Datye A. K., Zaidi Saleem H. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1622-1629. ↑

J728. Arnold M. D. Multi-axis retarder arrays by masked oblique deposition. / Arnold M. D., Hodgkinson I. J., Wu Q. H., Blaikie R. J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1398-1404. ↑

J729. Meneou K. Site-controlled InAs quantum dots on GaAs patterned using self-organized nano-channel alumina template. / Meneou K., Tsai C. L., Zhang Z. H., Cheng K. Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 3. - P. 1232-1235. ↑

J730. Wang S. Z. Thermal excitation effects of photoluminescence of annealed Ga In N As /Ga As quantum-well laser structures grown by plasma-assisted molecular-beam epitaxy. / Wang S. Z., Yoon S. F., Fan W. J., Liu C. Y., Yuan S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1434-1440. ↑

J731. Miyoshi Makoto. Structural characterization of strained AlGaN layers in different Al content Al Ga N /Ga N heterostructures and its effect on two-dimensional electron transport properties. / Miyoshi Makoto, Egawa

Takashi, Ishikawa Hiroyasu. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1527-1531.

J732. Yiang K. Y. Impact of buried capping layer on electrical stability of advanced interconnects. / Yiang K. Y., Yoo W. J., Krishnamoorthy Ahila. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1499-1503.

J733. Perentos A. Polymer long-period raised rib waveguide gratings using nano-imprint lithography. / Perentos A., Kostovski G., Mitchell A. // IEEE Photonics Technology Letters. - 2005. - Vol. 17, No. 12. - P. 2595-2597.

J734. Wong S.T.C. Emerging biomedical technologies at the micro and nano levels. / Wong S.T.C., Jie Chen. // IEEE Signal Processing Magazine. - 2005. - Vol. 22, No. 4. - P. 91-94.

J735. Fridman G. Nonthermal plasma bio-active liquid micro and nano-xerography. / Fridman G., Mengyan Li, Lelkes P.I., Friedman G., Fridman A., Gutsol A.F. // IEEE Transactions on Plasma Science. - 2005. - Vol. 33, No. 3. - P. 1061-1065.

J736. Bin Wang. Embedded slanted grating for vertical coupling between fibers and silicon-on-insulator planar waveguides. / Bin Wang, Jianhua Jiang, G.P. Nordin. // IEEE Photonics Technology Letters. - 2005. - Vol. 17, No. 9. - P. 1884-1886.

J737. Kung-Hsuan Lin. Optical piezoelectric transducer for nano-ultrasonics. / Kung-Hsuan Lin, Gia-Wei Chern, Cheng-Ta Yu, Tzu-Ming Liu, Chang-Chi Pan, Guan-Ting Chen, Jen-Inn Chyi, Sheng-Wen Huang, Pai-Chi Li, Chi-Kuang Sun. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2005. - Vol. 52, No. 8. - P. 1404-1414.

J738. {no data available}. Special issue on dynamics & control of micro and nano scale systems. IEEE Transactions on Control Systems Technology. - 2005. - Vol. 13, No. 5. - P. 851.

J739. Matsumoto K. Jc enhancement in YBa2 Cu3 Ox thin films by introduction of one-dimensional artificial pinning centers. / Matsumoto K., Horide T., Mele P., Ichinose A., Horii S., Yoshida Y., Mukaida M., Osamura K. // IEEE Transactions on Applied Superconductivity. - 2005. - Vol. 15, No. 2. - P. 3774-3777.

J740. Eunjeong Lee. An integrated micro HTS system for energy storage and attitude control for three-axis stabilized nanosatellites. / Eunjeong Lee, Bongsu Kim, Junseok Ko, Chi Young Song, Seong-Jin Kim, Sangkwon Jeong, Lee S.S. // IEEE Transactions on Applied Superconductivity. - 2005. - Vol. 15, No. 2. - P. 2324-2327.

J741. Paulson L.D. Researchers work on transistor successor. Computer. - 2005. - Vol. 38, No. 5. - P. 17.

J742. Chun-Chih Wang. Study of the heterogeneous nucleation of 211-particle by the addition of CeO2 precursor with different sizes. / Chun-Chih Wang, Shih-Yun Chen, Po-An Lai, In-Gann Chen, Maw-Kuen Wu. // IEEE Transactions on Applied Superconductivity. - 2005. - Vol. 15, No. 2. - P. 3118-3121.

J743. Jae-Woong Ko. Fabrication of fine and homogeneous MgB2 nano powders by spray pyrolysis. / Jae-Woong Ko, Jaimoo Yoo, Young-Kuk Kim, Kook-Chae Chung, Hyungsik Chung, Sang-Im Yoo. // IEEE Transactions on Applied Superconductivity. - 2005. - Vol. 15, No. 2. - P. 3349-3351.

J744. Song K.J. The effect of nano-powder additions on the superconducting properties of MgB2. / Song K.J., Kim S.W., Park C., Chung J.K., Yang J.S., Joo J.H., Ko R.K., Ha H.S., Kim H.S., Ha D.W., Oh S.S., Lee E.Y., Kwon Y.K., Rim G.H. // IEEE Transactions on Applied Superconductivity. - 2005. - Vol. 15, No. 2. - P. 3288-3291.

J745. Xiaojun Guo. Investigation on the current nonuniformity in current-mode TFT active-matrix display pixel circuitry. / Xiaojun Guo, Silva S.R.P. // IEEE Transactions on Electron Devices. - 2005. - Vol. 52, No. 11. - P. 2379-2385.

J746. Becker K.-F. Duromer MID technology for system-in-package generation. / Becker K.-F., Braun T., Neumann A., Ostmann A., Koch M., Bader V., Aschenbrenner R., Reichl H., Erik Jung. // IEEE Transactions on Electronics Packaging Manufacturing. - 2005. - Vol. 28, No. 4. - P. 291-296.

J747. Cannillo F. Nano-power subthreshold current-mode logic in sub-100 nm technologies. / Cannillo F.,

Toumazou C. // Electronics Letters. - 2005. - Vol. 41, No. 23. - P. 1268-1269.

J748. Benkart P. 3D chip stack technology using through-chip interconnects. / Benkart P., Kaiser A., Munding A., Bschorr M., Pfleiderer H.-J., Kohn E., Heittmann A., Huebner H., Ramacher U. // IEEE Design & Test of Computers. - 2005. - Vol. 22, No. 6. - P. 512-518.

J749. Zhang Y.-H. Fast switching bistable electromagnetic microactuator. / Zhang Y.-H., Ding G.-F., Dai X.-H., Cai B.-C. // Electronics Letters. - 2005. - Vol. 41, No. 23. - P. 1276-1278.

J750. {no data available}. Special issue on dynamics & control of micro and nano scale systems. IEEE Transactions on Control Systems Technology. - 2005. - Vol. 13, No. 6. - P. 1125.

J751. Chih-Huang Lai. Co-existence of biquadratic and unidirectional anisotropy in IrMn/CoFe/FeOx /CoFe films. / Chih-Huang Lai, Chih-Ta Shen, Po Hsiang Huang, Lin H.J., Chen C.T. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 2703-2705.

J752. Sukegawa H. Magnetic transport mechanism in double ferromagnetic tunnel junctions with two-dimensional ferromagnetic particles. / Sukegawa H., Hirohata A., Nakamura S., Tezuka N., Sugimoto S., Inomata K. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 2679-2681.

J753. Prasad N.K. Preparation of cellulose-based biocompatible suspension of nano-sized γ-Alx Fe2-x O3. / Prasad N.K., Panda D., Singh S., Bahadur D. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 4099-4101.

J754. Sebastian A. Design methodologies for robust nano-positioning. / Sebastian A., Salapaka S.M. // IEEE Transactions on Control Systems Technology. - 2005. - Vol. 13, No. 6. - P. 868-876.

J755. Morshuis P.H.F. Degradation of solid dielectrics due to internal partial discharge: some thoughts on progress made and where to go now. IEEE Transactions on Dielectrics and Electrical Insulation. - 2005. - Vol. 12, No. 5. - P. 905-913.

J756. A. Afonso. Dynamic bandpass filtering using a programmable Interferometer array. / A. Afonso, J.Ld.B. de la Tocnaye, N. Wolffer, Y. Defosse, P. Gautier. // IEEE Photonics Technology Letters. - 2005. - Vol. 17, No. 5. - P. 1079-1081.

J757. Pal B. N. Electrically aligned binary system of nanoparticles. / Pal B. N., Basu S., Chakravorty D. // Journal of Applied Physics. - 2005. - Vol. 98, No. 8. - P. 084306-084306-5.

J758. Oh Tae Sik. Field-emission characteristics of carbon nanotube paste layers. / Oh Tae Sik, Yoo Ji Beom, Park Chong Yun, Lee Seong Eui, Lee Jeong Hee, Kim Jong Min. // Journal of Applied Physics. - 2005. - Vol. 98, No. 8. - P. 084313-084313-9.

J759. Wang Jian Jim. Filling high aspect-ratio nano-structures by atomic layer deposition and its applications in nano-optic devices and integrations. / Wang Jian Jim, Deng Xuegong, Varghese Ron, Nikolov Anguel, Sciortino Paul, Liu Feng, Chen Lei, Liu Xiaoming. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 3209-3213.

J760. Chang W.-H. Optical emission from individual InGaAs quantum dots in single-defect photonic crystal nanocavity. / Chang W.-H., Chen W.-Y., Chang H.-S., Hsu T. M., Hsieh T.-P., Chyi J.-I. // Journal of Applied Physics. - 2005. - Vol. 98, No. 3. - P. 034306-034306-4.

J761. Miyoshi Makoto. Nanostructural characterization and two-dimensional electron-gas properties in high-mobility Al Ga N /Al N /Ga N heterostructures grown on epitaxial AlN/sapphire templates. / Miyoshi Makoto, Egawa Takashi, Ishikawa Hiroyasu, Asai Kei-Ichiro, Shibata Tomohiko, Tanaka Mitsuhiro, Oda Osamu. // Journal of Applied Physics. - 2005. - Vol. 98, No. 6. - P. 063713-063713-5.

J762. Bose Anindita. Electrical properties of compacted assembly of copper oxide nanoparticles. / Bose Anindita, Basu Soumen, Banerjee Sourish, Chakravorty Dipankar. // Journal of Applied Physics. - 2005. - Vol. 98, No. 7. - P. 074307-074307-5.

