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ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 11-1

“Nanostructure”
(«Наноструктуры»)

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"Nanometer-resolution optical probe using a metallic-nanoparticle-intercalated carbon nanotube"

We propose a nanometer-resolution optical probe tip for near-field scanning optical microscopy that utilizes a carbon nanotube (CNT) with a conical bottom end, in which gold nanoparticles are intercalated. The near-field component of the input source was coupled with a nanoparticle at the top end of the CNT and was plasmonically transferred through both the CNT and nanoparticles to reproduce a nanometer-order near-field spot at the bottom end of the CNT. The field distribution at the output plane of the CNT probe tip was calculated using the finite-difference time-domain algorithm; a 5 nm near-field optical spot was obtained at a wavelength of 886 nm for a 20 nm diameter and 200 nm long CNT probe tip filled with 4 nm diameter gold nanoparticles. The spectral response of the CNT probe tip was also presented. These results indicate that a metallic-nanostructure-intercalated CNT probe tip has significant potential for nanometer-resolution optical imaging. [J1]

"Proposal for a topological plasmon spin rectifier"

We propose a device in which the spin-polarized ac plasmon mode in the surface state of a topological insulator nanostructure induces a static spin accumulation in a resonant, normal metal structure coupled to it. Using a finite-difference time-domain model, we simulate this spin-pump mechanism with drift, diffusion, relaxation, and precession in a magnetic field. This optically driven system can serve as a dc "spin battery" for spintronic devices. [J2]

"Resonance Frequencies of Electrically Charged Nanoparticles"

We develop a procedure to analyze charged nanoparticle (NP) surface modes. Using the resonance condition derived by Rosenkrantz and Arnon, we obtain frequencies at which the electromagnetic (EM) radiation stimulates resonance over a wide range of modes. Our results confirm that the relation between the resonance frequencies and the excess surface charge can be described by a monotonically increasing function. Taking the derivative of this function, it is evident that the lower surface potentials have a greater influence on the resonance frequency. This effect decreases as the surface potential increases. Surface modes contribute to the surface energy of charged NPs, and for this reason, they can modify charged NP optical properties. We found that there is a strong dependence of the resonance frequencies on the electrically charged NP refractive index and surface potential. This dependence can play an important role in nonmetallic nanotechnological devices, such as attenuators and modulators in optical communication and optical detectors in biomedical sensors. [J3]

"Direct observation of dynamic surface acoustic wave controlled carrier injection into single quantum posts using phase-resolved optical spectroscopy"

A versatile stroboscopic technique based on active phase-locking of a surface acoustic wave to picosecond laser pulses is used to monitor dynamic acoustoelectric effects. Time-integrated multichannel detection is applied to probe the modulation of the emission of a quantum well for different frequencies of the surface acoustic wave. For quantum posts we resolve dynamically controlled generation of neutral and charged excitons and preferential injection of holes into localized states within the nanostructure. [J4]

"Structure evolution of Zn cluster on graphene for ZnO nanostructure growth"

Monte Carlo simulations are carried out for Zn cluster supported on a suspended graphene to estimate the morphological evolution of the following growth of ZnO nanostructure. The metal-metal interactions are modeled with the tight-binding many-body potential and a Lennard-Jones potential is used to describe the metal-carbon interactions. The dynamic processes of Zn cluster in the temperature field decomposing and drifting effects are visualized through the simulation. Zn atoms make one regular atomic single layer on the graphene sheet at a relatively low temperature, which would act as orderly and high density catalytic nucleation sites. In the relatively high temperature, the Zn atomic single layer falls to pieces, the orderly and low density catalytic nucleation sites are formed. It is expected from these behaviors that the buffer layer of graphene provide a sound explanation for

the formation of ordered orientated ZnO nanostructure. [J5]

"Thermal exchange bias field drift in field cooled Mn 83 Ir 17 /Co 70 Fe 30 thin films after 10 keV He ion bombardment"

The thermal exchange bias field drift of sputter deposited Mn83Ir17(15nm)/Co70Fe30(10nm)/Tathin films at room temperature after 10 keV He+ion bombardment in an externally applied in-plane magnetic field for different ion fluences was studied. Although field cooling of the layer system resulted in a temporally stable exchange bias field at room temperature the exchange bias field starts to drift after ion bombardment like in non-annealed samples. Between 1 and 648 h after ion bombardment a logarithmic increase in the absolute magnitude of the exchange bias field is observed. A tentative model is presented for its description based on noninteracting domains in the antiferromagnet. A comparison between experimental data and the model reveals the delicate interplay between the ion bombardment modified average antiferromagnetic anisotropy constants, exchange coupling constants, and relaxation time distributions in the polycrystalline layer system influencing the thermal drift velocities. [J6]

"Control of semiconductor quantum dot nanostructures: Variants of Si x Ge 1-x /Si quantum dot molecules"

We examine variations in the basic structure of quantum dot molecules (fourfold quantum dot nanostructures forming around a central facetted pit) in the SixGe1-x/Si(100)system. Arrays of quantum dot molecules are seeded by Ga+focused ion beam (FIB) prepatterning of the Si substrate prior to epitaxial Si buffer layer growth and GexSi1-xfilm deposition. Five main variants to the regular quantum dot molecule structure are observed. The populations of these variant structures depend on the initial FIB processing conditions; their frequencies generally increase with increasing prepatterned pit depth and with increasing incident ion energy. This work suggests both routes to improving uniformity of regular quantum dot molecule arrays as well as routes to enabling synthesis of a wider range of nanostructure geometries. [J7]

"Robust Si-Based Membranes for Fluid Control in Microbatteries Using Superlyophobic Nanostructures"

Mechanically robust superhydrophobic Si-based membranes are described. The membranes are prepared using microelectromechanical-systems-type processing and implement "nanonail" design features that enable superlyophobic (also called omniphobic, superolephobic) behavior. A variety of low- and high-surface-tension liquids are repelled by such porous membranes without liquid penetrating into the pores of the membrane. Electrowetting transitions have been successfully implemented as a way to demonstrate electrically triggered and tunable permeability of the structures. Long-term stability of the hydrophobic coatings based on fluoropolymers has been evaluated using contact angle measurements. Among those, Teflon-based coatings tend to show the best survivability in aqueous and organic electrolytes for periods longer than 200 days of continuous exposure at room temperature and at 60 °C. Such robust membranes are currently used in reserve microbattery technology and microfluidic devices and, potentially, could enable other applications involving fluid separation, fuel cells, and filtration. [J8]

"Optoelectronic Signatures of DNA-Based Hybrid Nanostructures"

This paper presents a characterization of the vibrational modes of nanostructure-DNA complexes immobilized on substrates, such as silver-coated microspheres and silver nanostructure array DNA strands end terminated with titanium dioxide (TiO2) nanoparticles are used to study UV-induced cleaving of DNA molecules functionalized with indirect-bandgap semiconductors. In addition, conventional DNA-based molecular beacons were designed and applied in the detection of DNA of selected organisms. Micro-Raman (μRaman) measurements of DNA in water have proven to be a major challenge because of: 1) weak DNA signatures in solution; 2) changes in structural conformations of the DNA; and 3) environmental effects, such as temperature and pH of the solution in which DNA is suspended. We have studied optoelectronic properties of nanostructure-DNA complexes immobilized on silver nanosphere substrates as well as on Ag-coated micro- and nanostructures. In this research, self-assembled monolayers of DNA formed on these substrates were studied using μRaman techniques. These Raman spectra were used to identify prominent vibrational modes of DNA, and to characterize DNA Raman spectra for both B-DNA with a right-handed double helix, and Z-DNA with a left-handed double helix (S. C. Ha, K. Lowenhaupt, A. Rich, Y. Kim, and K. Kim, "Crystal structure of a junction between B-DNA and Z-DNA reveals two extruded bases," Nature, Vol. 437, pp. 1183-1186, 2005). These Raman-based studies of the conformational states of DNA employ pH-changing trivalent salts, methylation of cytosine bases, and alternating GC bases. Moreover, DNA strands terminated with titanium dioxide (TiO2) nanoparticles were observed to undergo cleaving upon UV illumination. [J9]

"Formation of 1-D Nanostructures Using Atomic Force Microscope"

In this paper, we develop a new process using an atomic force microscope (AFM) to fabricate micro- and nanostructures. An AFM probe was coated with gold, and then, slid on a silicon substrate in ambient environment. Repetitive sliding of the probe generated a nanostructure on the substrate instead of plowing. The Au material was found to transfer from the probe onto the Si substrate. Morphological, electrical, and chemical properties were characterized using high-resolution techniques. It was found that the nanostructure was composed of an Au-Si alloy, which behaved like a conductor. The mechanisms of the process and effects of electrical potential are discussed in this paper. [J10]

"The transport properties of D- sigma -A molecules: A strikingly opposite directional rectification"

We design the A-R rectifier based on the D-sigma -Amolecules to examine the rectifying performances by the first-principles method. The calculated results show that the electronic structures for all of our systems perfectly match the A-R rectifier, as expected, but their rectifying direction is very strikingly opposite and working mechanism is completely different. This behavior can be rationalized through an asymmetrical shift of molecular levels under bias of different polarities, which is because of always-existing intrinsic asymmetrical coupling effects of molecular levels to electrodes. Detailed analysis demonstrates that the rectifying direction induced by this mechanism is always in opposition to that induced by the A-R mechanism. [J11]

"Nanoimprint replication of nonplanar nanostructure fabricated by focused-ion-beam chemical vapor deposition"

Nanoimprint lithography (NIL) is a very useful technique for replicating planar nanostructures at low cost with high throughput, but an expansion from planar to nonplanar will probably be required to enhance the functional capabilities of nanodevices. On the other hand, focused-ion-beam chemical vapor deposition (FIB-CVD) is a promising technology for fabricating nonplanar nanostructures. In this study, the authors demonstrated a new nonplanar replication method using a combination of FIB-CVD and NIL to achieve nonplanar replication with submicrometer feature sizes. Furthermore, they replicated nonplanar nanostructures by using step and repeat NIL. [J12]

"Electromagnetic properties of resonant magnetoplasmonic core-shell nanostructures"

We present a numerical model we have created and verified to characterize the frequency dependence of the effective magnetic permeability and permittivity of a core-shell (CS) nanostructure composed of a magnetic core and a plasmonic shell with well-controlled dimensions for different geometries and polarizations. Two principal ingredients in our model are as follows: (i) we consider two-dimensional (or cross sections of infinite three-dimensional parallel, infinitely long, identical, cylinders, where the properties and characteristics are invariant along the perpendicular cross sectional plane) three-phase heterostructure, and (ii) while strictly valid only in a dc situation, our analysis can be extended to treat electric fields that oscillate with time provided that the wavelengths associated with the fields are much larger than the microstructure dimension in order that the homogeneous (effective medium) representation of the composite structure makes sense. Such nanostructures simultaneously possess both magnetic gyromagnetic resonance and plasmonic resonance (PLR) resonances. To illustrate the effects of shape anisotropy of the CS structure, we analyze several possible shell shapes involving sharp edges and tips. Geometric parameters of the CS nanostructures and excitation polarized parallel and perpendicular to the antenna axis permit to finely tune the PLR. Changing the internal geometry of the nanostructure not only shifts its resonance frequencies but can also strongly modify the relative magnitudes of the electric field enhancement, independently of nanoparticle shape. The model sets the foundation of quantitatively determining the spatial confinement of the electric field in regions ≈20 nm in linear dimension. Because of its resonant nature, we found nanolocalized terahertz fields corresponding to large electric field enhancement two orders of magnitude higher in amplitude than the excitation optical field. The simulations in this paper are import--ant because magnetoplasmonic CS nanostructures are currently being explored as candidates for resonant optical nanoantennas for biosensing applications. [J13]

"Nanoscale surface modifications and formation of conical structures at aluminum surface induced by single shot exposure of soft x-ray laser pulse"

We irradiated the soft x-ray laser (SXRL) pulses having a wavelength of 13.9 nm, a duration time of 7 ps, and fluences of up to 27mJ/cm2to aluminum (Al) surface. After the irradiation process, the modified surface was observed with the visible microscope, the scanning electron microscope, and the atomic force microscope. The surface modifications caused by the SXRL pulses were clearly seen, and it was found that the conical structures having about 70-150 nm in diameters were formed under a single pulse shot. The conical structures were

formed in the features with the average depth of about 40 nm, and this value was in accordance with the attenuation length of the SXRL beam for Al. However, those conical structures were deconstructed under the multiple pulse shots exposure. Thermomechanical modeling of SXRL laser interaction with Al surface, which explains nanostructure surface modification, was provided. [J14]