J763. Pearson J. L. Towards nano-fluidics by solvent deformation of electron beam resist. / Pearson J. L., Cumming D. R. S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. -

2005. - Vol. 23, No. 6. - P. 2793-2797.

J764. Lin C. H. Simulation of air bubble scattering effects in 193 nm immersion interferometric lithography. / Lin C. H., Wang L. A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2684-2693.

J765. Srituravanich W. Deep subwavelength nanolithography using localized surface plasmon modes on planar silver mask. / Srituravanich W., Durant S., Lee H., Sun C., Zhang X. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2636-2639.

J766. Wang Jian Jim. Monolithically integrated circular polarizers with two-layer nano-gratings fabricated by imprint lithography. / Wang Jian Jim, Liu Feng, Deng Xuegong, Liu Xiaoming, Chen Lei, Sciortino Paul, Varghese Ron. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 3164-3167.

J767. Tirumala Vijay R. Direct-write e-beam patterning of stimuli-responsive hydrogel nanostructures. / Tirumala Vijay R., Divan Ralu, Ocola Leonidas E., Mancini Derrick C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 3124-3128.

J768. Tormen Massimo. Fabrication of three-dimensional stamps for embossing techniques by lithographically controlled isotropic wet etching. / Tormen Massimo, Carpentiero Alessandro, Vaccari Lisa, Altissimo Matteo, Ferrari Enrico, Cojoc Dan, Di Fabrizio Enzo. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2920-2924.

J769. Low Tony. Valence band structure of ultrathin silicon and germanium channels in metal-oxide-semiconductor field-effect transistors. / Low Tony, Li M. F., Yeo Y. C., Fan W. J., Ng S. T., Kwong D. L. // Journal of Applied Physics. - 2005. - Vol. 98, No. 2. - P. 024504-024504-8.

J770. Wang J.J. Wafer-based nanostructure manufacturing for integrated nanooptic devices. / Wang J.J., Lei Chen, Tai S., Xuegong Deng, Sciortino P.F., Jiandong Deng, Feng Liu. // Journal of Lightwave Technology. - 2005. - Vol. 23, No. 2. - P. 474-485.

J771. Hsieh G.-W. Bond-and-transfer scanning probe array for high-density data storage. / Hsieh G.-W., Ching-Hsiang Tsai, We-Chih Lin, Chao-Chiun Liang, Yu-Wen Lee. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 2. - P. 989-991.

J772. {no data available}. 5th IEEE Conference on Nanotechnology (IEEE-NANO 2005). Journal of Lightwave Technology. - 2005. - Vol. 23, No. 1. - P. 461.

J773. Guangya Zhou. An open-loop nano-positioning micromechanical digital-to-analog converter for grating light modulation. / Guangya Zhou, L. VJ, Fook Siong Chau. // IEEE Photonics Technology Letters. - 2005. - Vol. 17, No. 5. - P. 1010-1012.

J774. Hung-Wen Huang. Improvement of InGaN-GaN light-emitting diode performance with a nano-roughened p-GaN surface. / Hung-Wen Huang, C.C. Kao, J.T. Chu, H.C. Kuo, S.C. Wang, C.C. Yu. // IEEE Photonics Technology Letters. - 2005. - Vol. 17, No. 5. - P. 983-985.

J775. Shakespeare W.J. MEMS integrated submount alignment for optoelectronics. / Shakespeare W.J., Pearson R.A., Grenestedt J.L., Hutapea P., Gupta V. // Journal of Lightwave Technology. - 2005. - Vol. 23, No. 2. - P. 504-509.

J776. Lee Szetsen. Diagnostics of hydrogen plasma with in situ optical emission and silicon probes. / Lee Szetsen, Chung Yi-Jie. // Journal of Applied Physics. - 2005. - Vol. 98, No. 10. - P. 103304-103304-8.

J777. Wiese N. Switching of submicron-sized, antiferromagnetically coupled Co Fe B /Ru /Co Fe B trilayers. / Wiese N., Dimopoulos T., Ruhrig M., Wecker J., Reiss G. // Journal of Applied Physics. - 2005. - Vol. 98, No. 10. - P. 103904-103904-5.

J778. Yang C. L. Thermally activated carrier transfer processes in In Ga N /Ga N multi-quantum-well light-emitting devices. / Yang C. L., Ding L., Wang J. N., Fung K. K., Ge W. K., Liang H., Yu L. S., Qi Y. D., Wang D. L., Lu Z. D., Lau K. M. // Journal of Applied Physics. - 2005. - Vol. 98, No. 2. - P. 023703-023703-5.

J779. Chen Hong-Ying. Oxidation behavior of titanium nitride films. / Chen Hong-Ying, Lu Fu-Hsing. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 4. - P. 1006-1009. ↑

J780. Ishikawa Yasushi. Prediction of ultraviolet-induced damage during plasma processes in dielectric films using on-wafer monitoring techniques. / Ishikawa Yasushi, Katoh Yuji, Okigawa Mitsuru, Samukawa Seiji. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 6. - P. 1509-1512. ↑

J781. Wang Sea-Fue. Dielectric properties and microstructure of nano-MgO dispersed Ba 0.3 Sr 0.7 Ti O 3 thin films prepared by sputter deposition. / Wang Sea-Fue, Chu Jinn P., Lin Chen Chun, Mahalingam T. // Journal of Applied Physics. - 2005. - Vol. 98, No. 1. - P. 014107-014107-5. ↑

J782. Cunningham M. IEE Proceedings Science, Measurement & Technology-editorial. / Cunningham M., Fouracre T. // IEE Proceedings - Science, Measurement and Technology. - 2004. - Vol. 151, No. 1. - P. 1. ↑

J783. Fukuzawa H. MR ratio enhancement by NOL current-confined-path structures in CPP spin valves. / Fukuzawa H., Yuasa H., Hashimoto S., Koi K., Iwasaki H., Takagishi M., Tanaka Y., Sahashi M. // IEEE Transactions on Magnetics. - 2004. - Vol. 40, No. 4. - P. 2236-2238. ↑

J784. Fung C.K.M. Dielectrophoretic batch fabrication of bundled carbon nanotube thermal sensors. / Fung C.K.M., Wong V.T.S., Chan R.H.M., Li W.J. // IEEE Transactions on Nanotechnology. - 2004. - Vol. 3, No. 3. - P. 395-403. ↑

J785. Yeonsang Park. Double-Layer antireflection coating design for semi-infinite one-dimensional photonic Crystals. / Yeonsang Park, Jeon H. // Journal of Lightwave Technology. - 2004. - Vol. 22, No. 8. - P. 1987-1989. ↑

J786. Goto A. Development of an optical pumping nuclear spin polarizer. / Goto A., Shimizu T., Hashi K., Ohki S., Iijima T., Kido G. // IEEE Transactions on Applied Superconductivity. - 2004. - Vol. 14, No. 2. - P. 1635-1638. ↑

J787. Gee-Kung Chang. Chip-to-chip optoelectronics SOP on organic boards or packages. / Gee-Kung Chang, Guidotti D., Fuhan Liu, Yin-Jung Chang, Zhaoran Huang, Sundaram V., Balaraman D., Hegde S., Tummala R.R. // IEEE Transactions on Advanced Packaging. - 2004. - Vol. 27, No. 2. - P. 386-397. ↑

J788. Truszkowski W. NASA's swarm missions: the challenge of building autonomous software. / Truszkowski W., Hinchey M., Rash J., Rouff C. // IT Professional. - 2004. - Vol. 6, No. 5. - P. 47-52. ↑

J789. Strobl C.J. Nano- and pico-dispensing of fluids on planar substrates using SAW. / Strobl C.J., von Guttenberg Z., Wixforth A. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2004. - Vol. 51, No. 11. - P. 1432-1436. ↑

J790. Hanemann T. From micro to nano: properties and potential applications of micro- and nano-filled polymer ceramic composites in microsystem technology. / Hanemann T., Boehm J., Henzi P., Honnef K., Litfin K., Ritzhaupt-Kleissl E., Hausselt J. // IEE Proceedings - Nanobiotechnology. - 2004. - Vol. 151, No. 4. - P. 167-172. ↑

J791. {no data available}. 5th IEEE Conference on Nanotechnology (IEEE-NANO 2005). Journal of Lightwave Technology. - 2004. - Vol. 22, No. 11. - P. 2707. ↑

J792. Seunghyun Kim. High efficiency 90° silica waveguide bend using an air hole photonic crystal region. / Seunghyun Kim, G.P. Nordin, Jianhua Jiang, Jingbo Cai. // IEEE Photonics Technology Letters. - 2004. - Vol. 16, No. 8. - P. 1846-1848. ↑

J793. Stuchlik M. Micro-nano actuators driven by polarised light. / Stuchlik M., Krecmer P., Elliott S.R. // IEE Proceedings - Science, Measurement and Technology. - 2004. - Vol. 151, No. 2. - P. 131-136. ↑

J794. Shu-Fen Hu. A dual-gate-controlled single-electron transistor using self-aligned polysilicon sidewall spacer gates on silicon-on-insulator nanowire. / Shu-Fen Hu, Yung-Chun Wu, Chin-Lung Sung, Chun-Yen Chang, Tiao-Yuan Huang. // IEEE Transactions on Nanotechnology. - 2004. - Vol. 3, No. 1. - P. 93-97. ↑

J795. Set S.Y. Laser mode locking using a saturable absorber incorporating carbon nanotubes. / Set S.Y.,

Yaguchi H., Tanaka Y., Jablonski M. // Journal of Lightwave Technology. - 2004. - Vol. 22, No. 1. - P. 51-56.

J796. Kun-Ming Chen. Characterization and modeling of SOI varactors at various temperatures. / Kun-Ming Chen, Guo-Wei Huang, Sheng-Chun Wang, Wen-Kuan Yeh, Yean-Kuen Fang, Fu-Liang Yang. // IEEE Transactions on Electron Devices. - 2004. - Vol. 51, No. 3. - P. 427-433.

J797. Moore M. Nanoelectromechanics in engineering and biology (nano-and microscience, engineering, technology, and medicine series)-Book Review. IEEE Engineering in Medicine and Biology Magazine. - 2004. - Vol. 23, No. 1. - P. 203-204.

J798. Osiander R. Microelectromechanical devices for satellite thermal control. / Osiander R., Firebaugh S.L., Champion J.L., Farrar D., Darrin M.A.G. // IEEE Sensors Journal. - 2004. - Vol. 4, No. 4. - P. 525-531.

J799. Duchang Heo. Study on InGaAsP-InGaAs MQW-LD with symmetric and asymmetric separate confinement heterostructure. / Duchang Heo, Il Ki Han, Jung Il Lee, Jichai Jeong. // IEEE Photonics Technology Letters. - 2004. - Vol. 16, No. 8. - P. 1801-1803.

J800. Pak Kin Wong. Electrokinetics in micro devices for biotechnology applications. / Pak Kin Wong, Tza-Huei Wang, J.H. Deval, Chih-Ming Ho. // IEEE/ASME Transactions on Mechatronics. - 2004. - Vol. 9, No. 2. - P. 366-376.

J801. Yi Zhao. Double sampling data checking technique: an online testing solution for multisource noise-induced errors on on-chip interconnects and buses. / Yi Zhao, Dey S., Li Chen. // IEEE Transactions on Very Large Scale Integration (VLSI) Systems. - 2004. - Vol. 12, No. 7. - P. 746-755.

J802. Jang Wan Young. Electrical characterization of individual carbon nanotubes grown in nanoporous anodic alumina templates. / Jang Wan Young, Kulkarni N. N., Shih C. K., Yao Zhen. // Applied Physics Letters. - 2004. - Vol. 84, No. 7. - P. 1177-1179.

J803. Qian Linmao. Anomalous relationship between hardness and wear properties of a superelastic nickel-titanium alloy. / Qian Linmao, Xiao Xudong, Sun Qingping, Yu Tongxi. // Applied Physics Letters. - 2004. - Vol. 84, No. 7. - P. 1076-1078.

J804. Zheng R. K. Cr 2 O 3 surface layer and exchange bias in an acicular CrO 2 particle. / Zheng R. K., Liu Hui, Wang Y., Zhang X. X. // Applied Physics Letters. - 2004. - Vol. 84, No. 5. - P. 702-704.

J805. Bhattacharyya Somnath. Phonon confinement in oxide-coated silicon nanowires. / Bhattacharyya Somnath, Samui Saumyadip. // Applied Physics Letters. - 2004. - Vol. 84, No. 9. - P. 1564-1566.

J806. Rastei M. V. Electrochemical growth of Co nanodots on patterned Si substrates. / Rastei M. V., Meckenstock R., Bucher J. P., Devaux E., Ebbesen Th. // Applied Physics Letters. - 2004. - Vol. 85, No. 11. - P. 2050-2052.

J807. Lee C. S. Multifunctional transducer using poly (vinylidene fluoride) active layer and highly conducting poly (3,4-ethylenedioxythiophene) electrode: Actuator and generator. / Lee C. S., Joo J., Han S., Koh S. K. // Applied Physics Letters. - 2004. - Vol. 85, No. 10. - P. 1841-1843.

J808. Miyoshi M. High-electron-mobility Al Ga N /Al N /Ga N heterostructures grown on 100-mm -diam epitaxial AlN/sapphire templates by metalorganic vapor phase epitaxy. / Miyoshi M., Ishikawa H., Egawa T., Asai K., Mouri M., Shibata T., Tanaka M., Oda O. // Applied Physics Letters. - 2004. - Vol. 85, No. 10. - P. 1710-1712.

J809. Kuramochi Hiromi. In situ detection of faradaic current in probe oxidation using a dynamic force microscope. / Kuramochi Hiromi, Ando Kazunori, Tokizaki Takashi, Yokoyama Hiroshi. // Applied Physics Letters. - 2004. - Vol. 84, No. 20. - P. 4005-4007.

J810. Liu H. J. Carbon nanotubes-zeolite complex: A Li-intercalated compound with high storage capacity. / Liu H. J., Li Z. M., Liang Q., Tang Z. K., Chan C. T. // Applied Physics Letters. - 2004. - Vol. 84, No. 14. - P. 2649-2651.

J811. Shi Li. Thermal conductivities of individual tin dioxide nanobelts. / Shi Li, Hao Qing, Yu Choongho, Mingo Natalio, Kong Xiangyang, Wang Z. L. // Applied Physics Letters. - 2004. - Vol. 84, No. 14. - P. 2638-2640.

J812. Hao M. Formation chemistry of high-density nanocraters on the surface of sapphire substrates with an in situ etching and growth mechanism of device-quality GaN films on the etched substrates. / Hao M., Ishikawa H., Egawa T. // Applied Physics Letters. - 2004. - Vol. 84, No. 20. - P. 4041-4043. ↑

J813. Arulkumaran S. Surface passivation effects on AlGaN/GaN high-electron-mobility transistors with SiO 2, Si 3 N 4, and silicon oxynitride. / Arulkumaran S., Egawa T., Ishikawa H., Jimbo T., Sano Y. // Applied Physics Letters. - 2004. - Vol. 84, No. 4. - P. 613-615. ↑

J814. Oh-e Masahito. Structure of the glycerol liquid/vapor interface studied by sum-frequency vibrational spectroscopy. / Oh-e Masahito, Yokoyama Hiroshi, Baldelli Steven. // Applied Physics Letters. - 2004. - Vol. 84, No. 24. - P. 4965-4967. ↑

J815. Chang M. N. The influence of the annealing sequence on p+ /n junctions observed by scanning capacitance microscopy. / Chang M. N., Chen C. Y., Wan W. W., Liang J. H. // Applied Physics Letters. - 2004. - Vol. 84, No. 23. - P. 4705-4707. ↑

J816. Zheng R. K. Exchange bias and the origin of magnetism in Mn-doped ZnO tetrapods. / Zheng R. K., Liu H., Zhang X. X., Roy V. A. L., Djurisic A. B. // Applied Physics Letters. - 2004. - Vol. 85, No. 13. - P. 2589-2591. ↑

J817. Kim S. J. Directional growth by low electric-field-controlled crystallization of bulk amorphous lithium tetraborate. / Kim S. J., Kim J. E., Yang Y. S. // Applied Physics Letters. - 2004. - Vol. 85, No. 24. - P. 5956-5958. ↑

J818. Arulkumaran S. Current collapse-free i-GaN /AlGaN /GaN high-electron-mobility transistors with and without surface passivation. / Arulkumaran S., Hibino T., Egawa T., Ishikawa H. // Applied Physics Letters. - 2004. - Vol. 85, No. 23. - P. 5745-5747. ↑

J819. Sun Z. G. Magnetic-field-controllable avalanche breakdown and giant magnetoresistive effects in Gold/semi-insulating-GaAs Schottky diode. / Sun Z. G., Mizuguchi M., Manago T., Akinaga H. // Applied Physics Letters. - 2004. - Vol. 85, No. 23. - P. 5643-5645. ↑

J820. Liu Y. Near-ideal Schottky contact on quaternary AlInGaN epilayer lattice-matched with GaN. / Liu Y., Egawa T., Jiang H., Zhang B., Ishikawa H., Hao M. // Applied Physics Letters. - 2004. - Vol. 85, No. 24. - P. 6030-6032. ↑

J821. Li Z. M. Synthesis of 4 E single-walled carbon nanotubes in catalytic Si-substituted Al P O 4 -5 molecular sieves. / Li Z. M., Zhai J. P., Liu H. J., Li I. L., Chan C. T., Sheng Ping, Tang Z. K. // Applied Physics Letters. - 2004. - Vol. 85, No. 7. - P. 1253-1255. ↑

J822. Khondaker Saiful I. Electron transport through single phenylene-ethynylene molecular junctions at low temperature. / Khondaker Saiful I., Yao Zhen, Cheng Long, Henderson Jay C., Yao Yuxing, Tour James M. // Applied Physics Letters. - 2004. - Vol. 85, No. 4. - P. 645-647. ↑

J823. Henley S. J. Room temperature photoluminescence from nanostructured amorphous carbon. / Henley S. J., Carey J. D., Silva S. R. P. // Applied Physics Letters. - 2004. - Vol. 85, No. 25. - P. 6236-6238. ↑

J824. Hu Shu-Fen. Proximity effect of electron beam lithography for single-electron transistor fabrication. / Hu Shu-Fen, Sung Chin-Lung, Huang Kuo-Dong, Wan Yue-Min. // Applied Physics Letters. - 2004. - Vol. 85, No. 17. - P. 3893-3895. ↑

J825. Felmet Kimberly. Patterning conductive copper by nanotransfer printing. / Felmet Kimberly, Loo Yueh-Lin, Sun Yangming. // Applied Physics Letters. - 2004. - Vol. 85, No. 15. - P. 3316-3318. ↑

J826. Salem M. A. Probing electron charging in nanocrystalline Si dots using Kelvin probe force microscopy. / Salem M. A., Mizuta H., Oda S. // Applied Physics Letters. - 2004. - Vol. 85, No. 15. - P. 3262-3264. ↑

J827. Wen Weijia. Particle size scaling of the giant electrorheological effect. / Wen Weijia, Huang Xianxiang, Sheng Ping. // Applied Physics Letters. - 2004. - Vol. 85, No. 2. - P. 299-301. ↑

J828. Chen Liang-Yih. Hydrogen-doped high conductivity ZnO films deposited by radio-frequency magnetron sputtering. / Chen Liang-Yih, Chen Wen-Hwa, Wang Jia-Jun, Hong Franklin Chau-Nan, Su Yan-Kuin. // Applied ↑

Physics Letters. - 2004. - Vol. 85, No. 23. - P. 5628-5630.