"Current rectification induced by asymmetrical electrode materials in a molecular device"

Molecular devices are constructed based on a molecule connected into both electrodes with different metal materials, and their transport properties are investigated by the first-principles method. The result shows that such devices can generate two asymmetrical Schottky barriers at contacts; the current rectification thus is created. This rectification is also fully rationalized by the calculated transmission spectra and the spatial distribution of the lowest unoccupied molecular orbital and highest occupied molecular orbital states. Our study suggests that it might be a very important way for both electrodes using different materials to realize a molecular rectification. [J15]

"Silicon nanostructure solar cells with excellent photon harvesting"

Silicon (Si) nanostructure solar cells have been synthesized using a nanowire (NW) array as the surface texturing. Optical-reflection measurement exhibits an excellent photon-harvesting property for the Si-NW-array texturization. Less than 2% reflection ratio at an 800 nm wavelength was achieved. Results show that an optimized 125Ч125mm2Si nanostructure solar cell with an excellent photon-harvesting property has a 35.4% higher energy-conversion efficiency than the c-Si solar cell due to its enhanced optical-absorption characteristics. However, for the nanostructured solar cells, the decrease in external quantum efficiencies in the short-wavelength region proves that the surface recombination plays a critical role in determining the final quantum-efficiency performance, indicating that optimum surface passivation was a prerequisite in high-efficiency Si nanostructure solar cells. [J16]

"Photoinduced magnetoresistance in organic field-effect transistors"

We report on negative magnetoresistance (MR) of -0.46% in low external magnetic fields in pentacene field-effect transistors. This effect can only be observed if the device is irradiated. MR strongly depends on gate voltage but is independent of drain voltage. Furthermore, the MR increases as the intensity of irradiation increases and the relationship of both parameters is not linear. The dependency of MR on magnetic field is not linear either, but it follows non-Lorentzian line shape. The triplet exciton-charge reaction model is a possible explanation for negative MR in irradiated pentacene field-effect transistors. [J17]

"Localized surface plasmon resonance of nanoporous gold"

We report the plasmonic properties of free-standing nanoporous gold (NPG) films with an intricate bicontinuous nanostructure. Two characteristic plasmon bands of NPG have been detected in absorption spectra. One at 490nm, resulting from the resonant absorption of gold films, is independent of nanopore sizes and dielectric surroundings. The other at 550-650nm, arising from the excitation of localized surface plasmon resonance, shows obvious band shift with the nanopore sizes and dielectric indices of surrounding media, suggesting that NPG is a promising candidate as plasmonic sensors for organic and biologic molecule detection. This study also shines light on the underlying mechanisms of surface enhanced spectroscopy of NPG. [J18]

"CF4 plasma treatment on nanostructure band engineered Gd2 O3 -nanocrystal nonvolatile memory"

The effects of CF4plasma treatment on Gd2O3nanocrystal (NC) memory were investigated. For material analysis, secondary ion mass spectrometry and x-ray photoelectron spectroscopy analyses were performed to characterize the fluorine depth profile of the Gd2O3-NC film. In addition, an UV-visible spectrophotometer was used to obtain the Gd2O3bandgap and analyzed to suggest the modified structure of the energy band. Moreover, the electrical properties, including the memory window, program/erase speed, charge retention, and endurance characteristics were significantly improved depending on the CF4plasma treatment conditions. This can be explained by the physical model based on the built-in electric field in the Gd2O3nanostructure. However, it was observed that too much CF4plasma caused large surface roughness induced by the plasma damage, leading to characteristics degradation. It was concluded that with suitable CF4plasma treatment, this Gd2O3-NC memory can be applied to future nonvolatile memory applications. [J19]

"A tuning fork based wide range mechanical characterization tool with nanorobotic manipulators inside a scanning electron microscope"

This study proposes a tuning fork probe based nanomanipulation robotic system for mechanical characterization of ultraflexible nanostructures under scanning electron microscope. The force gradient is measured via the frequency modulation of a quartz tuning fork and two nanomanipulators are used for manipulation of the nanostructures. Two techniques are proposed for attaching the nanostructure to the tip of the tuning fork probe. The first technique involves gluing the nanostructure for full range characterization whereas the second technique uses van der Waals and electrostatic forces in order to avoid destroying the nanostructure. Helical nanobelts (HNB) are proposed for the demonstration of the setup. The nonlinear stiffness behavior of HNBs during their full range tensile studies is clearly revealed for the first time. Using the first technique, this was between 0.009 N/m for rest position and 0.297 N/m before breaking of the HNB with a resolution of 0.0031 N/m. For the second experiment, this was between 0.014 N/m for rest position and 0.378 N/m before detaching of the HNB with a resolution of 0.0006 N/m. This shows the wide range sensing of the system for potential applications in mechanical property characterization of ultraflexible nanostructures. [J20]

"Quantum mechanical simulation of electronic transport in nanostructured devices by efficient self-consistent pseudopotential calculation"

We present a new empirical pseudopotential (EPM) calculation approach to simulate the million atom nanostructured semiconductor devices under potential bias using periodic boundary conditions. To treat the nonequilibrium condition, instead of directly calculating the scattering states from the source and drain, we calculate the stationary states by the linear combination of bulk band method and then decompose the stationary wave function into source and drain injecting scattering states according to an approximated top of the barrier splitting (TBS) scheme based on physical insight of ballistic and tunneling transports. The decomposed electronic scattering states are then occupied according to the source/drain Fermi-Levels to yield the occupied electron density which is then used to solve the potential, forming a self-consistent loop. The TBS is tested in a one-dimensional effective mass model by comparing with the direct scattering state calculation results. It is also tested in a three-dimensional 22 nm double gate ultra-thin-body field-effect transistor study, by comparing the TBS-EPM result with the nonequilibrium Green's function tight-binding result. We expected the TBS scheme will work whenever the potential in the barrier region is smoother than the wave function oscillations and it does not have local minimum, thus there is no multiple scattering as in a resonant tunneling diode, and when a three-dimensional problem can be represented as a quasi-one-dimensional problem, e.g., in a variable separation approximation. Using our approach, a million atom nonequilibrium nanostructure device can be simulated with EPM on a single processor computer. [J21]

"Electromechanical phenomena in semiconductor nanostructures"

Electromechanical phenomena in semiconductors are still poorly studied from a fundamental and an applied science perspective, even though significant strides have been made in the last decade or so. Indeed, most current electromechanical devices are based on ferroelectric oxides. Yet, the importance of the effect in certain semiconductors is being increasingly recognized. For instance, the magnitude of the electric field in an AlN/GaN nanostructure can reach 1-10 MV/cm. In fact, the basic functioning of an (0001) AlGaN/GaN high electron mobility transistor is due to the two-dimensional electron gas formed at the material interface by the polarization fields. The goal of this review is to inform the reader of some of the recent developments in the field for nanostructures and to point out still open questions. Examples of recent work that involves the piezoelectric and pyroelectric effects in semiconductors include: the study of the optoelectronic properties of III-nitrides quantum wells and dots, the current controversy regarding the importance of the nonlinear piezoelectric effect, energy harvesting using ZnO nanowires as a piezoelectric nanogenerator, the use of piezoelectric materials in surface acoustic wave devices, and the appropriateness of various models for analyzing electromechanical effects. Piezoelectric materials such as GaN and ZnO are gaining more and more importance for energy-related applications; examples include high-brightness light-emitting diodes for white lighting, high-electron mobility transistors, and nanogenerators. Indeed, it remains to be demonstrated whether these materials could be the ideal multifunctional materials. The solutions to these and other related problems will not only lead to a better understanding of the basic physics of these materials, but will validate new characterization tools, and advance the development of new and better devices. We will restrict ourselves to nanostructures in the current article even thoug--h the measurements and calculations of the bulk electromechanical coefficients remain challenging. Much of the literature has focused on InGaN/GaN, AlGaN/GaN, ZnMgO/ZnO, and ZnCdO/ZnO quantum wells, and InAs/GaAs and AlGaN/AlN quantum dots for their optoelectronic properties; and work on the bending of nanowires have been mostly for GaN and ZnO nanowires. We hope the present review article will stimulate further research into the field of electromechanical phenomena and help in the development of applications. [J22]

"Photoabsorption and photoelectric process in Si nanocrystallites"

Using the effective mass approximation, we investigate the photoabsorption and photoelectric process in the

conduction band of a single electron charged spherical Si semiconductor quantum dot nanostructure embedded in the amorphous SiO2matrix. We consider the potential barrier at the interface as of (i) infinite and (ii) finite heights. The effect of self-energy associated with surface polarization due to the charging of the quantum dot is also considered. Our results of photoabsorption coefficient for (1s-1p) transition are found to be in good agreement with the available experimental data. [J23]

"Magnetic properties of nanocrystallized nickel films on gold substrate deposited by cathodic voltammetry: Scan rate induced effects"

Ni electrodeposits of thickness values ranged from 70 nm till about 1.20mcmand grown on gold substrate by cathodic voltammetry (C-V) technique are investigated varying the scan rate (r)of the related (C-V) curves in the interval 0.167<r<1.67mV/s. The system engenders thinner films having rougher surfaces for higher rvalues while lower ones leads to thicker and smoother samples. Their magnetic reversal is ruled by the domain wall (DW)nucleation and motion. Their ferromagnetic-topography dependence reveals the existence of a critical thickness dc 375nmfor both their microstructure and magnetic nanostructure. Their magnetic domain sizes (w)evolution with the sample roughness is typical of the Bloch domain type (MD)Bbelow dcwhile the Neel type (MD)Nappears beyond dcaccording to the topography-based model of Zhao etal [J. Appl. Phys. 89, 1325 (2001)]. The magnetic anisotropy of the Ni samples exhibits a predominant parallel component for the thinnest sample while the perpendicular one grows with the thickness increase. [J24]

"Cross-sectional scanning tunneling microscopy and spectroscopy of semimetallic ErAs nanostructures embedded in GaAs"

The growth and atomic/electronic structure of molecular beam epitaxy-grown ErAs nanoparticles and nanorods embedded within a GaAs matrix are examined for the first time via cross-sectional scanning tunneling microscopy and spectroscopy. Cross sections enable the interrogation of the internal structure and are well suited for studying embedded nanostructures. The early stages of embedded ErAs nanostructure growth are examined via these techniques and compared with previous cross-sectional transmission electron microscopy work. Tunneling spectroscopy I(V)for both ErAs nanoparticles and nanorods was also performed, demonstrating that both nanostructures are semimetallic. [J25]

"Ultrafast cross saturation dynamics in inhomogeneously broadened InAs/InP quantum dash optical amplifiers"

We describe multiwavelength pump probe characterization of an inhomogeneously broadened semiconductor nanostructure gain medium. An InAs/InP quantum-dash optical amplifier is perturbed by a 100 fs pulse and the response is measured at wavelengths outside the homogeneously broadened spectral region. Energy dependent carrier cross relaxation as well as capture and escape processes are investigated and quantified. [J26]

"Electron and hole energy levels in InAs/GaAs quantum dots: Size and magnetic field effects"

We present a systematic study on the influence of strain, size, and magnetic field on the electronic properties of InAs/GaAs quantum dots. Using a 40-band k.pmodel, we have calculated the band diagram of strained InAs, and extract the band parameters which are useful for the electronic properties of InAs/GaAs quantum dots. Then, using an exact numerical diagonalization method on Fourier-Bessel function basis over a large cylinder domain, we calculated numerically the electron and hole eigenenergies and associated wave functions. We considered thereafter the effect of an external applied magnetic field, strain and quantum dot size variation on the charge carrier energy levels. It is clearly found that the strain strongly modifies the quantum dot potential profile, leading to a different electron and hole energy distribution. Our results revealed also that the electron and hole energy spectra change significantly when varying the quantum dot size as well as the magnetic field. Given this striking nanostructure size and magnetic field energy dependent property, these systems provide the opportunity to control and tune their optical and electronic properties through these parameters. [J27]