J829. Lee Fuk Kay. Continuous liquid crystal pretilt control through textured substrates. / Lee Fuk Kay, Zhang Baoshe, Sheng Ping, Kwok Hoi Sing, Tsui Ophelia K. C. // Applied Physics Letters. - 2004. - Vol. 85, No. 23. - P. 5556-5558. ↑

J830. Liu Weili. Temperature dependence of thermal conductivity of Al x Ga 1-x N thin films measured by the differential 3omega technique. / Liu Weili, Balandin Alexander A. // Applied Physics Letters. - 2004. - Vol. 85, No. 22. - P. 5230-5232. ↑

J831. Lugstein A. Advanced nanoscale material processing with focused ion beams. / Lugstein A., Basnar B., Smoliner J., Bertagnolli E., Weil M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 2995-2999. ↑

J832. van den Boogaart M. A. F. Deep-ultraviolet-microelectromechanical systems stencils for high-throughput resistless patterning of mesoscopic structures. / van den Boogaart M. A. F., Kim G. M., Pellens R., van den Heuvel J.-P., Brugger J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 3174-3177. ↑

J833. Liu Zhuming. High-speed and high-precision deflectors applied in electron beam lithography system based on scanning electron microscopy. / Liu Zhuming, Gu Wenqi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 3557-3559. ↑

J834. Reinhard D. K. Fabrication and properties of ultranano, nano, and microcrystalline diamond membranes and sheets. / Reinhard D. K., Grotjohn T. A., Becker M., Yaran M. K., Schuelke T., Asmussen J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 2811-2817. ↑

J835. Gu Ning. Controllable fabrication of fiber nano-tips by dynamic chemical etching based on siphon principle. / Gu Ning, Li Chang-an, Sun Long, Liu Zhan-hui, Sun Yong-kang, Xu Li-na. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 5. - P. 2283-2285. ↑

J836. Yang Guan-Jun. Effects of annealing treatment on microstructure and photocatalytic performance of nanostructured TiO 2 coatings through flame spraying with liquid feedstocks. / Yang Guan-Jun, Li Chang-Jiu, Han Feng, Huang Xin-Chun. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 5. - P. 2364-2368. ↑

J837. Bysakh S. Mechanisms of nano-hole drilling due to nano-probe intense electron beam irradiation on a stainless steel. / Bysakh S., Shimojo M., Mitsuishi K., Furuya K. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 2620-2627. ↑

J838. Malueg Daniel H. Modeling, fabrication, and experimental application of clear x-ray phase masks. / Malueg Daniel H., Taylor James W., Thielman Don, Leonard Quinn, Dhuey Scott, Cerrina Franco. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 3575-3580. ↑

J839. Cho B. Low-temperature field emission system for development of ultracoherent electron beams. / Cho B., Ogawa T., Ichimura T., Ichinokawa T., Amakusa T., Oshima C. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 10. - P. 3091-3096. ↑

J840. Park Young Min. Electrical and optical characterizations of self-assembled quantum dots formed by the atomic layer epitaxy technique. / Park Young Min, Park Young Ju, Kim Kwang Moo, Shin Jae Cheol, Song Jin Dong, Lee Jung Il, Yoo Keon-Ho. // Journal of Applied Physics. - 2004. - Vol. 95, No. 1. - P. 123-127. ↑

J841. Xie Ping. Dynamical control of light propagation in nonlinear photonic crystals by applied electric fields. / Xie Ping, Zhang Zhao-Qing. // Journal of Applied Physics. - 2004. - Vol. 95, No. 4. - P. 1630-1633. ↑

J842. Orii T. Target system for fabrication and control of magnetic metal content in diluted magnetic semiconductors by pulsed-laser deposition. / Orii T., Seto T., Hirasawa M. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 5. - P. 2096-2100. ↑

J843. Kang DongKyun. Improvement of detected intensity in confocal microscopy by using reflecting optical

system. / Kang DongKyun, Seo JungWoo, Gweon DaeGab. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 2. - P. 550-552. ↑

J844. Momota Sadao. First operation of ECR ion source at Kochi University of Technology. / Momota Sadao, Nojiri Yoichi, Saihara Miwako, Sakamoto Asako, Hamagawa Hisayoshi, Hamaguchi Kensuke. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 5. - P. 1497-1498. ↑

J845. Knechten K. Two-photon absorption laser induced fluorescence on O and O 3 in a dc plasma for oxidation of aluminum. / Knechten K., Kniknie B. J., Engeln R., Swagten H. J. M., Koopmans B., van de Sanden M. C. M., de Jonge W. J. M. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 6. - P. L11-L14. ↑

J846. Fonoberov Vladimir A. Optical properties of wurtzite and zinc-blende GaN/AlN quantum dots. / Fonoberov Vladimir A., Balandin Alexander A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 4. - P. 2190-2194. ↑

J847. Kang Eu-Seok. Nondestructive dopant profile measurement and its quantitative analysis using the nanocapacitance-voltage method. / Kang Eu-Seok, Hwang Ho-Jung, Lee Gyoo-Yeong. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 1. - P. 432-438. ↑

J848. Chen Jem-Kun. Fabrication of curved structures with electron-beam and surface structure characterization. / Chen Jem-Kun, Ko Fu-Hsiang, Chen Hsuan-Ko, Chou Cheng-Tung, Chen Hsuen-Li, Chang Feng-Chih. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 2. - P. 492-500. ↑

J849. Shimojo M. Electron induced nanodeposition of tungsten using field emission scanning and transmission electron microscopes. / Shimojo M., Mitsuishi K., Tameike A., Furuya K. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 2. - P. 742-746. ↑

J850. Alvarez D. High-resolution scanning spreading resistance microscopy of surrounding-gate transistors. / Alvarez D., Schomann S., Goebel B., Manger D., Schlosser T., Slesazeck S., Hartwich J., Kretz J., Eyben P., Fouchier M., Vandervorst W. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 1. - P. 377-380. ↑

J851. Hu S. F. Formation mechanism and Coulomb blockade effect in self-assembled gold quantum dots. / Hu S. F., Yeh R. L., Liu R. S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 1. - P. 60-64. ↑

J852. Pan F. M. Selective growth of carbon nanotube on scanning probe tips by microwave plasma chemical vapor deposition. / Pan F. M., Liu Y. B., Chang Y., Chen C. Y., Tsai T. G., Chang M. N., Sheu J. T. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 1. - P. 90-93. ↑

J853. Moon D. W. Development of multiple As delta layer Si reference thin film for shallow junction secondary ion mass spectrometry profiling. / Moon D. W., Lee H. I., Kim H. K., Kim K. J., Shon H. K., Won J. Y., Lee J. C., Toujou F. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 1. - P. 323-326. ↑

J854. Pey K. L. Stability and composition of Ni-germanosilicided Si 1-x Ge x films. / Pey K. L., Chattopadhyay S., Choi W. K., Miron Y., Fitzgerald E. A., Antoniadis D. A., Osipowicz T. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 2. - P. 852-858. ↑

J855. Pau S. Nonorthogonal wafer dicing for waveguide, microelectromechanical systems, and nanotechnology applications. / Pau S., Taylor J. A., Pai C. S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 4. - P. L15-L16. ↑

J856. Charbonnier F. M. Emission characteristics of NbC/Nb field emitters. / Charbonnier F. M., Southall L. A., Mackie W. A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 4. - P. 1643-1652. ↑

J857. Dong Y. Generation of nano-sized free standing single crystal silicon particles. / Dong Y., Bapat A., Hilchie S., Kortshagen U., Campbell S. A. // Journal of Vacuum Science & Technology B: Microelectronics and

Nanometer Structures. - 2004. - Vol. 22, No. 4. - P. 1923-1930.

J858. Ngoc Minh Phan. Microelectron field emitter array with focus lenses for multielectron beam lithography based on silicon on insulator wafer. / Ngoc Minh Phan, Ono Takahito, Sato Nobuyuki, Mimura Hidenori, Esashi Masayoshi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 3. - P. 1273-1276.

J859. Deng Yunfei. Characterization of material contrast and effective wavelength effects in immersion inspection. / Deng Yunfei, Neureuther Andrew R. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 3. - P. 1006-1011.

J860. Pan F. M. Alkylation of nanoporous silica thin films by high density plasma chemical vapor deposition of a-SiC:H. / Pan F. M., Wu B. W., Cho A. T., Tsai K. C., Tsai T. G., Chao K. J., Chen J. Y., Chang L. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 3. - P. 1067-1074.

J861. Murakami Katsuhisa. Characteristics of nano electron source fabricated using beam assisted process. / Murakami Katsuhisa, Takai Mikio. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 3. - P. 1266-1268.

J862. Zhang Chun. Frictional properties of alkanethiol self-assembled monolayers with different thermal annealing. / Zhang Chun, Liang Qi, Wang Bing, Xiao Xudong. // Journal of Applied Physics. - 2004. - Vol. 95, No. 7. - P. 3411-3416.

J863. Zhang Baijun. Thermal stability of InGaN multiple-quantum-well light-emitting diodes on an AlN/sapphire template. / Zhang Baijun, Egawa Takashi, Ishikawa Hiroyasu, Liu Yang, Jimbo Takashi. // Journal of Applied Physics. - 2004. - Vol. 95, No. 6. - P. 3170-3174.

J864. Song J. D. Influence of arsenic during indium deposition on the formation of the wetting layers of InAs quantum dots grown by migration enhanced epitaxy. / Song J. D., Park Y. M., Shin J. C., Lim J. G., Park Y. J., Choi W. J., Han I. K., Lee J. I., Kim H. S., Park C. G. // Journal of Applied Physics. - 2004. - Vol. 96, No. 8. - P. 4122-4125.

J865. Li Chang-Jiu. Effect of nano-crystallization of high velocity oxy-fuel-sprayed amorphous NiCrBSi alloy on properties of the coatings. / Li Chang-Jiu, Wang Yu-Yue, Li Hua. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 5. - P. 2000-2004.

J866. Ohta Riichiro. Organosilane self-assembled monolayers directly linked to the diamond surfaces. / Ohta Riichiro, Saito Nagahiro, Inoue Yasushi, Sugimura Hiroyuki, Takai Osamu. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 5. - P. 2005-2009.

J867. Kim Sang Woo. Zinc-embedded silica nanoparticle layer in a multilayer coating on a glass substrate achieves broadband antireflection and high transparency. / Kim Sang Woo, Bae Dong-Sik, Shin Hyunho. // Journal of Applied Physics. - 2004. - Vol. 96, No. 11. - P. 6766-6771.

J868. Park Young Min. Interdiffusion and structural change in an InGaAs dots-in-a-well structure by rapid thermal annealing. / Park Young Min, Park Young Ju, Kim Kwang Moo, Song Jin Dong, Lee Jung Il, Yoo Keon-Ho, Kim Hyung Seok, Park Chan Gyung. // Journal of Applied Physics. - 2004. - Vol. 96, No. 10. - P. 5496-5499.

J869. Sun Yijun. A quantitative model for the blueshift induced by rapid thermal annealing in GaNAs /GaAs triple quantum wells. / Sun Yijun, Egawa Takashi, Ishikawa Hiroyasu. // Journal of Applied Physics. - 2004. - Vol. 96, No. 5. - P. 2586-2591.

J870. Yang Chih-Ming. Diffusion of O 2 in C 60 crystal by measuring the decay of electrical conductivity. / Yang Chih-Ming, Liao Jian-Liang, Chiu Kuan-Cheng. // Journal of Applied Physics. - 2004. - Vol. 96, No. 4. - P. 1934-1938.

J871. Aguilar-Frutis M. Optical, structural, and electrical characteristics of high dielectric constant zirconium oxide thin films deposited by spray pyrolysis. / Aguilar-Frutis M., Reyna-Garcia G., Garcia-Hipolito M., Guzman-Mendoza J., Falcony C. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 4. - P. 1319-1325.

J872. Cumpson Peter J. Microelectromechanical system device for calibration of atomic force microscope cantilever spring constants between 0.01 and 4 N/m. / Cumpson Peter J., Hedley John, Clifford Charles A., Chen Xinyong, Allen Stephanie. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 4. - P. 1444-1449. ↑

J873. Kelkar P. S. Nano patterning on optical fiber and laser diode facet with dry resist. / Kelkar P. S., Beauvais J., Lavallee E., Drouin D., Cloutier M., Turcotte D., Yang Pan, Mun Lau Kien, Legario R., Awad Y., Aimez V. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 3. - P. 743-746. ↑

J874. Krug C. Spectroscopic characterization of high k dielectrics: Applications to interface electronic structure and stability against chemical phase separation. / Krug C., Lucovsky G. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 4. - P. 1301-1308. ↑

J875. Yi S. S. Luminescence behavior of Li-doped Gd 2 O 3 :Eu 3+ thin film phosphors grown by pulsed laser ablation. / Yi S. S., Bae J. S., Seo H. J., Jeong J. H., Holloway P. H. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 4. - P. 1746-1750. ↑

J876. Karabacak T. Physical self-assembly and the nucleation of three-dimensional nanostructures by oblique angle deposition. / Karabacak T., Wang G.-C., Lu T.-M. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 4. - P. 1778-1784. ↑

J877. Tan K. M. Direct trim etching process of Si/SiO 2 gate stacks using 193 nm ArF patterns. / Tan K. M., Yoo W. J., Ma H. H. H., Li F., Chan L. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 4. - P. 1500-1505. ↑

J878. Chen Jinghao. Investigation of etching properties of HfO based high-K dielectrics using inductively coupled plasma. / Chen Jinghao, Yoo Won Jong, Tan Zerlinda YL, Wang Yingqian, Chan Daniel S.H. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2004. - Vol. 22, No. 4. - P. 1552-1558. ↑

J879. Zheng R. K. Giant exchange bias and the vertical shifts of hysteresis loops in gamma -Fe 2 O 3 -coated Fe nanoparticles. / Zheng R. K., Wen G. H., Fung K. K., Zhang X. X. // Journal of Applied Physics. - 2004. - Vol. 95, No. 9. - P. 5244-5246. ↑

J880. Wu Jian. Solid C 60 doped with C 70 : Order-to-disorder transition studied with dielectric and 13 C nuclear magnetic resonance spectroscopies. / Wu Jian, Gu Min, Liu Dawei, Keung Sharon S. K., Tang Tong B. // Journal of Applied Physics. - 2004. - Vol. 95, No. 8. - P. 4093-4095. ↑

J881. Sangu S. Excitation energy transfer and population dynamics in a quantum dot system induced by optical near-field interaction. / Sangu S., Kobayashi K., Shojiguchi A., Kawazoe T., Ohtsu M. // Journal of Applied Physics. - 2003. - Vol. 93, No. 5. - P. 2937-2945. ↑

J882. Chang J. Y. Transmission electron microscopy study on ferromagnetic (Ga,Mn)N epitaxial films. / Chang J. Y., Kim G. H., Lee J. M., Han S. H., Kim H. J., Lee W. Y., Ham M. H., Huh K. S., Myoung J. M. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 7858-7860. ↑

J883. Selden Nathaniel P. Comparison of force balance calibration techniques for the nano-Newton range. / Selden Nathaniel P., Ketsdever Andrew D. // Review of Scientific Instruments. - 2003. - Vol. 74, No. 12. - P. 5249-5254. ↑

J884. Kimura T. Spin-current-assisted domain-wall depinning in a submicron magnetic wire. / Kimura T., Otani Y., Tsukagoshi K., Aoyagi Y. // Journal of Applied Physics. - 2003. - Vol. 94, No. 12. - P. 7947-7949. ↑

J885. Kimura T. Suppressed pinning field of a trapped domain wall due to direct current injection. / Kimura T., Otani Y., Yagi I., Tsukagoshi K., Aoyagi Y. // Journal of Applied Physics. - 2003. - Vol. 94, No. 11. - P. 7266-7269. ↑

J886. Fang Kuo-Lung. Metal drift induced electrical instability of porous low dielectric constant film. / Fang Kuo-Lung, Tsui Bing-Yue. // Journal of Applied Physics. - 2003. - Vol. 93, No. 9. - P. 5546-5550. ↑

J887. Imhof Joseph M. Standard sample probes for characterizing optical apertures in near-field scanning

optical microscopy. / Imhof Joseph M., Kwak Eun-Soo, Vanden Bout David A. // Review of Scientific Instruments. - 2003. - Vol. 74, No. 4. - P. 2424-2428. ↑

J888. Fukuda T. Assembly of nanodevices with carbon nanotubes through nanorobotic manipulations. / Fukuda T., Arai F., Dong L. // Proceedings of the IEEE. - 2003. - Vol. 91, No. 11. - P. 1803-1818. ↑

J889. Chua L.O. Nonlinear circuit foundations for nanodevices. I. The four-element torus. Proceedings of the IEEE. - 2003. - Vol. 91, No. 11. - P. 1830-1859. ↑

J890. Amir Parviz B. Using self-assembly for the fabrication of nano-scale electronic and photonic devices. / Amir Parviz B., Ryan D., Whitesides G.M. // IEEE Transactions on Advanced Packaging. - 2003. - Vol. 26, No. 3. - P. 233-241. ↑

J891. Chun-yen Chang. The highlights in the nano world. Proceedings of the IEEE. - 2003. - Vol. 91, No. 11. - P. 1756-1764. ↑

J892. Al-Kofahi K.A. Median-based robust algorithms for tracing neurons from noisy confocal microscope images. / Al-Kofahi K.A., Can A., Lasek S., Szarowski D.H., Dowell-Mesfin N., Shain W., Turner J.N., Roysam B. // IEEE Transactions on Information Technology in Biomedicine. - 2003. - Vol. 7, No. 4. - P. 302-317. ↑

J893. Hughes M.P. Micro- and nano-electrokinetics in medicine. IEEE Engineering in Medicine and Biology Magazine. - 2003. - Vol. 22, No. 6. - P. 32. ↑

J894. Chang L. Extremely scaled silicon nano-CMOS devices. / Chang L., Yang-kyu Choi, Ha D., Ranade P., Shiying Xiong, Bokor J., Chenming Hu, King T.J. // Proceedings of the IEEE. - 2003. - Vol. 91, No. 11. - P. 1860-1873. ↑

J895. Weil V. Zeroing in on ethical issues in nanotechnology. Proceedings of the IEEE. - 2003. - Vol. 91, No. 11. - P. 1976-1979. ↑

J896. Clement N. High aspect ratio nano-oxidation of silicon with noncontact atomic force microscopy. / Clement N., Tonneau D., Gely B., Dallaporta H., Safarov V., Gautier J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 2348-2351. ↑

J897. Chen H. L. Fabry-Perot structures for attenuated phase-shifting mask application in ArF and F 2 lithography. / Chen H. L., Wu H. S., Lee C. C., Ko F. H., Fan Wonder, Hsieh C. I. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 3057-3061. ↑

J898. Thomas A. Aluminum oxidation by a remote electron cyclotron resonance plasma in magnetic tunnel junctions. / Thomas A., Bruckl H., Sacher M. D., Schmalhorst J., Reiss G. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 5. - P. 2120-2122. ↑

J899. Ohtake H. Highly selective and high rate SiO 2 etching using argon-added C 2 F 4 /CF 3 I plasma. / Ohtake H., Ishihara H., Fuse T., Koshiishi A., Samukawa S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 5. - P. 2142-2146. ↑

J900. Hsu Ju-Hung. Fabrication of nickel oxide nanostructures by atomic force microscope nano-oxidation and wet etching. / Hsu Ju-Hung, Lai Hsin-Wen, Lin Heh-Nan, Chuang Chia-Chih, Huang Jin-Hua. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 2599-2601. ↑

J901. Baek I. K. Comparison of dry etching of AlGaAs and InGaP in a planar inductively coupled BCl 3 plasma. / Baek I. K., Lim W. T., Lee J. W., Jeon M. H., Cho G. S., Pearton S. J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 2487-2491. ↑

J902. Vratzov B. Large scale ultraviolet-based nanoimprint lithography. / Vratzov B., Fuchs A., Lemme M., Henschel W., Kurz H. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 2760-2764. ↑

J903. Morita Takahiko. Free-space-wiring fabrication in nano-space by focused-ion-beam chemical vapor deposition. / Morita Takahiko, Kometani Reo, Watanabe Keiichiro, Kanda Kazuhiro, Haruyama Yuichi, Hoshino Takayuki, Kondo Kazushige, Kaito Takashi, Ichihashi Toshinari, Fujita Jun-ichi, Ishida Masahiko, Ochiai Yukinori,

Tajima Tsutomu, Matsui Shinji. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 2737-2741. ↑

J904. Kan M. C. Electron emission from nanotips of amorphous diamond. / Kan M. C., Huang J. L., Sung J. C., Lii D. F. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 4. - P. 1216-1223. ↑