"Tellurite Photonic Nanostructured Fiber"

In this paper, we address the challenges faced in the fabrication process of nanostructured fiber. We show that a slight nonuniformity of holes of the preform results in a difference in the added pressure in the holes of the fiber during the fabrication process. It may not be a notable problem for the microstructured fiber, but it can result in serious deformation or even collapse for nanostructured fiber. By using a model, we propose a distortion factor that indicates the distortion degree of the geometry of fiber compared with the geometry of preform. The hole size of preform is the most important variable to the distortion factor. A large hole size in the preform is of great significance in decreasing the distortion. We also show that when the temperature is increased, the surface

tension is decreased, but the viscosity is decreased much more quickly, so the distortion becomes severe. For minimum distortion in the nanostructured fibers we demonstrate, preforms with comparatively large and uniform inner holes are fabricated by inflating with inert gas. By using such preforms, we fabricate hexagonal core and triangular core nanostructured fibers with the smallest size recorded. Supercontinuum generation from the nanostructured fiber is demonstrated. In this paper, the glass we use for the demonstration is a soft glass. By using polymer or silica glass, which is more suitable for nanostructure fabrication, and by controlling the uniformity of holes in the original cane more accurately, various nanostructured fibers with even smaller size and more complex structure, or nanowire array, should be able to be fabricated by the inflation method. [J28]

"Potassium iodide-assisted polyol route synthesis of monodisperse silver nanospheres"

Monodisperse silver nanospheres have been synthesised in high yield by a developed polyol process, in which silver nitrate (AgNO3) was reduced by ethylene glycol (EG) with the assistance of polyvinyl pyrrolidone (PVP) and potassium iodide (KI). Both the KI concentration and reaction temperature are crucial for the morphologies and diameter distribution of silver nanostructures. Transmission electron microscopy and X-ray diffraction have been employed to characterise silver nanoparticles. The role of KI for the formation of monodisperse silver nanospheres has been discussed by taking into account the formation of silver iodide (AgI) as seeds. [J29]

"Evaluation of Nanostructural, Mechanical, and Biological Properties of Collagen-Nanotube Composites"

Collagen I is an essential structural and mechanical building block of various tissues, and it is often used as tissue-engineering scaffolds. However, collagen-based constructs reconstituted in vitrooften lacks robust fiber structure, mechanical stability, and molecule binding capability. To enhance these performances, the present study developed 3-D collagen-nanotube composite constructs with two types of functionalized carbon nanotubes, carboxylated nanotubes and covalently functionalized nanotubes (CFNTs). The influences of nanotube functionalization and loading concentration on the collagen fiber structure, mechanical property, biocompatibility, and molecule binding were examined. Results revealed that surface modification and loading concentration of nanotubes determined the interactions between nanotubes and collagen fibrils, thus altering the structure and property of nanotube-collagen composites. Scanning electron microscopy and confocal microscopy revealed that the incorporation of CFNT in collagen-based constructs was an effective means of restructuring collagen fibrils because CFNT strongly bound to collagen molecules inducing the formation of larger fibril bundles. However, increased nanotube loading concentration caused the formation of denser fibril network and larger aggregates. Static stress-strain tests under compression showed that the addition of nanotube into collagen-based constructs did not significantly increase static compressive moduli. Creep/recovery testing under compression revealed that CFNT-collagen constructs showed improved mechanical stability under continuous loading. Testing with endothelial cells showed that biocompatibility was highly dependent on nanotube loading concentration. At a low loading level, CFNT-collagen showed higher endothelial coverage than the other tested constructs or materials. Additionally, CFNT-collagen showed capability of binding to other biomolecules to enhance the construct functionality. In concl--usion, functionalized nanotube-collagen composites, particularly CFNT-collagen composites, could be promising materials, which provide structural support showing bundled fibril structure, biocompatibility, multifunctionality, and mechanical stability, but rigorous control over chemical modification, loading concentration, and nanotube dispersion are needed. [J30]

"Application of nanoimprinting technology to organic field-effect transistors"

The charge carrier transport efficiency and issues of patterning in organic semiconductors limit the potential range of microelectronic and optoelectronic applications of organic devices in nanoscale. We demonstrate high-performance organic field-effect transistors (OFETs) with a mobility of approximately 2.5cm2/V susing nanogroove gate-dielectrics formed by nanoimprinting. The preferred flow of charge carriers in OFETs parallel to the nanogrooves yields a high mobility anisotropic ratio (above 220), providing a built-in autopattern organic semiconductor function with nanoscale resolution. This nanostructure embedded device has great potential for use in the manufacture and lithography-free patterning of organic semiconductor films in integrated circuits. [J31]

"Methodologies for Developing Surface-Enhanced Raman Scattering (SERS) Substrates for Detection of Chemical and Biological Molecules"

This paper describes methodologies for developing efficient surface-enhanced Raman scattering (SERS) substrates such as annealing thin gold films for developing gold nanoislands, fabrication of nanopillars arrays and roughened films by employing focused ion beam (FIB) milling of gold films, as well as overcoating deep-UV-fabricated silicon nanowires with a layer of gold film. Excitation of surface plasmons in these gold nanostructures leads to substantial enhancement in the Raman scattering signal obtained from molecules lying in the vicinity of

the nanostructure surface. In this paper, we perform comparative studies of SERS signals from molecules such as p-mercaptobenzoic acid and cresyl fast violet attached to or adsorbed on various gold SERS substrates. It was observed that gold-coated silicon nanowire substrates and annealed gold island substrates provided considerably higher SERS signals as compared to those from the FIB patterned substrates and planar gold films. The SERS substrates developed by the different processes were employed for detection of biological molecules such as dipicolinic acid, an excellent marker for spores of bacteria such as Anthrax. [J32]

"Measuring Entropy Generated by Spin-Transfer"

We present an experimental protocol that allows the entropy generated by spin-transfer to be measured. We investigate the effect of strong spin injection on a ferromagnetic nanostructure, focusing on the quasi-static equilibrium states of a single magnetic domain. We measure the response of the magnetoresistance to a temperature excitation as a function of the magnetic field for different values of the injected current. This quantity is related to the thermal susceptibility of the ferromagnetic wire through the anisotropic magnetoresistance. We deduce the ferromagnetic entropy generated by spin injection by a thermodynamic Maxwell relation. We applied this protocol to single contacted Ni nanowires obtained by electrodeposition in a nanoporous template. We observe that the entropy produced by the spin injection is a linear function of the current and reaches 60% of the initial entropy of the system for 5 ?? 107A/cm2. This study shows that the effect of the spin-transfer in these samples results in the generation of incoherent excitations instead of rotation of the magnetization. [J33]

"Superhydrophilic TiO 2 surface without photocatalytic activation"

Since the discovery of extreme surface wetting phenomenon induced by ultraviolet photocatalysis, TiO2has become the material of choice for environmental friendly applications such as self-cleaning coatings. Nevertheless, it remains a significant challenge to realize surfaces exhibiting persistent superhydrophilicity but without the need of external stimuli. We report a bioinspired TiO2nanostructure that shows extreme superhydrophilicity without the need of light activation, and with stability against successive wetting-dewetting cycles. This ultimate TiO2wetting surface exhibits high transmittance from near ultraviolet to the infrared, thus enabling practical antifogging technologies where transparency is critical. [J34]

"Proposal for an Inversionless Tunable Far-Infrared and THz Room-Temperature Laser on a Quantum Well Semiconductor Nanostructure"

On the basis of density matrix formalism a mathematical model describing lasing in quantum well semiconductor nanostructures is developed. In its frame, an inversionless room-temperature operating amplifier or laser widely tunable in the far-infrared and terahertz (THz) region is suggested. Its working frequency can be varied by several times via the simple change of the mid-infrared pump power. For the pump beam intensity I = 2.9 Ч 107W/cm2the output frequency of such a device is expected to be 1.27 THz and the corresponding gain 0.73 cm-1. For I = 8.6 Ч 107W/cm2its working frequency is 1.9 times higher and the gain reaches 10.95 cm-1. The suggested amplifier or laser is expected to operate in the pulsed mode and to be used as a compact and convenient tunable source of the far-infrared and THz radiation for fundamental studies and various applications. [J35]

"A Flat Heat Pipe Architecture Based on Nanostructured Titania"

A novel 3 cm Ч 3 cm Ч 600 μm-thick Ti-based flat heat pipe is developed for Thermal Ground Plane (TGP) applications. The Ti-based heat pipe architecture is constructed by laser welding two microfabricated titanium substrates to form a hermetically sealed vapor chamber. The scalable heat pipes' flat geometry facilitates contact with planar heat sources, such as microprocessor chip surfaces, thereby reducing thermal contact resistance and improving system packaging. Fluid transport is driven by the wicking structure in the TGP, which consists of an array of Ti pillars that are microfabricated from a titanium substrate using recently developed high-aspect-ratio Ti processing techniques. The hydrophilic nature of the Ti pillars is increased further by growing ~200-nm hairlike nanostructured titania of the pillar surfaces. The resulting super hydrophilic wick offers the potential to generate high wicking velocities of ~27.5 mm/s over distances of 2 mm. The experimental wetting results show a diffusive spreading behavior that is predicted by Washburn dynamics. The maximum effective thermal conductivity of a heat pipe is directly related to the speed of capillary flow of the working fluid through the wick and is measured experimentally in the first-generation device to be k = 350 W/m · K. A dummy TGP with a cavity volume of ~170 μL was used to test the hermiticity level of the laser packaging technique. The device gave a 0.067% of water loss based on ~60 μL of charged water at 100°C in air for over a year. [J36]

"Sequential Plasma-Activated Bonding Mechanism of Silicon/Silicon Wafers"

To investigate the sequentially plasma-activated bonding (SPAB) mechanism of silicon/silicon wafers, the surface

hydrophilicity, and the interface voids, nanostructures and chemical compositions that control the bonding quality, such as bonding strength, have been observed. Although the sequentially plasma-activated surfaces are hydrophilic, the SPAB mechanism is not identical to the hydrophilic bonding. SPAB shows high bonding strength at room temperature and water rearrangement below 150°C, which removes the water from the interface to the bulk. This results in a thinner amorphous silicon oxide layer at the interface. Further heating of the bonded wafers desorbs water from the bulk. The heating at 225°C starts producing hillocks at the interface, which turn into voids at temperatures above 400°C for absorbing the hydrogen gas produced from the desorbed water at the interface. The new and bigger voids are due to the hydrogen gas at 600°C and start accumulating at 800°C, resulting in bubbles caused by the accumulation of voids at the preferential sites. No nitrogen exists either in silicon or in the amorphous SiO2layer at the interface. The Si-L2, 3edges from the amorphous silicon oxide at the bonded interface are identical to those of the standard SiO2. [J37]

"Molecular dynamics simulations of the internal temperature dependent diffusing and epitaxial behaviors of Pd-Ag cluster beam deposition"

The molecular dynamics simulations are applied to study the internal temperature dependence of diffusing and structural properties of Pd1-xAgxbimetallic clusters and the corresponding epitaxial behaviors of deposited nanostructure on the Pd substrate in this research. In the alloy cluster, Ag atoms are found to have higher activities than Pd atoms and play a role of improving the diffusibility of Pd atoms. The analysis of the mean spreading index indicates that the surface segregation phenomena due to the different surface energy of atoms are obvious if the internal temperature of the cluster is high enough. The radial composition distributions show that the Pd-core/Ag-shell structure of the cluster of 249 atoms is obtained when the internal temperature is above 770 K. The clusters of high internal temperature deposited on the substrate also present better epitaxy than that of low internal temperature as the mean spreading index. Because of the difference of the radius of Pd and Ag, the increase in the Ag atoms of the deposited cluster doesn't contribute to the epitaxial growth and only enhances the mean spreading index. The evaluations of atomic epitaxfactors for the cluster-assembled film reveal that some grain boundaries of (111) planes are formed during the cluster deposition process as well as the scattered nonepitaxial atoms. These nanostructures of low epitaxy would induce internal stresses of the cluster-assembled film and hence affect the mechanical and thermal properties of the thin film. [J38]

"Electron microscopy characterization of hexagonal molybdenum trioxide (MoO 3) nanorods"