J905. Chen Jinghao. Formation of polycrystalline silicon germanium/HfO 2 gate stack structure using inductively coupled plasma etching. / Chen Jinghao, Tan Kian Ming, Wu Nan, Yoo Won Jong, Chan Daniel SH. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2003. - Vol. 21, No. 4. - P. 1210-1217. ↑

J906. Choi K. Cleaning of Si and properties of the HfO 2 -Si interface. / Choi K., Harris H., Gangopadhyay S., Temkin H. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2003. - Vol. 21, No. 3. - P. 718-722. ↑

J907. Yen Bing K. Microstructure and properties of ultrathin amorphous silicon nitride protective coating. / Yen Bing K., White Richard L., Waltman Robert J., Dai Qing, Miller Dolores C., Kellock Andrew J., Marchon Bruno, Kasai Paul H., Toney Michael F., York Brian R., Deng Hong, Xiao Qi-Fan, Raman Vedantham. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2003. - Vol. 21, No. 6. - P. 1895-1904. ↑

J908. Lukaszew Rosa Alejandra. Surface morphology and magnetization reversal. / Lukaszew Rosa Alejandra, Zhang Zhengdong, Cionca Codrin, Stoica Vladimir, Clarke Roy. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2003. - Vol. 21, No. 4. - P. 1524-1527. ↑

J909. Kim Hoon. Enhancement of emission characteristics for field-emitter arrays by optimizing the etched feature of the gate electrode. / Kim Hoon, Seo Sang-Won, Lee Joo-Won, Park Jong-Won, Lee Yun-Hi, Jang Jin, Ju Byeong-Kwon. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 1. - P. 186-192. ↑

J910. Poon Chyiu Hyia. Multiple-pulse laser annealing of preamorphized silicon for ultrashallow boron junction formation. / Poon Chyiu Hyia, Cho Byung Jin, Lu Yong Feng, Bhat Mousumi, See Alex. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 2. - P. 706-709. ↑

J911. Kim Hoon. Development of a cold-cathode electron gun for cathode-ray tube using a Mo-tip field-emitter array. / Kim Hoon, Seo Sang-Won, Park Jong-Won, Lee Yun-Hi, Jang Jin, Ju Byeong-Kwon. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 1. - P. 43-47. ↑

J912. Lee F. K. Fabrication of mesoscopic devices using atomic force macroscopic electric field induced oxidation. / Lee F. K., Wen G. H., Zhang X. X., Tsui O. K. C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 1. - P. 162-167. ↑

J913. Lee Y.C. Packaging for microelectromechanical and nanoelectromechanical systems. / Lee Y.C., Amir Parviz B., Chiou J.A., Shaochen Chen. // IEEE Transactions on Advanced Packaging. - 2003. - Vol. 26, No. 3. - P. 217-226. ↑

J914. Wen Weijia. Infrared passbands from fractal slit patterns on a metal plate. / Wen Weijia, Yang Z., Xu Gu, Chen Yonghai, Zhou Lei, Ge Weikun, Chan C. T., Sheng Ping. // Applied Physics Letters. - 2003. - Vol. 83, No. 11. - P. 2106-2108. ↑

J915. Li Irene L. Chirality-dependent curvature effect in smallest single-walled carbon nanotubes. / Li Irene L., Li G. D., Liu H. J., Chan C. T., Tang Z. K. // Applied Physics Letters. - 2003. - Vol. 82, No. 9. - P. 1467-1469. ↑

J916. Iwata J.-I. First-principle study on GaN epitaxy on lattice-matched ZrB 2 substrates. / Iwata J.-I., Shiraishi K., Oshiyama A. // Applied Physics Letters. - 2003. - Vol. 83, No. 13. - P. 2560-2562. ↑

J917. Li Irene L. Optical properties of organic dyes in nanoporous zeolite crystals. / Li Irene L., Tang Z. K., Xiao X. D., Yang C. L., Ge W. K. // Applied Physics Letters. - 2003. - Vol. 83, No. 12. - P. 2438-2440. ↑

J918. Hao M. Anomalous compositional pulling effect in InGaN/GaN multiple quantum wells. / Hao M., Ishikawa H., Egawa T., Shao C. L., Jimbo T. // Applied Physics Letters. - 2003. - Vol. 82, No. 26. - P. 4702-

4704.

J919. Yao B. D. Formation mechanism of TiO 2 nanotubes. / Yao B. D., Chan Y. F., Zhang X. Y., Zhang W. F., Yang Z. Y., Wang N. // Applied Physics Letters. - 2003. - Vol. 82, No. 2. - P. 281-283.

J920. De Virgiliis A. A predictive tool in micro- and nanoengineering: Straightforward estimation of conformal film growth efficiency. / De Virgiliis A., Azzaroni O., Salvarezza R. C., Albano E. V. // Applied Physics Letters. - 2003. - Vol. 82, No. 12. - P. 1953-1955.

J921. Kwan Kai-Chong. Effects due to disorder on photonic crystal-based waveguides. / Kwan Kai-Chong, Zhang Xiangdong, Zhang Zhao-Qing, Chan C. T. // Applied Physics Letters. - 2003. - Vol. 82, No. 25. - P. 4414-4416.

J922. Jung Min-Cherl. Nanostructured silicon formations as a result of ionized N 2 gas reactions on silicon with native oxide layers. / Jung Min-Cherl, Lee Tae Gyoung, Park Young Ju, Jun Sung Ho, Lee Joosang, Han Moonsup, Jeong Jong Seok, Lee Jeong Yong. // Applied Physics Letters. - 2003. - Vol. 82, No. 21. - P. 3653-3655.

J923. Chan Y. F. ZnSe nanowires epitaxially grown on GaP(111) substrates by molecular-beam epitaxy. / Chan Y. F., Duan X. F., Chan S. K., Sou I. K., Zhang X. X., Wang N. // Applied Physics Letters. - 2003. - Vol. 83, No. 13. - P. 2665-2667.

J924. Lee Caroline Sunyong. Microcantilevers integrated with heaters and piezoelectric detectors for nano data-storage application. / Lee Caroline Sunyong, Nam Hyo-Jin, Kim Young-Sik, Jin Won-Hyeog, Cho Seong-Moon, Bu Jong-uk. // Applied Physics Letters. - 2003. - Vol. 83, No. 23. - P. 4839-4841.

J925. Liu Po-Tsun. Dielectric characteristics of low-permittivity silicate using electron beam direct patterning for intermetal dielectric applications. / Liu Po-Tsun, Chang T. C., Tsai T. M., Lin Z. W., Chen C. W., Chen B. C., Sze S. M. // Applied Physics Letters. - 2003. - Vol. 83, No. 20. - P. 4226-4228.

J926. Leland Chang. Moore's law lives on [CMOS transistors]. / Leland Chang, Yang-Kyu Choi, Kedzierski J., Lindert N., Peiqi Xuan, Bokor J., Chenming Hu, Tsu-Jae King. // IEEE Circuits and Devices Magazine. - 2003. - Vol. 19, No. 1. - P. 35-42.

J927. Yu R. S. Positronium time-of-flight measurements of porous low-k films. / Yu R. S., Ohdaira T., Suzuki R., Ito K., Hirata K., Sato K., Kobayashi Y., Xu Jun. // Applied Physics Letters. - 2003. - Vol. 83, No. 24. - P. 4966-4968.

J928. Lai Yun. Large band gaps in elastic phononic crystals with air inclusions. / Lai Yun, Zhang Zhao-Qing. // Applied Physics Letters. - 2003. - Vol. 83, No. 19. - P. 3900-3902.

J929. Anderson Mark S. Enhanced infrared absorption with dielectric nanoparticles. Applied Physics Letters. - 2003. - Vol. 83, No. 14. - P. 2964-2966.

J930. Takano Fumiyoshi. Spatial diffusion of excitons in n -type modulation-doped (Cd,Mn)Te/(Cd,Mg)Te single quantum wells under magnetic fields. / Takano Fumiyoshi, Akinaga Hiro, Tokizaki Takashi, Kuroda Shinji, Takita Koki. // Applied Physics Letters. - 2003. - Vol. 83, No. 14. - P. 2853-2855.

J931. Kim Jong-Hyun. High-resolution bistable nematic liquid crystal device realized on orientational surface patterns. / Kim Jong-Hyun, Yoneya Makoto, Yokoyama Hiroshi. // Applied Physics Letters. - 2003. - Vol. 83, No. 17. - P. 3602-3604.

J932. Zhang X. Y. Fabrication and magnetic properties of ultrathin Fe nanowire arrays. / Zhang X. Y., Wen G. H., Chan Y. F., Zheng R. K., Zhang X. X., Wang N. // Applied Physics Letters. - 2003. - Vol. 83, No. 16. - P. 3341-3343.

J933. Won Seok Chang. Thermomechanical analyses of laser precision joining for optoelectronic components. / Won Seok Chang, Suck Joo Na. // IEEE Transactions on Components and Packaging Technologies. - 2003. - Vol. 26, No. 2. - P. 349-358.

J934. Hong-Bo Sun. Two-photon laser precision microfabrication and its applications to micro-nano devices and systems. / Hong-Bo Sun, Kawata S. // Journal of Lightwave Technology. - 2003. - Vol. 21, No. 3. - P. 624-

633. ↑

J935. Lee S.J. Characterization and reliability of dual high-k gate dielectric stack (poly-Si-HfO2 -SiO2) prepared by in situ RTCVD process for system-on-chip applications. / Lee S.J., Choi C.H., Kamath A., Clark R., Kwong D.L. // IEEE Electron Device Letters. - 2003. - Vol. 24, No. 2. - P. 105-107. ↑

J936. Bernussi A.A. High-precision characterization of single-mode optical fiber arrays. / Bernussi A.A., de Peralta L.G., Temkin H. // Journal of Lightwave Technology. - 2003. - Vol. 21, No. 6. - P. 1557-1561. ↑

J937. Mijatovic D. MgB2 thin films and Josephson devices. / Mijatovic D., Brinkman A., Oomen I., Veldhuis D., Rijnders G., Hilgenkamp H., Rogalla H., Blank D.H.A. // IEEE Transactions on Applied Superconductivity. - 2003. - Vol. 13, No. 2. - P. 3245-3248. ↑

J938. Ying Fu. Microwave-transmission, heat and temperature properties of electrically conductive adhesive. / Ying Fu, Wang T., Johan Liu. // IEEE Transactions on Components and Packaging Technologies. - 2003. - Vol. 26, No. 1. - P. 193-198. ↑

J939. Hung-Der Su. A floating well method for exact capacitance-voltage measurement of nano technology. / Hung-Der Su, Bi-Shiou Chiou, Shien-Yang Wu, Ming-Hsung Chang, Kuo-Hua Lee, Yung-Shun Chen, Chih-Ping Chao, Yee-Chaung See, Sun J.Y.-C. // IEEE Transactions on Electron Devices. - 2003. - Vol. 50, No. 6. - P. 1543-1544. ↑

J940. Bourianoff G. The future of nanocomputing. Computer. - 2003. - Vol. 36, No. 8. - P. 44-53. ↑

J941. Xiongfei Yu. A high-density MIM capacitor (13 fF/μm2) using ALD HfO2 dielectrics. / Xiongfei Yu, Chunxiang Zhu, Hang Hu, Chin A., Li M.F., Byung Jin Cho, Dim-Lee Kwong, Foo P.D., Ming Bin Yu. // IEEE Electron Device Letters. - 2003. - Vol. 24, No. 2. - P. 63-65. ↑

J942. Horng-Chih Lin. High-performance p-channel Schottky-barrier SOI FinFET featuring self-aligned PtSi source/drain and electrical junctions. / Horng-Chih Lin, Meng-Fan Wang, Fu-Ju Hou, Hong-Nien Lin, Chia-Yu Lu, Jan-Tsai Liu, Tiao-Yuan Huang. // IEEE Electron Device Letters. - 2003. - Vol. 24, No. 2. - P. 102-104. ↑

J943. Jong Soo Kim. Thermal and Mn diffusion behaviors of CoNbZr-based spin valves with nano oxide layers. / Jong Soo Kim, Young Keun Kim, Seong-Rae Lee. // IEEE Transactions on Magnetics. - 2003. - Vol. 39, No. 5. - P. 2824-2826. ↑

J944. Jollie M. Recording studies on a self-assembling medium of cobalt nano-particles. / Jollie M., Choo D., Newman D., Wears M.L., Miles J. // IEE Proceedings - Science, Measurement and Technology. - 2003. - Vol. 150, No. 5. - P. 240-243. ↑

J945. Szczech J.B. Fine-line conductor manufacturing using drop-on demand PZT printing technology. / Szczech J.B., Megaridis C.M., Gamota D.R., Jie Zhang. // IEEE Transactions on Electronics Packaging Manufacturing. - 2002. - Vol. 25, No. 1. - P. 26-33. ↑

J946. Matsushita N. High-rate low-temperature (90°C) deposition of Ni-Zn ferrite films highly permeable in gigahertz range. / Matsushita N., Chee Ping Chong, Mizutani T., Abe M. // IEEE Transactions on Magnetics. - 2002. - Vol. 38, No. 5. - P. 3156-3158. ↑

J947. Bower C. A micromachined vacuum triode using a carbon nanotube cold cathode. / Bower C., Shalom D., Wei Zhu, Lopez D., Kochanski G.P., Gammel P.L., Sungho Jin. // IEEE Transactions on Electron Devices. - 2002. - Vol. 49, No. 8. - P. 1478-1483. ↑

J948. Goldfarb I. Morphological evolution of epitaxial cobalt-semiconductor compound layers during growth in a scanning tunneling microscope. / Goldfarb I., Briggs G. A. D. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 4. - P. 1419-1426. ↑

J949. Shieh Jia-Min. Improvements of characteristics of fluorinated dielectric films integrated as interlayer dielectrics. / Shieh Jia-Min, Tsai Kou-Chiang, Suen Shich-Chang, Dai Bau-Tong. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 4. - P. 1388-1393. ↑

J950. Shieh Jia-Min. Reduction of etching plasma damage on low dielectric constant fluorinated amorphous carbon films by multiple H 2 plasma treatment. / Shieh Jia-Min, Tsai Kou-Chiang, Dai Bau-Tong, Wu Yew-

Chung, Wu Yu-Hen. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 4. - P. 1476-1481. ↑

J951. Ou Keng-Liang. Improved TaN barrier layer against Cu diffusion by formation of an amorphous layer using plasma treatment. / Ou Keng-Liang, Wu Wen-Fa, Chou Chang-Pin, Chiou Shi-Yung, Wu Chi-Chang. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 5. - P. 2154-2161. ↑

J952. Rommel Sean L. Effect of H 2 on the etch profile of InP/InGaAsP alloys in Cl 2 /Ar /H 2 inductively coupled plasma reactive ion etching chemistries for photonic device fabrication. / Rommel Sean L., Jang Jae-Hyung, Lu Wu, Cueva Gabriel, Zhou Ling, Adesida Ilesanmi, Pajer Gary, Whaley Ralph, Lepore Allen, Schellanbarger Zane, Abeles Joseph H. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 4. - P. 1327-1330. ↑

J953. Wernersson L.-E. Epitaxially overgrown, stable W-GaAs Schottky contacts with sizes down to 50 nm. / Wernersson L.-E., Georgsson K., Gustafsson A., Lofgren A., Montelius L., Nilsson N., Pettersson H., Seifert W., Samuelson L., Malm J.-O. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 2. - P. 580-589. ↑

J954. Yang Lei. Bright peak enhanced x-ray clear phase mask. / Yang Lei, Cerrina Franco, Taylor James W. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 1. - P. 250-256. ↑

J955. Ha Jeong Sook. Role of surface steps in the arrangement of silicon nano-dots on a vicinal Si(111) surface: Scanning tunneling microscopy investigation. / Ha Jeong Sook, Park Kang-Ho, Ko Young-Jo, Park Kyungwan. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 2. - P. 747-751. ↑

J956. Chen H. L. Thermal-flow techniques for sub-35 nm contact-hole fabrication in electron-beam lithography. / Chen H. L., Chen C. H., Ko F. H., Chu T. C., Pan C. T., Lin H. C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 6. - P. 2973-2978. ↑

J957. Kawamoto Tohru. Conceptual design of nanostructures for efficient photoinduced phase transitions. / Kawamoto Tohru, Abe Shuji. // Applied Physics Letters. - 2002. - Vol. 80, No. 14. - P. 2562-2564. ↑

J958. Abe M. Magneto-optical effects calculated for granular composites with magnetized nano-onions dispersed in matrixes. / Abe M., Kuroda J. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7305-7307. ↑

J959. Yoneya Makoto. Simple model for patterned bidirectional anchoring of nematic liquid crystal and its bistability. / Yoneya Makoto, Kim Jong-Hyun, Yokoyama Hiroshi. // Applied Physics Letters. - 2002. - Vol. 80, No. 3. - P. 374-376. ↑

J960. Li Irene L. Structure study of Se species in channels of AlPO 4 -5 crystals. / Li Irene L., Tang Z. K. // Applied Physics Letters. - 2002. - Vol. 80, No. 25. - P. 4822-4824. ↑

J961. Nagahama T. Quantum size effect in magnetic tunnel junctions with ultrathin Fe(001) electrodes. / Nagahama T., Yuasa S., Suzuki Y., Tamura E. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7035-7037. ↑

J962. Hoffman A. Microstructure and phase composition evolution of nano-crystalline carbon films: Dependence on deposition temperature. / Hoffman A., Heiman A., Strunk H. P., Christiansen S. H. // Journal of Applied Physics. - 2002. - Vol. 91, No. 5. - P. 3336-3344. ↑

J963. Lee Yun-Hi. Direct nano-wiring carbon nanotube using growth barrier: A possible mechanism of selective lateral growth. / Lee Yun-Hi, Jang Yoon-Taek, Choi Chang-Hoon, Kim Eun-Kyu, Ju Byeong-Kwon, Kim Dong-Ho, Lee Chang-Woo, Yoon Sang-Soo. // Journal of Applied Physics. - 2002. - Vol. 91, No. 9. - P. 6044-6050. ↑

J964. Bruckl H. Comparison of hard magnetic electrodes for magneto-electronics by magnetic force microscopy. / Bruckl H., Schmalhonst J., Boeve H., Gieres G., Wecker J. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7029-7031. ↑

J965. Liu Zhiyong. Magnetic force microscopy using focused ion beam sharpened tip with deposited antiferro-ferromagnetic multiple layers. / Liu Zhiyong, Dan You, Jinjun Qiu, Wu Yihong. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 8843-8845. ↑

J966. Trabesinger W. Single-molecule near-field optical energy transfer microscopy. / Trabesinger W., Kramer A., Kreiter M., Hecht B., Wild U. P. // Applied Physics Letters. - 2002. - Vol. 81, No. 11. - P. 2118-2120. ↑

J967. Zheng R. K. Extraordinary Hall effect in Co x Pt 100-x films. / Zheng R. K., Wen G. H., Zhang X. X. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7424-7426. ↑

J968. Matsushita N. Ni-Zn ferrite films with high permeability (mu ' = 30, mu " = 30) at 1 GHz prepared at 90 °C. / Matsushita N., Chong C. P., Mizutani T., Abe M. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7376-7378. ↑

J969. You Dan. Head-to-disk spacing control in contact recording studies. / You Dan, Zheng Yuankai, Qiu Jinjun, Guo Zaibing, Wu Yihong. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 8703-8705. ↑

J970. Wei G. Nanotribological studies of thin CrN x, CrO x and CN x overcoats for magnetic recording applications. / Wei G., Barnard J. A. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7565-7567. ↑

J971. Kim Kwang Joo. Spectroscopic ellipsometry study of optical transitions in Zn 1-x Co x O alloys. / Kim Kwang Joo, Park Young Ran. // Applied Physics Letters. - 2002. - Vol. 81, No. 8. - P. 1420-1422. ↑

J972. Khondaker Saiful I. Fabrication of nanometer-spaced electrodes using gold nanoparticles. / Khondaker Saiful I., Yao Zhen. // Applied Physics Letters. - 2002. - Vol. 81, No. 24. - P. 4613-4615. ↑

J973. Smit G. D. J. Scaling of nano-Schottky-diodes. / Smit G. D. J., Rogge S., Klapwijk T. M. // Applied Physics Letters. - 2002. - Vol. 81, No. 20. - P. 3852-3854. ↑