A simple low-temperature chemical method to produce metastable hexagonal phase molybdenum oxide (h-MoO3)nanorods and their excellent structural characteristics has been demonstrated. In this approach, h-MoO3samples were prepared by precipitating molybdenum oxide from an ammonium paramolybdate solution by the adding nitric acid. The structure of h-MoO3nanorods was examined in detail using high-resolution scanning electron microscopy (SEM) and high-resolution transmission electron microscopy (HR-TEM). The SEM data reveal that the nanorod h-MoO3crystals have the shape of straight hexagonal rods with an aspect ratio 60. The HR-TEM results confirm the hexagonal structure of the MoO3nanocrystals. Computations of the observed TEM data along with x-ray diffraction pattern further confirm the stability of the nanostructure of h-MoO3rods. [J39]

"Influence of nanostructure on charge transport in Ru O 2 thin films"

Polycrystalline thin films of RuO2were grown on fused-quartz substrates and a parametric study was carried out to probe the influence of film nanostructure on the four-point Van der Pauw resistivity and Hall coefficient. The films were grown via reactive rf magnetron sputtering of a Ru target in an Ar/O2plasma using deposition rates from 0.27to3.5E/sand substrate temperatures from 16to500°C. Room-temperature resistivities of the RuO2films ranged from 58to360mu Omega cm. Upon first heating following deposition, some films showed decreasing resistivity with increasing temperature, but the resistivities also decreased upon subsequent cooling suggesting that the annealing treatment reduces the film defect density. The temperature coefficient of resistance was found to be small (<0.001K-1)in agreement with previous investigations. Hall coefficient measurements of the polycrystalline thin films demonstrated that either n-type or p-type majority carriers can be present depending on deposition conditions and the resulting nanostructure, in contrast to single-crystal RuO2, which is an n-type metal. Grain size and homogeneous strain within the films were measured by x-ray diffraction and are correlated to the majority carrier type. [J40]

"Photoemission from localized surface plasmons in fractal metal nanostructures"

We use photoemission microscopy to characterize localized surface plasmon distributions in nanostructured gold layers on indium-tin-oxide/glass substrates. The Au films have a fractal dimension of 1.3and smallest feature sizes of 100nm. We use femtosecond laser pulses at a wavelength of 800nmfor the plasmon excitation.

Photoelectron emission occurs by a three-photon process in localized areas of indium-tin-oxide with 70nmdiameter. In these areas the photoemission rate is enhanced several thousand fold compared to nonstructured surface areas. The results show that plasmon enhanced photoemission can be induced in a nonabsorbing material in proximity to a plasmon-active metal nanostructure. [J41]

"Surface plasmon density of states at the metal-dielectric interface: Dependence of metal layer thickness and dielectric material"

We calculate theoretically the dispersion curves and surface plasmon (SP) density of states (DOS) at the interface between gold and silver nanostructures and a dielectric medium. The SP DOS for the gold nanostructure has two maxima, one at the SP absorption wavelength, and another at a redshifted wavelength from the SP absorption due to scattered SP modes, whereas for the silver nanostructure there is only one maximum at the SP absorption wavelength. When the thickness of the metal increases, the SP DOS at the interface decreases due to the reduced coupling between the top and the bottom metal SP modes, and the electron oscillation damping loss in the thick metal. The incremental change of the SP wave vector and the DOS are also observed with increasing dielectric constant of the material on top metal layer. Previous experimental results on interactions between semiconductor excitons and nanostructured Ag/AuSPs are considered and explained using such SP DOS. [J42]

"Low-dimensional oxide nanostructures on metals: Hybrid systems with novel properties"

Oxide nanostructures in low dimensions on well-defined metal surfaces form novel hybrid systems with tremendous potential and impact in fundamental research and for the emerging nanotechnologies. In contrast to bulk materials low-dimensional oxide nanostructures not only involve a large number of undercoordinated atoms but their interaction with the metal substrate also provides constraints on their structure and morphology and often yields elastic strain and/or uncompensated charge. These factors modify significantly the physical and chemical properties of the nanophases as compared to bulk oxides. In this review the authors will examine critically the available data with respect to structure-property relationships of metal-supported oxide nanostructures in reduced dimensions. The connection between structure, elastic strain, and charge transfer on the one hand, and electronic and magnetic behavior on the other one, will be discussed. The novel chemical properties of the oxide-metal nanostructure systems will provide another focus of this review. [J43]

"Target-Localized Nanograting-Based Surface Plasmon Resonance Detection toward Label-free Molecular Biosensing"

We explore the sensitivity enhancement of label-free detection based on localized surface plasmon resonance using surface-relief nanograting structures. A nanograting structure was modeled, so that target molecular interactions are localized in hot spots of the near fields. The nanograting structure was optimized numerically for the highest enhancement of sensitivity with hybridization between complementary strands of DNA as the model target interaction. Experimentally, angled evaporation was performed to fabricate the target-localized nanograting samples. Measured data confirm the numerical results that sensitivity enhancement by an order of magnitude may be feasible on a per-unit-volume basis through target localization. [J44]

"Optical switching of a metamaterial by temperature controlling"

We have fabricated a metamaterial of metal/semiconductor/metal sandwich nanostrips structure comprising a pair of gold strips and a vanadium dioxide (VO2)strip. The optical response of the metamaterial has been studied. The results indicate the nanostructure with VO2strips can be used as a temperature-controlling optical switch and the mechanism of this switch can be explained by the magnetic resonance. [J45]

"Cosensitized Solar Cells Based on a Flower-Like ZnO Nanorod Structure"

We shall present a cosensitized solar cell with sequentially assembled CdS quantum dots (QDs) and black dye on a flower-like ZnO rod nanostructure. As revealed by UV-vis absorption spectrum and scanning electron microscopy CdS QDs and black dye can be effectively adsorbed onto a flower-like ZnO nanorod array. Besides acting as a sensitizer, CdS QDs layer helps to prevent formation of Zn2+/dye complex. CdS QDs also provide intermediate energy levels for excited electron transfer from black dye to ZnO film. A power conversion efficiency as high as 3.26% was achieved for CdS QD and black dye cosensitized ZnO photoanode under the illumination of one Sun (AM1.5G, 100 mW/cm2). [J46]

"Investigation of Sub-10-nm Diameter, Gate-All-Around Nanowire Field-Effect Transistors for Electrostatic Discharge Applications"

Electrostatic discharge (ESD) robustness of a promising nanoscaled device, the gate-all-around nanowire field-effect transistor (NW FET), was characterized for the first time using the transmission-line pulsing technique. The effects of gate length, nanowire dimension, and nanowire count on the failure current, leakage current, trigger voltage, and on-resistance were investigated. ESD performances of the gate-all-around NW FET and other nanostructure devices, such as the poly-Si nanowire thin-film transistor and FinFET were also compared and discussed. [J47]

"Carbon nanotube-Si diode as a detector of mid-infrared illumination"

We report a room temperature mid-infrared photodetector based on a carbon nanotube-silicon heterojunction nanostructure. The observed mid-infrared band (8-12mcm)in the photocurrent spectrum is consistent with the estimated band gap energy of semiconducting multiwall nanotubes (15 to 30 nm diameter). The fast response time (16 ms) and small temperature change (10-8K)upon infrared light suggest that the photocurrent response is not due to bolometric effect. We determined that the primary mechanism of the photocurrent in this spectral range is associated with photon absorption of semiconducting multiwalled carbon nanotubes followed by charge separation at the interface, their transport, and collection at the external electrodes. [J48]

"Integrated Nanostructure-Semiconductor Molecular Complexes as Tools for THz Spectral Studies of DNA"

The study of the THz spectral properties of DNA is facilitated by the use of integrated nanostructure-biomolecule structures since they provide: 1) a means of monitoring correlations in DNA THz spectra with molecular conformation; 2) a means of identifying specific DNA molecules in samples being characterized via THz signatures; and 3) a means of single-molecule detection. Specifically, molecular beacons, based on single strands of DNA, are used as hybridization probes that can potentially detect single nucleotide polymorphisms. This technique combines the use of semiconductor quantum dots (QDs) that fluoresce and the gold nanoparticles as a quencher moiety. This QD-oligonucleotide complex can recognize and pair with its complementary DNA strand. This high affinity of DNA oligonucleotides for its complementary strand has been used to form a simple semiconductor probe for ultra sensitive DNA detection. MicroRaman (Г‚ВїRaman) signatures of DNA self-assembled on a variety of substrates will be discussed in terms of the THz spectra of DNA. This study will highlight the fabrication of the substrates, AFM and Raman analyses of these DNA-functionalized substrates and the use of these substrates to understand THz spectra of DNA under a variety of conditions, as well as the photoluminescence spectra of the DNA-nanoparticle complexes to study the molecular conformation changes and study of single polynucleotide polymorphism. [J49]

"Distance-controlled scattering in a plasmonic trap"

Light scattered by a dielectric object when it is trapped in the field of a plasmonic nanostructure is studied theoretically and experimentally using both dielectric spheres and S. cerevisiae cells. A dramatic enhancement of the scattered light is observed for short separation distances between scatterer and plasmonic trap. It is shown that this effect can serve to selectively image cells after their immobilization and distinguish them from a turbid background. The high sensitivity of the scattered light to the separation distance and lateral displacement also provides additional insights in the configuration of the cell within the trap. [J50]

"Optical Characterization of a 1-D Nanostructure by Dark-Field Microscopy and Surface Plasmon Resonance to Determine Biomolecular Interactions"

This paper presents a multifunctional imaging system that combines dark-field microscopy (DFM) with spectroscopy to image nanostructures and identify their optical properties from absorption spectra. The optical resolving power of this system is determined using a 1-D nanostructure with pitches of 120, 390, and 770 nm with four formats of optical disks. These pattern sizes are verified by atomic force microscopy (AFM) first. The results demonstrate that the resolving power of current system setup can down to 86 nm. The resultant DFM images appear to be slightly larger than the AFM images. A 50-nm-thick gold film was then deposited on top of these nanostructures, and their absorption spectra were obtained to elucidate its optical properties, enhanced by surface plasmon resonance. The immobilization of streptavidin on the surface of gold-coated nanostructure causes the absorption spectra to shift from 600 to 610 nm. A protein nanoarray with a dot size of 50 nm was also imaged by DFM, and can be implemented as a potential biochemical diagnostic system on an optical disk format. Specimens of adenocarcinoma cells and ovary cancer cells were also imaged using this DFM system, and the nuclei structure and some cellular organs can be recognized using a 100Г‚В— objective oil lens. [J51]

"Metamaterial as a controllable template for nanoscale field localization"

We report that subwavelength localization of light in the near-field of a double-periodic photonic metamaterial may be efficiently controlled by the polarization and wavelength of the incident radiation. A dramatic variation in the periodic near-field landscapes, including a transition from a pattern of isolated subwavelength plasmon hot-spots to a blurred, low contrast pattern, accompanied by a change in the pattern's symmetry has been observed in the proximity of an aluminum nanowire "fish-scale" nanostructure. Hot-spots as small as 0.23lambda have been achieved and their position has been controlled by tuning the wavelength of incident light across the dipole absorption resonance of the metamaterial. A simple switch of the polarization state can lead to a spatial period doubling in the landscape pattern. [J52]

"The influence of coiled nanostructure on the enhancement of dielectric constants and electromagnetic shielding efficiency in polymer composites"

We report through a comparison of the electromagnetic properties of polymer composites constituted of linear and nonlinear (helically coiled) carbon nanotubes (CNTs) that the electromagnetic interference (EMI) shielding efficiency could be much increased in the latter. A higher ac conductivity and relative dielectric permittivity (both epsilon 'and epsilon ") was recorded when coiled structures were used, and was ascribed to enhanced capacitive and electric field depolarization effects. The EMI shielding was related to the extended length/diameter aspect ratio of the CNTs. Our study has implications in the design of materials for EMI shielding, where nanostructure geometry could play a major role. [J53]

"Direct investigation on conducting nanofilaments in single-crystalline Ni/NiO core/shell nanodisk arrays"

We report resistive switching characteristics of single-crystalline Ni/NiO core/shell nanodisk arrays, in which the conducting filaments are highly localized on the surface of nanostructure. The local current distributions observed in such a single-grained nanodisk demonstrate that the contact area and the contact time between the conductive tip of conducting atomic force microscopy and the surface of nanodisk critically influence the voltage-stress-induced electroforming behaviors of nanofilaments in NiO switching nanoblocks. These contact parameters, such as the contact area and the contact time, are interpreted to the electrode size and the voltage-stress time for the formation of filaments in metal oxides. [J54]