J974. Yao B. D. Formation of ZnO nanostructures by a simple way of thermal evaporation. / Yao B. D., Chan Y. F., Wang N. // Applied Physics Letters. - 2002. - Vol. 81, No. 4. - P. 757-759. ↑

J975. Manago T. Spin-polarized light-emitting diode using metal/insulator/semiconductor structures. / Manago T., Akinaga H. // Applied Physics Letters. - 2002. - Vol. 81, No. 4. - P. 694-696. ↑

J976. Choi Seungho. Raman spectra of nano-structured carbon films synthesized using ammonia-containing feed gas. / Choi Seungho, Park Kyung Ho, Lee Soonil, Koh Ken Ha. // Journal of Applied Physics. - 2002. - Vol. 92, No. 7. - P. 4007-4011. ↑

J977. Shi Frank. Characterization of GaAs-based n-n and p-n interface junctions prepared by direct wafer bonding. / Shi Frank, Chang Kuo-Lih, Epple John, Xu Chao-Feng, Cheng K. Y., Hsieh K. C. // Journal of Applied Physics. - 2002. - Vol. 92, No. 12. - P. 7544-7549. ↑

J978. Lai Yun. Large sonic band gaps in 12-fold quasicrystals. / Lai Yun, Zhang Xiangdong, Zhang Zhao-Qing. // Journal of Applied Physics. - 2002. - Vol. 91, No. 9. - P. 6191-6193. ↑

J979. Pey K. L. Thermal reaction of nickel and Si 0.75 Ge 0.25 alloy. / Pey K. L., Choi W. K., Chattopadhyay S., Zhao H. B., Fitzgerald E. A., Antoniadis D. A., Lee P. S. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2002. - Vol. 20, No. 6. - P. 1903-1910. ↑

J980. Kim Kwang Moo. Alignment of InAs quantum dots on a controllable strain-relaxed substrate using an InAs/GaAs superlattice. / Kim Kwang Moo, Park Young Ju, Park Young Min, Hyon Chan Kyeong, Kim Eun Kyu, Park Jung Ho. // Journal of Applied Physics. - 2002. - Vol. 92, No. 9. - P. 5453-5456. ↑

J981. Qiu Jianbei. Highly efficient green up-conversion luminescence of Nd 3+ -Yb 3+ -Ho 3+ codoped fluorite-type nanocrystals in transparent glass ceramics. / Qiu Jianbei, Kawamoto Yoji, Zhang Junjie. // Journal of Applied Physics. - 2002. - Vol. 92, No. 9. - P. 5163-5168. ↑

J982. Nam Wook Jun. Nano- and microchannel fabrication using column/void network deposited silicon. / Nam Wook Jun, Bae Sanghoon, Kaan Kalkan A., Fonash Stephen J. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2001. - Vol. 19, No. 4. - P. 1229-1233. ↑

J983. Baranauskas Vitor. Micro-crystalline diamond and nano-carbon structures produced using a high argon

concentration in hot-filament chemical vapor deposition. / Baranauskas Vitor, Peterlevitz Alfredo C., Ceragioli Helder J., Durrant Steven F. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2001. - Vol. 19, No. 4. - P. 1057-1062. ↑

J984. Wang N. Nucleation and growth of well-aligned, uniform-sized carbon nanotubes by microwave plasma chemical vapor depositon. / Wang N., Yao B. D. // Applied Physics Letters. - 2001. - Vol. 78, No. 25. - P. 4028-4030. ↑

J985. Brillson L. J. Nanoscale luminescence spectroscopy of defects at buried interfaces and ultrathin films. Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 5. - P. 1762-1768. ↑

J986. Phani A. R. Structural and mechanical properties of TiC and Ti-Si-C films deposited by pulsed laser deposition. / Phani A. R., Krzanowski J. E., Nainaparampil J. J. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2001. - Vol. 19, No. 5. - P. 2252-2258. ↑

J987. Cheng Y. H. Influence of substrate bias on the microstructure and internal stress in Cu films deposited by filtered cathodic vacuum arc. / Cheng Y. H., Tay B. K., Lau S. P., Shi X., Tan H. S. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2001. - Vol. 19, No. 5. - P. 2102-2108. ↑

J988. Kim Jong-Hyun. Surface alignment bistability of nematic liquid crystals by orientationally frustrated surface patterns. / Kim Jong-Hyun, Yoneya Makoto, Yamamoto Jun, Yokoyama Hiroshi. // Applied Physics Letters. - 2001. - Vol. 78, No. 20. - P. 3055-3057. ↑

J989. Srinivasan U. Microstructure to substrate self-assembly using capillary forces. / Srinivasan U., Liepmann D., Howe R.T. // Journal of Microelectromechanical Systems. - 2001. - Vol. 10, No. 1. - P. 17-24. ↑

J990. Lin H.C. Schottky barrier thin-film transistor (SBTFT) with silicided source/drain and field-induced drain extension. / Lin H.C., Yeh K.L., Huang R.G., Lin C.Y., Huang T.Y. // IEEE Electron Device Letters. - 2001. - Vol. 22, No. 4. - P. 179-181. ↑

J991. Sandhu A. Bismuth nano-Hall probes fabricated by focused ion beam milling for direct magnetic imaging by room temperature scanning Hall probe microscopy. / Sandhu A., Masuda H., Kurosawa K., Oral A., Bending S.J. // Electronics Letters. - 2001. - Vol. 37, No. 22. - P. 1335-1336. ↑

J992. Vijayalakshmi S. Nonlinear dispersion properties of subwavelength photonic crystals. / Vijayalakshmi S., Zhang Y., Grebel H., Yaglioglu Gul, Dorsinville R., White C. W. // Applied Physics Letters. - 2001. - Vol. 78, No. 12. - P. 1754-1756. ↑

J993. Lai Yun. Engineering acoustic band gaps. / Lai Yun, Zhang Xiangdong, Zhang Zhao-Qing. // Applied Physics Letters. - 2001. - Vol. 79, No. 20. - P. 3224-3226. ↑

J994. Chang T. Analysis and control of monolithic piezoelectric nano-actuator. / Chang T., Xuemei Sun. // IEEE Transactions on Control Systems Technology. - 2001. - Vol. 9, No. 1. - P. 69-75. ↑

J995. Michel B. Printing meets lithography: Soft approaches to high-resolution patterning. / Michel B., Bernard A., Bietsch A., Delamarche E., Geissler M., Juncker D., Kind H., Renault J.-P., Rothuizen H., Schmid H., Schmidt-Winkel P., Stutz R., Wolf H. // IBM Journal of Research and Development. - 2001. - Vol. 45, No. 5. - P. 697-719. ↑

J996. Lee K. J. Numerical study of spin relaxation by thermal fluctuation: Effect of shape anisotropy. / Lee K. J., Park N. Y., Lee T. D. // Journal of Applied Physics. - 2001. - Vol. 89, No. 11. - P. 7460-7462. ↑

J997. Yang Choong Jin. Isolated Fe-Co-Ni nanoparticles in a random arrangement and their magnetic properties. / Yang Choong Jin, Kim Kyung Soo, Wu Jianmin. // Journal of Applied Physics. - 2001. - Vol. 90, No. 11. - P. 5741-5746. ↑

J998. Thean A. Geometry and strain effects on single-electron charging in silicon nano-crystals. / Thean A., Leburton J. P. // Journal of Applied Physics. - 2001. - Vol. 90, No. 12. - P. 6384-6390. ↑

J999. Shieh Jia-Min. Characteristics of fluorinated amorphous carbon films and implementation of 0.15 mcm Cu /a-C:F damascene interconnection. / Shieh Jia-Min, Suen Shich-Chang, Tsai Kou-Chiang, Dai Bau-Tong, Wu

Yew-Chung, Wu Yu-Hen. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 3. - P. 780-787. ↑

J1000. Schmalhorst J. Evolution of the dielectric breakdown in Co/Al 2 O 3 /Co junctions by annealing. / Schmalhorst J., Bruckl H., Justus M., Thomas A., Reiss G., Vieth M., Gieres G., Wecker J. // Journal of Applied Physics. - 2001. - Vol. 89, No. 1. - P. 586-589. ↑

J1001. Sant S. Giant magnetoresistance in ion beam deposited spin-valve films with specular enhancement. / Sant S., Mao M., Kools J., Koi K., Iwasaki H., Sahashi M. // Journal of Applied Physics. - 2001. - Vol. 89, No. 11. - P. 6931-6933. ↑

J1002. Hinds Bruce J. Emission lifetime of polarizable charge stored in nano-crystalline Si based single-electron memory. / Hinds Bruce J., Yamanaka Takayuki, Oda Shunri. // Journal of Applied Physics. - 2001. - Vol. 90, No. 12. - P. 6402-6408. ↑

J1003. Pinnow C. U. Preparation and properties of dc-sputtered IrO 2 and Ir thin films for oxygen barrier applications in advanced memory technology. / Pinnow C. U., Kasko I., Dehm C., Jobst B., Seibt M., Geyer U. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 5. - P. 1857-1865. ↑

J1004. Yacaman M. Jose. Structure shape and stability of nanometric sized particles. / Yacaman M. Jose, Ascencio J. A., Liu H. B., Gardea-Torresdey J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 4. - P. 1091-1103. ↑

J1005. Liu Po-Tsun. Highly reliable chemical-mechanical polishing process for organic low-k methylsilsesquioxane. / Liu Po-Tsun, Chang Ting-Chang, Huang Ming-Chih, Tsai M. S., Sze S. M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 4. - P. 1212-1218. ↑

J1006. Chen H. L. Low-dielectric constant bisbenzo(cyclobutene) and fluorinated poly(arylene)ether films as bottom anti-reflective coating layers for ArF lithography. / Chen H. L., Chu T. C., Li M. Y., Ko F. H., Cheng H. C., Huang T. Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 6. - P. 2381-2384. ↑

J1007. Shim Jong-Youp. Piezo-driven metrological multiaxis nanopositioner. / Shim Jong-Youp, Gweon Dae-Gab. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 11. - P. 4183-4187. ↑

J1008. Panhorst M. Formation of metallic surface structures by ion etching using a S-layer template. / Panhorst M., Bruckl H., Kiefer B., Reiss G., Santarius U., Guckenberger R. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 3. - P. 722-724. ↑

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