"Magnetoelectric and multiferroic properties of variously oriented epitaxial BiFeO 3 -CoFe 2 O 4 nanostructured thin films"

We report the ferroelectric, ferromagnetic, and magnetoelectric (ME) properties of self-assembled epitaxial BiFeO3-CoFe2O4(BFO-CFO) nanostructure composite thin films deposited on (001), (110), and (111) SrTiO3(STO) single crystal substrates. These various properties are shown to depend on orientation. The maximum values of the relative dielectric constant, saturation polarization, longitudinal piezoelectric coefficient, saturation magnetization, and ME coefficient at room temperature were 143, 86mcm/cm2, 50 pm/V, 400 emu/cc, and 20mV/cm Oe, respectively. [J55]

"Hydrogen in plasma-nanofabrication: Selective control of nanostructure heating and passivation"

The possibility of independent control of the surface fluxes of energy and hydrogen-containing radicals, thus enabling selective control of the nanostructure heating and passivation, is demonstrated. In situ energy flux measurements reveal that even a small addition of H2to low-pressure Ar plasmas leads to a dramatic increase in the energy deposition through H recombination on the surface. The heat release is quenched by a sequential addition of a hydrocarbon precursor while the surface passivation remains effective. Such selective control offers an effective mechanism for deterministic control of the growth shape, crystallinity, and density of nanostructures in plasma-aided nanofabrication. [J56]

"In situ peeling of one-dimensional nanostructures using a dual-probe nanotweezer"

We reported a method for in situ peeling force measurement of one-dimensional nanostructures using a dual-probe nanotweezer, which is developed on the principle of force microscopy. Benefiting from capabilities of image scanning and accurate force sensing, the nanotweezer is capable of positioning one-dimensional nanostructures deposited on a surface and then performing in situ peeling tests with pick-and-place operations at different peeling locations of interest along a selected nanostructure. In experiments, nanoscale peeling of silicon nanowires (SiNWs) on a silicon substrate has been studied. Peeling locations at the end and in the middle of the SiNW were tested and the results indicate that approximate peeling energies are needed. [J57]

"In Situ Electron Microscopy Mechanical Testing of Silicon Nanowires Using Electrostatically

Actuated Tensile Stages"

Two types of electrostatically actuated tensile stages for in situelectron microscopy mechanical testing of 1-D nanostructures were designed, microfabricated, and tested. Testing was carried out for mechanical characterization of silicon nanowires (SiNWs). The bulk micromachined stages consist of a comb-drive actuator and either a differential capacitive sensor or a clamped-clamped beam force sensor. High-aspect-ratio structures (height/gap = 20) were designed to increase the driving force of the geometrically optimized actuator and the sensitivity of the capacitive sensor. The actuator stiffness is kept low to enable high tensile force to be exerted in the specimen rather than in the suspensions of the comb drive. Individual SiNWs were mounted on the devices by in situscanning electron microscopy nanomanipulation, and their tensile properties were determined to demonstrate the device capability. The phosphorus-doped SiNWs, which were grown in a bottom-up manner by the vapor-liquid-solid process, show an average Young's modulus of (170.0 ?? 2.4) GPa and a tensile strength of at least 4.2 GPa. Top-down electroless chemically etched SiNWs, with their long axis along the [100] direction, show a fracture strength of 5.4 GPa. [J58]

"Atomistic model of the spider silk nanostructure"

Spider silk is an ultrastrong and extensible self-assembling biopolymer that outperforms the mechanical characteristics of many synthetic materials including steel. Here we report atomic-level structures that represent aggregates of MaSp1 proteins from the N. Clavipes silk sequence based on a bottom-up computational approach using replica exchange molecular dynamics. We discover that poly-alanine regions predominantly form distinct and orderly beta-sheet crystal domains while disorderly structures are formed by poly-glycine repeats, resembling 31-helices. These could be the molecular source of the large semicrystalline fraction observed in silks, and also form the basis of the so-called "prestretched" molecular configuration. Our structures are validated against experimental data based on dihedral angle pair calculations presented in Ramachandran plots, alpha-carbon atomic distances, as well as secondary structure content. [J59]

"Distinct C 60 growth modes on anthracene carboxylic acid templates"

Two anthracene carboxylic acid (AnCA) self assembly structures on Ag(111) were employed to investigate the template effects on sequentially deposited C60molecules using scanning tunneling microscope. The initial AnCA structures execute strong modulations on C60growth. Either laterally separated AnCA-C60elongated domain arrays or an "epitaxial" C60dimer structure over AnCA can be formed depending on the selected AnCA template. These distinct C60growth modes are closely related to the structural stability of the AnCA templates. Our studies suggest a pathway of molecular nanostructure fabrication through the choice of suitable template. [J60]

"Synthesis of PbTe/Pb quasi-one-dimensional nanostructure material arrays by electrodeposition"

The ordered PbTe/Pb quasi-one-dimensional nanowires array was electrodeposited on the SiO2/Sisubstrate. There are two essential factors for the formation of such kind of change in nanowire morphology and structure. One is the charges distribution at the tips of electrodeposit, the other one is the change in ion concentration in front of growth tip. We research the current versus bias voltage characteristics of single PbTe/Pb nanowire by four-probe scanning tunneling microscopy system. [J61]

"Surface-enhanced fluorescence of praseodymium ions (Pr 3+) on silver/silicon nanostructure"

The enhanced fluorescence of praseodymium ions (Pr3+)owing to resonant plasma oscillation on the surface of Ag/Si nanostructure was investigated. When Ag/Si nanomaterials were added, the fluorescence peaks were markedly enhanced. A typical 12- to 40-fold enhancement at 604 nm and 18- to 193-fold enhancement at 640 nm could be achieved over a range of concentration from 0.01 to 0.05 M praseodymium ions, which had larger enhancement factor than that caused by unsupported silver nanoparticles. These results might be explained by the local field overlap originated from the closed and fixed silver nanoparticles on silicon nanowires. [J62]

"Localized exciton emission from ZnO nanocrystalline films"

ZnO nanocrystalline films were grown using In2O3nanostructure as template by pulsed laser deposition. A strong emission at 3.372 eV dominates the low temperature photoluminescence (PL) spectra. Combined with annealing and surface passivation process, it is indicated from temperature-dependent PL results that the emission could be attributed to recombination of localized excitons. The low probability that localized excitons decay through nonradiative recombination centers may contribute to the efficient luminescence at low temperature. It was suggested that disorder introduced by grain boundaries is responsible for the exciton localization. [J63]

"Localized heating induced chemical vapor deposition for one-dimensional nanostructure

synthesis"

Localized heating has emerged as a viable technique for the site specific synthesis of one-dimensional (1D) nanostructures. By localizing the heat source, the extent of chemical vapor deposition synthesis reactions can be confined to well-defined, microscale regions. Resistive heating has been extensively used to realize highly localized regions of elevated temperature while maintaining a microelectronics-compatible thermal environment elsewhere. Other localized heating methods are being pursued as well. Overall, the approach is simple, flexible, and robust, and offers unique opportunities in 1D nanostructure synthesis, characterization, and integration. Herein, the recent progress of these techniques is reviewed and discussed. [J64]

"Tunable Photonic Oscillators Using Optically Injected Quantum-Dash Diode Lasers"

An analytical approximation is described and experimentally verified for predicting the resonance frequency of an optically injected quantum-dash Fabry-Pe??rot laser in the period-one (P1) state. Due to the large spontaneous and nonlinear carrier relaxation rates measured in nanostructure lasers, the P1 resonance frequency is modified appreciably. The function presented accounts for these effects, and it also identifies the role of the linewidth enhancement factor of the optically injected slave laser. The resulting equation is shown to improve the P1 resonance frequency calculation when compared to previous models. Calculating the P1 resonance frequency is critical in using optically injected lasers as a building block for tunable photonic oscillators. [J65]

"Radiation emission from wrinkled SiGe/SiGe nanostructure"

Semiconductor optical emitters radiate light via band-to-band optical transitions. Here, a different mechanism of radiation emission, which is not related to the energy band of the materials, is proposed. In the case of carriers traveling along a sinusoidal trajectory through a wrinkled nanostructure, radiation was emitted via changes in their velocity in a manner analogous to synchrotron radiation. The radiated frequency of wrinkled SiGe/SiGe nanostructure was found to cover a wide spectrum with radiation power levels of the order of submilliwatts. Thus, this nanostructure can be used as a Si-based optical emitter and it will enable the integration of optoelectronic devices on a wafer. [J66]

"The Nanostructured High Strength High Conductivity Cu Matrix Composites With Different BCC Metals Strengthening Filaments"

The nanostructured microcomposites with FCC (Face Centered Cubic lattice) copper metal matrix and BCC (Body Centered Cubic lattice) metal strengthening filaments uniformly distributed in copper matrix are characterized by specific unique combination of physical and mechanical properties that distinctly differs from the properties of coarse grained macrocomposite materials. The experimental investigation on the influence of the nature of BCC strengthening elements is presented. Cu-Nb, Cu-V and Cu-Fe microcomposite wires have been designed and produced with the use of the same fabrication approach. The main mechanisms of microstructure transformation for all three composite materials have been analyzed. The possibility to attain the optimum microstructure with extremely high volume fraction of internal phase boundaries for each of the investigated microcomposites has been estimated. The data on the mechanical strength and electrical conductivity of Cu-Nb, Cu-V and Cu-Fe microcomposites are presented. The correlations the attained mechanical strength and conductivity with microstructure parameters are analyzed. [J67]

"Evaporation of Tetrapod ZnO Nanostructures and Its Influence on the Field-Emission Performance"

The ZnO cathode is a promising electron source due to its excellent field-emission performance. In this letter, we investigate the evaporation characteristics of the field emitters in a screen-printed ZnO cathode by a quadrupole mass spectrometer, energy-dispersive X-ray, and scanning electron microscopy. As the experiments show, the oxygen and zinc start to be evaporated if the temperature is higher than 1273 K. The quantity of evaporative materials increases with the increment of temperature, and the quantity of evaporated oxygen is much larger than that of zinc. The evaporations of oxygen and zinc have considerable effects on the field-emission properties of the ZnO cathode, particularly the turn-on field, the threshold electric field, and the emission current density. Therefore, the evaporation of field emitters is an important factor for the stability of the field-emission current. [J68]

"Ferromagnetic resonance and magnetoelastic demodulation in thin active films with an uniaxial anisotropy"

The results of experimental and theoretical studies of ferromagnetic resonance (FMR) and magnetoelastic excitations near the spin reorientation transition (SRT) in an uniaxial TbCo2/FeColayered nanostructure and a

La0.7Sr0.3MnO3film are reported. Experimental dependences of the amplitude of the reflected microwave signal versus the external magnetic field strength are presented in comparison with the theoretical ones. An increase in FMR reflectivity in the vicinity of SRT is clearly demonstrated. Low frequency magnetoelastic excitation of flexural vibrations of the samples by means of modulated microwave electromagnetic field is observed experimentally using a laser beam deflection technique. The increase in amplitude of vibrations at modulation frequency under combined FMR and SRT conditions is observed in agreement with the theory. [J69]

"ZnO Devices and Applications: A Review of Current Status and Future Prospects"

ZnO is an attractive material for applications in electronics, photonics, acoustics, and sensing. In optical emitters, its high exciton binding energy (60 meV) gives ZnO an edge over other semiconductors such as GaN if reproducible and reliable p-type doping in ZnO were to be achieved, which currently remains to be the main obstacle for realization of bipolar devices. On the electronic side, ZnO holds some potential in transparent thin film transistors (TFTs) owing to its high optical transmittivity and high conductivity. Among the other promising areas of application for ZnO are acoustic wave devices, due to large electromechanical coupling in ZnO, and devices utilizing nanowires/nanorods such as biosensors and gas sensors and solar cells, since it is relatively easy to produce such forms of ZnO nanostructures, which have good charge carrier transport properties and high crystalline quality. Despite the significant progress made, there is still a number of important issues that need to be resolved before ZnO can be transitioned to commercial use, not to mention the stiff competition it is facing with GaN, which is much more mature in terms of devices. In this paper, recent progress in device applications of ZnO is discussed and a review of critical issues for realization of ZnO-based devices is given. [J70]

"Toward Low-Cost, High-Efficiency, and Scalable Organic Solar Cells with Transparent Metal Electrode and Improved Domain Morphology"

We review our recent progress toward realizing future low-cost, high-efficiency, and scalable organic solar cells (OSCs). First, we show that the transparent electrodes based on metallic nanostructure is a strong candidate as a replacement of conventional indium tin oxide (ITO) electrode due to their superior properties, such as high optical transparency, good electrical conductivity, and mechanical flexibility, and the versatility that these properties can be adjusted independently by changing the linewidth and thickness of the metal grid structure. Furthermore, we exploited the unique optical properties due to the excitation of surface plasmon resonance by the metallic nanogratings to enhance the light absorption of organic semiconductors, and demonstrated enhanced power conversion efficiency than devices made using ITO electrode. In addition, we also investigated a new device fabrication process with a focus on the photoactive layer formation, which produces the most optimum bulk-heterojunction morphology compared with conventional annealing-based methods. Finally, we successfully demonstrated that these approaches are scalable to large-area and high-speed roll-to-roll processes. We believe that the works highlighted in this paper represent one step forward to realizing low-cost, high-efficiency, and large-area OSCs. [J71]

"Influence of the As 2 /As 4 growth modes on the formation of quantum dot-like InAs islands grown on InAlGaAs/InP (100)"

The formation process of InAs quantum dashes and quantum dots (QDs) grown on quaternary InAlGaAs surfaces lattice-matched to n-type InP(100) are investigated. A clear trend of the InAs to form dashes or dots depending on the species of supplied arsenic could be demonstrated. Using As4, elongated quantum dashes can be observed. Changing the growth mode to As2molecules enables a shape transition from dashes to dome-shaped QDs. The dot ensembles exhibit improved photoluminescence (PL) intensity and linewidth over their elongated counterparts. With this basic concept, low temperature PL linewidths as low as 23 meV have been achieved. [J72]

"Control of Coercivity in Exchange-Coupled Graded (001) Nanocomposite Films"

We fabricated exchange-coupled composite films with perpendicular anisotropy using nanograms of L10FePt as a magnetically hard base layer and FePt: SiO2as a relatively soft phase. The degree of anisotropy and nanostructure in the soft layer was controlled by varying the deposition temperature. Growth of the low-anisotropy layer followed the particulate structure of the base layer at deposition temperatures of 390Г‚В°C or greater. Perpendicular coercivities were strongly dependent on both the anisotropy and thickness of the softer layer. [J73]

"Nanograss and nanostructure formation on silicon using a modified deep reactive ion etching"

Silicon nanograss and nanostructures are realized using a modified deep reactive ion etching technique on both

plane and vertical surfaces of a silicon substrate. The etching process is based on a sequential passivation and etching cycle, and it can be adjusted to achieve grassless high aspect ratio features as well as grass-full surfaces. The incorporation of nanostructures onto vertically placed parallel fingers of an interdigital capacitive accelerometer increases the total capacitance from 0.45 to 30 pF. Vertical structures with features below 100 nm have been realized. [J74]

"Modeling of Stress-Retarded Thermal Oxidation of Nonplanar Silicon Structures for Realization of Nanoscale Devices"

Accurate modeling of stress-retarded orientation-dependent 2-D oxidation is carried out by matching the experimental and simulated oxide thicknesses of silicon FIN nanostructures over a wide range of temperatures and times in dry oxygen. Experimentally observed initial oxidation rate enhancement, orientation-dependent stress retardation, and self-limiting phenomena are modeled, and a new universal stress retardation parameter set is obtained for the first time. The new parameter set has been validated against oxidation experiments presented here and those reported in the literature. Furthermore, the new model is used to explore silicon nanowire shape engineering. [J75]

"Synthesis and growth mechanism of long ultrafine gold nanowires with uniform diameter"

Homogeneous Au nanowires with 1.5 nm diameters and lengths of over 100mcmwere synthesized in an oleylamine matrix via the simple reduction of aurichloride in a limited reaction temperature range around 85 °C. Oleylamine has multifunctional roles as solvent, surfactant, and reductant, and the surfactant induce anisotropic growth by adsorbing on the specific Au crystalline surface. As a result, Au nanowires were grown along the direction of fcc-Au having many hcp atomic stacks. In this synthesis method, various shapes of Au nanostructures were produced simultaneously and this was strongly dependent on the reaction temperature. Au nanowires were provided by reconstruction from nanoparticles or their agglomeration. The growth mechanism of the Au nanowire in this synthesis was found to be quite unique and different from that for a conventional one-dimensional nanostructure which is obtained by anisotropical growth with supplying atoms from external resources. [J76]

"Structural and antireflective characteristics of catalyst-free GaN nanostructures on GaN/sapphire template for solar cell applications"

We report the structural and antireflective characteristics of catalyst-free GaN nanostructures on GaN/sapphire template for solar cell applications. The formation of GaN nanostructure depends on the growth temperature. At 530 °C, the nucleation of the initial seed due to the enhanced strain leads to the hexagonal closely packed nanorods. As the growth temperature decreases, the depression of atomic Ga transport changes the films into nanocolumns, and then the nanorods. The catalyst-free GaN nanorods have wurtzite structure and good single crystalline quality. The GaN nanorods exhibit a remarkably low reflectance over a wide-angle broadband spectrum, enhancing the antireflective property of GaN surface. [J77]

"Deep levels in GaAs(001)/InAs/InGaAs/GaAs self-assembled quantum dot structures and their effect on quantum dot devices"

Currently lattice mismatch strain-driven three-dimensional coherent island based quantum dots, dubbed self-assembled quantum dots (SAQDs), constitute the most developed class of quantum dots with successful applications to lasers and considerable potential for infrared detectors in the 1-12mcmregime. This is in no small part a consequence of the extensive studies on the formation and control of the islands and on their capping by appropriate overlayer materials under optimal growth conditions. By contrast, surprisingly few studies have been reported on the presence and nature of the deep levels in SAQD structures, much less direct studies of the impact of deep levels on SAQD based device characteristics. The latter is of particular significance to devices such as detectors that require large numbers of SAQD layers [i.e., multiple quantum dot (MQD) structures] and are thus increasingly prone to accumulating strain-induced defect formation with increasing numbers of quantum dot layers. In this paper, we report the results of a study of the density, energy profile, and spatial profile of deep levels in different regions of GaAs(001)/InAs/InGaAs/GaAs SAQD structures in which the InGaAs/GaAs capping layers have been grown at different growth conditions. Different types of deep levels are found in different regions and, as expected, their densities are found to increase in the presence of the SAQDs. The study shows that it is the density of deep levels in the GaAs capping layer, forced to be grown at the low temperature of 500 °Cto suppress In outdiffusion, which has a significant adverse impact on quantum dot device characteristics. Their density can be reduced by growth conditions such as migration enhanced epitaxy that permit high quality overgrowths at temperatures as low as 350 °C. Nevertheless, t- he ultimate performance limitation of thick MQD based devices resides in the ability to realize low density of the deep levels relative to

the density of SAQDs. [J78]

"Anisotropic SmCo 5 nanoflakes by surfactant-assisted high energy ball milling"

Crystallographically anisotropic SmCo5nanoflakes were fabricated directly by one-step surfactant-assisted high energy ball milling (HEBM) of Sm17Co83ingot powders for 5 h in heptane and oleic acid (OA) without preprocessing or further annealing. The SmCo5nanoflakes have a strong [001] out-of-plane texture. The thickness of nanoflakes is in the range of 8-80 nm while their length is 0.5-8mcm. The surfactant OA plays an important role in the formation of SmCo5nanoflakes. HEBM of SmCo5ingots in heptane without OA resulted in the formation of magnetically isotropic more or less equiaxed SmCo5particles with a size of 2-30mcm. Closely packed "kebablike" SmCo5nanoflakes were formed by HEBM in heptane with 15wt %OA. HEBM in 150wt %OA led to well-separated nanoflakes instead of the closely packed kebablike nanostructure. This resulted in the enhanced [001] out-of-plane texture. In-plane transmission electron microscope examination showed that the SmCo5nanoflakes were composed of grains with sizes in the range of 4-8 nm. Coercivities of about 18.0 kOe were obtained for the anisotropic SmCo5nanoflakes. [J79]

"Geometry induced entanglement transitions in nanostructures"

We model quantum dot nanostructures using a one-dimensional system of two interacting electrons. We show that strong and rapid variations may be induced in the spatial entanglement by varying the nanostructure geometry. We investigate the position-space information entropy as an indicator of the entanglement in this system. We also consider the expectation value of the Coulomb interaction and the ratio of this expectation to the expectation of the confining potential and their link to the entanglement. We look at the first derivative of the entanglement and the position-space information entropy to infer information about a possible quantum phase transition. [J80]

"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. [J81]

"Exchange coupling and magnetoresistance in CoFe/NiCu/CoFe spin valves near the Curie point of the spacer"

Thermal control of exchange coupling between two strongly ferromagnetic layers through a weakly ferromagnetic Ni-Cu spacer and the associated magnetoresistance is investigated. The spacer, having a Curie point slightly above room temperature, can be cycled between its paramagnetic and ferromagnetic states by varying the temperature externally or using joule heating. It is shown that the giant magnetoresistance vanishes due to a strong reduction in the mean free path in the spacer at above 30%Ni concentration-before the onset of ferromagnetism. Finally, a device is proposed which combines thermally controlled exchange coupling and large magnetoresistance by separating the switching and the readout elements. [J82]

"Effect of laser parameters and assist gas on spectral response of silicon fibrous nanostructure"

This article report, for the first time, the influence of laser parameters on the spectral response of weblike silicon fibrous nanostructures. These nanostructures are formed by femtosecond laser irradiation at megahertz pulse frequency under atmosphere and nitrogen ambient. The observed decreasing in reflectance is correlated with the density of fibrous nanostructures and the size of the agglomerated nanoparticles. Compared to bulk silicon, Raman spectra of fibrous nanostructures shows a downward shift and asymmetric broadening at the first order phonon peak. The shift and broadening are attributed to phonon confinement of fibrous nanostructure. Polarization and nitrogen gas modify the morphology of generated nanomaterials but does not have effect on light absorptance. Pulsewidth and pulse frequency do not have significant effect on light absorptance. [J83]

"Competition between surface trapping and nonradiative energy transfer to gold nanofilm"

Nonradiative resonant energy transfer from CdSeS quantum dot to gold nanofilm was investigated by taking nanosecond and picosecond time resolved photoluminescence measurements. Surface plasma resonant absorption peak of gold nanofilm was adjusted to meet the near resonant conditions with the fluorescence peak

of quantum dot by changing the thickness. Surface trapping state was proved to be the origin of the long lifetime component by comparing fresh and eight months aged quantum dot. It was observed that the excitonic state lifetime of the quantum dots was reduced by nonradiative resonant energy transfer to gold nanofilm. Nonradiative resonant energy transfer time, which was comparable with the surface trapping time, was calculated based on the data of picosecond photoluminescence measurements. No nonradiative energy transfer from surface trapping state to gold nanofilm, thus the lifetime of surface trapping state was not affected obviously. It is suggested that in the assembly combined with quantum dot and gold nanostructure, nonradiative energy transfer will occur after the population of excitonic state, and compete with surface trapping process. The interactions between surface trapping state and gold nanoflim were not exhibited. [J84]

"Magnetodielectric study in SiO 2 -coated Fe 3 O 4 nanoparticle compacts"

The dielectric properties of Fe3O4magnetic nanoparticles with an insulating coating layer of SiO2were investigated. At high temperatures, the changes in the dielectric constant and loss induced by the magnetic field are opposite in sign and strongly frequency-dependent, which originates from extrinsic magnetodielectric coupling-the Maxwell-Wagner effect combined with magnetoresistance. And the interface defects leads to the obvious hysteresis phenomena observed in the measurements. On the other hand, the strong coupling of dielectric and magnetic properties at low temperatures contradicts the Maxwell-Wagner model, suggesting the intrinsic magnetodielectric coupling. Our observations are consistent with the recent polarization switching measurements, which confirm the low-temperature multiferroic state existing in highly lossy Fe3O4. And the core/shell nanostructure may provide a new route to achieve applicable magnetoelectric materials with low loss. [J85]

"Spin-polarized current separator based on a fork-shaped Rashba nanostructure"

A scheme for a spin-polarized current separator is investigated by studying the spin-dependent electron transport of a fork-shaped nanostructure with Rashba spin-orbit coupling (SOC), connected to three leads with the same width. It is found that two spin-polarized currents are of the same magnitude but opposite polarizations can be generated simultaneously in the two output leads when the spin-unpolarized electrons injected from the input lead. The underlying physics is revealed to originate from the different spin-dependent conductance caused by the effects of Rashba SOC and the geometrical structure of the system. Further study shows that the spin-polarized current with a strong robustness against disorder, demonstrates the feasibility of the proposed nanostructure for a real application. [J86]

"Mixed-phase p-type silicon oxide containing silicon nanocrystals and its role in thin-film silicon solar cells"

Lower absorption, lower refractive index, and tunable resistance are three advantages of amorphous silicon oxide containing nanocrystalline silicon grains (nc-SiOx)compared to microcrystalline silicon (mu c-Si), when used as a p-type layer in mu c-Sithin-film solar cells. We show that p-nc-SiOxwith its particular nanostructure increases mu c-Sicell efficiency by reducing reflection and parasitic absorption losses depending on the roughness of the front electrode. Furthermore, we demonstrate that the p-nc-SiOxreduces the detrimental effects of the roughness on the electrical characteristics, and significantly increases mu c-Siand Micromorph cell efficiency on substrates until now considered too rough for thin-film silicon solar cells. [J87]

"Multilayered graphene efficiently formed by mechanical exfoliation for nonlinear saturable absorbers in fiber mode-locked lasers"

An efficiently prepared graphene from a bulk graphite using mechanical exfoliation is experimentally investigated for the first practical application to ultrafast photonics. Overcoming the limitations of the method in its size and atomic layer control, the multilayered graphene guarantees a nonlinear intensity modulation. After confirming its excellent crystal quality and few-layered nanostructure employing Raman analysis and atomic force microscopy the graphene layer is introduced into a fiber laser as an intracavity saturable absorber to realize the passive mode-locking that produces picosecond pulses at the repetition rate of 10.9 MHz. Extinction ratio of the resultant pulsed output is higher than 40 dB. [J88]

"Shape control via surface reconstruction kinetics of droplet epitaxy nanostructures"

We present the fabrication and discuss the growth dynamics of two classes of GaAs quantum nanostructures fabricated by droplet epitaxy, namely, double rings and coupled ring-disks. Their morphological differences has been investigated and found to be originated by the kinetic of the changes in the surface reconstruction around the initially formed Ga droplets during the arsenization step. The control of surface reconstruction dynamics thus

permits a fine tuning of the actual nanostructure shape at the nanoscale, based on pure self-assembling techniques. [J89]

"Reversible ultraviolet light-manipulated superhydrophobic-to-superhydrophilic transition on a tubular SiC nanostructure film"

We demonstrate the ultraviolet (UV) light-induced, reversible wettability behavior for tubular SiC nanostructure film. The as-synthesized tubular SiC nanostructure film shows the superhydrophilic nature with the water contact angle 152.4° and low sliding angle. Moreover, the surface transition between superhydrophobicity and superhydrophilicity can be easily achieved by the alternation of UV irradiation and closed thermal heating. A possible mechanism is also proposed to explain the reversible wettability behavior. [J90]

"Field emission stability and properties of simultaneously grown microcrystalline diamond and carbon nanostructure films"

The temporal stability and electron field emission characteristics of simultaneously grown microcrystalline diamond and carbon nanostructures were investigated. The films were prepared by hot filament chemical vapor deposition using typical diamond deposition parameters, and iron oxide nanoparticles on the molybdenum substrate were employed as catalyst for their induction. The hybrid system presented better emission characteristics compared with microcrystalline diamond with turn-on fields as low as 2.45V/mcm(at 1mu A/cm2), and a current density of up to 0.24mA/cm2was achieved. The films showed relatively stable emission behavior for a period of 24 h. [J91]

"Defect-free etching process for GaAs/AlGaAs hetero-nanostructure using chlorine/argon mixed neutral beam"

The authors studied a GaAs/Al0.3Ga0.7Ashetero-nanostructure etching process, neutral beam (NB) etching with chlorine (Cl2)and argon (Ar) mix gas. The effect of different mixing ratios of chlorine and argon has been investigated. The results showed that when pure chlorine NB (Cl-NB) was used, the pillar formation problem was observed on the etched surface. By increasing the Ar/(Cl2+Ar)gas mixing ratio, the pillar can be eliminated and the roughness of etched surface smoothed. As an Ar/(Cl2+Ar)gas mixing ratio of 78% was used, the root-mean-square roughness of etched surfaces of both GaAs and Al0.3Ga0.7Asis about 0.6 nm, which is almost the same as those of as-received samples. Meanwhile, the etching selectivity of GaAs/Al0.3Ga0.7Ascan be kept close to 1, which would help to etch a clear and smooth profile. Additionally, the high-resolution transmission-electron microscopy image of the GaAs etch profile shows that no crystalline defect was observed on the etched surface. [J92]

"Effect of TiO 2 nanoparticles on the thermal properties of decorated multiwall carbon nanotubes: A Raman investigation"

We have investigated multiwalled carbon nanotubes decorated with TiO2nanoparticles. Scanning electron microscopy and transmission electron microscopy measurements revealed that the TiO2incorporates on the nanotubes forming large cauliflowerlike aggregates and/or small crystalline particles attached to the nanotube wall, depending on the growth conditions. A detailed Raman study was performed in pristine and a series of decorated nanotubes, where we analyzed both the Raman signal from the nanotubes and from the TiO2nanoparticles. We demonstrate that the attached TiO2nanoparticles affect significantly the thermal properties of the resulting hybrid nanostructure, as revealed by differentiated reactions to laser heating. This is a crucial point for modeling and optimization of devices based on nanotubes, which properties are strongly temperature dependent. [J93]

"Nanostructure determines the intensity-dependence of open-circuit voltage in plastic solar cells"

We use photoconductive atomic force microscopy to make local measurements of the open-circuit voltage (VOC)as a function of light intensity in several polymer/fullerene bulk heterojunction blend solar cells. We find significant local variations in the slope of the open-circuit voltage plotted versus the log of the light intensity. By studying a model alkoxy-poly(p)-pheneylene-vinylene/phenyl-C61-butyric acid methyl ester system with known vertical structure, and by comparing our results with a simple numerical model, we associate these local differences in VOCversus light intensity with lateral variations in vertical morphology/composition. These results not only provide a qualitative method of mapping lateral variations in vertical structure/composition by making local measurements of VOCas a function of light intensity but suggest that the unusual light-intensity dependence of VOC(diode ideality factors in the light) of many organic photovoltaics can be linked with morphological heterogeneity. [J94]

"Encapsulation of methane in nanotube bundles"

In this study, the authors investigate methane storage, and in particular the binding and suction energies of methane in (8, 8) carbon and (10, 10) silicon nanotube bundles. Employing the Lennard-Jones potential together with the continuous approximation, they determine the interaction energy, molecular force and suction energy for a methane molecule in nanotube bundles. The authors approximate the methane molecule by assuming that the four hydrogen atoms are smeared over a spherical surface of a certain radius with the carbon atom located at the centre of the sphere. This is an important assumption in terms of simplifying the calculation, since with this model the particular orientations of the hydrogen atoms do not enter the calculation. Their results indicate that silicon nano structures may be superior candidates for methane storage at high temperatures, particularly in the range 200-400 K. [J95]

"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. [J96]

"Examinations into the contaminant-induced transport instabilities in a molecular device"

We report first-principles calculations of transport behaviors for a molecular device whose electrode surface is contaminated by various diatomic groups. It has been found that such a device demonstrates less transport variations for the contamination of the group PO or SO in the whole bias range but it shows more transport variations for contamination of the group CN, HS, or NO only under low bias, which suggests that contamination of all diatomic groups studied here always affects high-bias transport properties of a device in an extremely gentle manner. [J97]

"Local x-ray structure analysis of optically manipulated biological micro-objects"

X-ray diffraction using micro- and nanofocused beams is well suited for nanostructure analysis at different sites of a biological micro-object. To conduct in vitro studies without mechanical contact, we developed object manipulation by optical tweezers in a microfluidic cell. Here we report x-ray microdiffraction analysis of a micro-object optically trapped in three dimensions. We revealed the nanostructure of a single starch granule at different points and investigated local radiation damage induced by repeated x-ray exposures at the same position, demonstrating high stability and full control of the granule orientation by multiple optical traps. [J98]

"Structural characterization for L10 -ordered FePt films with (001) texture by x-ray diffraction"

The nanostructure of L10-ordered FePt films with a [001] orientation prepared by both an epitaxial growth and nonepitaxial method was characterized by fitting X-ray diffraction profiles. Good fitting results for both types of films were obtained by considering the structural inter-and intragrain disorders in a calculation model. The distributions of the long range order and film thicknesses were considered to be part of the structural disorder among the grains. The fluctuation of the lattice spacing and the depth of x-ray interference along the surface normal were also taken into account to explain the structural disorder within the grain. The epitaxial FePt films grown on the MgO(100) underlayer were gradually transformed from a disordered A1phase to an ordered L10phase with increasing deposition temperature. A thinner film of 5 nm indicated a relatively low long range order with the fluctuation of lattice spacing. This is attributed to a large mismatch between the lattice of the initial growth layer and the MgO underlayer. On the other hand, for nonepitaxial FePt films prepared by SiO2doping and rapid thermal post-annealing, high [001]-oriented L10grains without the distribution of long range order were obtained at an initial transformation stage at a low annealing temperature, and the L10grains grew along the film surface with increasing temperature. The fluctuation of lattice spacing was independent of the crystallite height in the nonepitaxial films, whereas the structural disorders such as the lattice fluctuation and chemical disorder in epitaxial films increased with a decrease in the crystallite height. [J99]

"Closed-air induced composite wetting on hydrophilic ordered nanoporous anodic alumina"

We investigate wetting behaviors of two kinds of hydrophilic ordered nanoporous anodic alumina (PAA). The water contact angle (CA) increases at first and subsequently decreases with increasing pore diameter of PAA with closed-pore structure, while the water CA decreases monotonously on PAA with open-pore structure. These interesting wetting behaviors are mainly due to the presence/absence of closed-air in the PAA. The closed-air could prevent water from entering into the nanopores. This work offers insight to control wetting by tailoring the surface nanostructure and will be significant for applications in printing, coating, etc. [J100]

"Intraband photon absorption in edge-defined nanowire superlattices for optoelectronic applications"

We calculate the conduction miniband energy dispersion relation in an edge-defined silicon quantum wire periodic nanostructure embedded in SiO2. Our main aim is to predict the behavior of these nanostructures when used as components in optoelectronic devices such as, for example, photodetectors or intermediate-band solar cells. We take into consideration the effects of nonparabolicity and anisotropy and the different electron states arising from each valley when solving the Schrodinger equation. From these results, we investigate the intraband photon absorption coefficient for those transitions between minibands arising from the conduction band. We analyze the influence of light polarization and level of doping of the system in order to ascertain the best conditions for operation. [J101]

"On-chip terahertz systems for spectroscopy and imaging"

A review is conducted of recent advances in the technology and applications of on-chip integrated terahertz systems, in which pulses of terahertz frequency radiation are generated by a photoconductive material, guided through a planar waveguide, and then detected coherently by photoconductive detection. These integrated systems are highly compact compared with typical free-space time domain terahertz spectroscopy systems, and allow much smaller sample volumes to be investigated, since they concentrate the propagating terahertz field to a length-scale far smaller than the diffraction limit. How both time-domain spectroscopy and imaging can be acheived using on-chip terahertz systems is discussed, along with some potential future applications for on-chip systems in the terahertz spectroscopy of single nanostructures. [J102]

"Drift-Diffusion: A Model for Teaching Spatial-Dispersion Concepts and the Importance of Screening in Nanoscale Structures"

Spatial dispersion has emerged as an extremely important concept in modeling metamaterials, including macro-, micro-, and nano-structured composites. However, the incorporation of spatial dispersion requires a considerable complication of the usual Ohm's law relationship with which students are familiar. In this note, the drift-diffusion equation is shown to be equivalent to the usual form of spatial dispersion in simple isotropic plasmas and metamaterials. It is suggested that the drift-diffusion equation is physically clear and intuitive, and, therefore, can be effectively used to help teach concepts of spatial dispersion to beginning graduate students. Furthermore, the drift-diffusion equation leads to a simple treatment of charge screening, which is important for fundamental understanding, and for the electromagnetics of nanostructures. [J103]

"Piezoelectric characteristic of nanocrystalline AlN films obtained by pulsed laser deposition at room temperature"

Aluminum nitride (AlN) thin films were deposited at room temperature by pulsed laser deposition, and their nanostructure and piezoelectric properties were investigated as a function of fluence. For all fluences, the films were found to consist of an amorphous AlN matrix containing crystalline AlN nanoparticles with size of 6-7 nm. These nanoparticles spark off the good piezoelectric response, with d33piezoelectric coefficients between 2.3 and 3.8pm V-1, similar to those obtained for (002)-oriented AlN films deposited at higher temperatures. These results indicate that nanocrystalline AlN films deposited at room temperature are good candidates for integration in acoustic wave applications. [J104]

"Structure of diamondlike carbon films deposited by femtosecond and nanosecond pulsed laser ablation"

The characterization of diamondlike carbon (DLC) films is a challenging subject, considering the diversity of carbon-based nanostructures depending on the deposition process. We propose to combine multiwavelength (MW) Raman spectroscopy and electron energy-loss spectroscopy (EELS) to probe the structural disorder and the carbon hybridizations of DLC films deposited by pulsed laser ablation performed either with a nanosecond laser (film labeled ns-DLC), either with a femtosecond laser (film labeled fs-DLC). Such deposition methods allow to reach a rather high carbon sp3hybridization but with some significant differences in terms of structural

disorder and carbonaceous chain configurations. MW Raman investigations, both in the UV and visible range, is a popular and nondestructive way to probe the structural disorder and the carbon hybridizations. EELS allows the determination of the carbon plasmon energy in the low-loss energy region of the spectra, as well as the fine structure of the ionization threshold in the high-loss energy region. The paper shows that the combination of MW Raman and EELS is a powerful way to elucidate the nanostructure of DLC films. Complementary nanoindentation investigations allow to correlate the analytical results with the mechanical properties of the films. The ns-DLC film presents a stronger sp3-bonded C character (74%-85%) with a significant content of sp2chains, whereas the fs-DLC contains less sp3bonds (35%-50%) with a significant content of sp2-bonded C rings. The ns-DLC film exhibits a higher proportion of disordered sp2C mainly in the form of chains. Comparatively, the fs-DLC exhibits a predominance of more ordered sp2C structures in the form of graphitic aggregates whose size has been estimated near three--aromatic rings. The film characteristics are in agreement with their mechanical properties. We also propose a correlation between the nanostructure and composition of the films with the deposition mechanisms. The difference in kinetic energy distribution in the plasma plume, together with an absence of interaction between the plasma plume and the femtosecond laser, are responsible for the observed differences in sp3C content and sp2C configuration ranging between a predominance of more ordered sp2rings in the fs-DLC film and a predominance of sp2chains in the ns-DLC film. These results are consistent with the mechanisms of subplantation occurring during DLC deposition [J105]

"Properties of silver/porous-silicon nanocomposite powders prepared by metal assisted electroless chemical etching"

We demonstrate that silver/porous-Si nanocomposite powders are obtained by etching Si powders with metal assisted electroless chemical reaction in an aqueous solution of AgNO3and HF. From x-ray photoelectron spectroscopy and scanning electron microscope measurements, metal layer consisting of nanometer-sized Ag particles and their aggregates is formed on each Si powder surface. Immoderate etching at higher concentrations of AgNO3results in the decrease in Si volume and increase in Ag layer thickness. Dips are observed in reflectance spectra of the nanocomposite powders at 400nm. By comparing the experimental spectra with theoretically calculated ones, these dips are found to arise from the optical absorption due to the roughness-assisted surface plasmon excitation and to be dependent on the size of the Ag nanostructure. The nanocomposite powders show weaker photoluminescence intensity than that of conventionally stain-etched porous Si powders, however, their photostability is improved. The improvement of the photostability is considered to be due to the existence of surface Si-O and Si-Ag bonds. [J106]

"Evaluation of oxygen inhibition for UV-curable resins by adhesion force measurement using scanning probe microscope"

UV nanoimprint lithography is used to fabricate nanostructure devices with high throughput, low cost, and high resolution. UV-curable resins are one important factor in UV nanoimprinting and they are mainly categorized into two reaction types: radical and cationic curing systems. A drawback of the radical curing system is curing inhibition by oxygen. To evaluate the oxygen inhibition for UV-curable resins, the authors measured the force curve transition by scanning probe microscopy with an UV irradiation system. With this system, the authors are able to measure in situ the UV dose dependence of the force curve transition on the same UV-curable resin. Measurements showed that the curing speed of radical UV-curable resin in vacuum became 800 times higher than that in air due to oxygen inhibition. Furthermore, for a cationic UV-curable resin, although the curing reaction of a cationic UV-curable resin is not affected by oxygen, the authors observed that the curing speed in vacuum at about 15 Pa became 4.5 times higher compared to that in air. The curing reaction of a cationic UV-curable resin may be inhibited by alkali. [J107]

"Nanostructure fabrication by self-assembly of block copolymers on three-dimensional diamondlike carbon structures"

The block copolymer self-assembly has the potential to form nanoscale periodic patterns on three-dimensional (3D) nanostructures and nanomaterials. However, block copolymer self-assembly processes have only been examined on two-dimensional flat plane substrates. Forming copolymer nanostructures onto 3D structures would extend the applicability of these nanoscale patterns to 3D wiring for electric circuits and 3D nanomechanical devices. Herein, we investigate the formation process of nanopatterns of block copolymers onto 3D structures. A "dip-coating process" enables the block copolymer to self-assemble onto 3D structures. In addition, treatment with materials possessing a large surface energy effectively forms regular and dense nanoscale patterns onto a 3D diamondlike carbon structure. Moreover, self-assembled patterns are formed even if the angle of the slope of the 3D structure is changed. [J108]

"Publisher's Note: "GaN nanostructure design for optimal dislocation filtering" [JJ. Appl. Phys. 108, 074313 (2010)]"

First Page of the Article [J109]

"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. [J110]

"Titania nanostructure arrays from lithographically defined templates"

We report the fabrication of TiO2nanostructures with lithographically defined templates. Interferomeric-lithography was used to define soft templates (polymer posts), and a sol-gel solution was deposited on a patterned surface. In the final step, calcination was employed to form uniform low aspect-ratio crystalline nonclose-packed TiO2nanotube arrays over a large area. Similarly, nanotree arrays and parallel nanotunnels were prepared as well. The position and morphology of TiO2nanostructures were well controlled. These TiO2nanostructures have a potential technological importance in clean energy, biosensor, and drug release. [J111]

"Electromechanical robustness of monolayer graphene with extreme bending"

We report on the electromechanical robustness of graphene in an extreme condition of deformation: uniaxial bending. A large-angle-bent graphene monolayer was obtained with a predefined template. Structural/mechanical analysis is conducted, followed by electronic transport measurement. Raman spectroscopy analysis suggests negligible strain in the significantly bent graphene, showing mechanical robustness of the two-dimensional carbon nanostructure. The impact on band structure with respect to key deformation parameters (bending angle and curvature radius) were investigated using sp3tight-binding simulation. Results show insignificant local band modification at bending locations. Even with extreme deformation, excellent carrier mobility in monolayer graphene is preserved. [J112]

"GaN nanostructure design for optimal dislocation filtering"

The effect of image forces in GaN pyramidal nanorod structures is investigated to develop dislocation-free light emitting diodes (LEDs). A model based on the eigenstrain method and nonlocal stress is developed to demonstrate that the pyramidal nanorod efficiently ejects dislocations out of the structure. Two possible regimes of filtering behavior are found: (1) cap-dominated and (2) base-dominated. The cap-dominated regime is shown to be the more effective filtering mechanism. Optimal ranges of fabrication parameters that favor a dislocation-free LED are predicted and corroborated by resorting to available experimental evidence. The filtering probability is summarized as a function of practical processing parameters: the nanorod radius and height. The results suggest an optimal nanorod geometry with a radius of 50b(26 nm) and a height of 125b(65 nm), in which bis the magnitude of the Burgers vector for the GaN system studied. A filtering probability of greater than 95% is predicted for the optimal geometry. [J113]

"Investigation of Carrier Transient Response of Nanopatterned n-ZnO/a-Si(i)/p -Si Photodiodes"

We investigated the carrier transient response of the nanopatterned silicon heterojunction photodiodes using ZnO as the n-type semiconductor. The results show that under the constant light illumination intensity, the planar structure has faster carrier response than the nanopatterned amorphous silicon (intrinsic) (a-Si(i)) diodes. It is attributed to a higher number of generated carriers in the nanostructure (due to the lower surface reflectivity) that increases the probability of collisions. On the other hand, the shortest response time of the device with nanopatterned p+-Si suggests that carriers can be effectively transported vertically and horizontally through the p-i(intrinsic)-n structure. Furthermore, the wavelength-dependent rise time is correlated to the different transport distance between electrons and holes at different excited wavelengths. [J114]

"Reversible electron-induced conductance in polymer nanostructures"

We report a mechanism for controlling conductance in polymer nanostructures. Poly(3-dodecylthiophene-2,5-diyl) (PDDT) nanostructures were directly written between gold electrodes using thermal dip pen nanolithography and then characterized in UHV. We find that the conductivity of a PDDT nanostructure can be increased by more than five orders of magnitude (from <10-4to 10S cm-1) by exposure to energetic electrons, and then repeatedly returned to a semi-insulating state by subsequent exposure to hydrogen. Based on systematic measurements complemented by calculations of electronic structure and electron transport in PDDT, we conclude that the conductance modulation is caused by H desorption and reabsorption. The phenomenon has potential applications in hydrogen sensing and molecular electronics. [J115]

"Compact nanostructure integrated pool boiler for microscale cooling applications"

An efficient cooling system without any external energy consumption that consists of a plate, on which an array of copper nanorods with an average diameter ~100 nm and length ~500 nm is integrated to a planar copper thin film coated silicon wafer surface, a heater, an aluminium base and a pool was developed. Heat is efficiently transferred from the nanostructure coated base plate to the liquid in the pool through boiling heat transfer mechanism. Phase change took place near the nanostructured plate, where the bubbles started to emerge because of the existing wall superheat. Bubble formation and bubble motion inside the pool resulted in effective heat transfer from the plate surface to the pool. Surface temperatures were measured and heat transfer coefficients were calculated for two working fluids; namely, water and ethanol. In this study, it was shown that using nanostructured surfaces can have the potential to be an effective method of device cooling for small and excessive heat generating microsystem applications, such as microelectromechanical systems, or microprocessors. [J116]

"Fabrication of antireflection-structured surface using vertical nanowires as an initial structure"

An antireflection structure was fabricated using vertically synthesized iron oxide nanowires as an initial structure. Iron oxide nanowires can be synthesized by simply annealing a thin Fe film in air. The authors propose a process for transforming these nanowires into an array of cone: An additional thin Cr film is deposited onto the nanowires and then etched by reactive ion etching. As a result of the redeposition of Cr, the vertical nanowires were successfully transformed into conical structures. This antireflection nanostructure is replicated onto a polymer surface by thermal nanoimprinting, and the replicated surface exhibited low reflectivity at all visible wavelengths. [J117]

"Enhanced thermoelectricity in composites by electronic structure modifications and nanostructuring"

The thermoelectric performance of nanocomposites with locally distorted density of states is investigated. The analytical expressions we have derived allow us to explore the effects of localized states modeled as Lorentzians on the materials transport properties in terms of their sharpness and locations relative to the Fermi level. Further optimization of the transport through nanostructuring design is also explored. We show that composites with both locally distorted density of states and nanostructure integration open the possibility for significant enhancement of the thermoelectric performance at room temperature. [J118]

"Interfacial mixing and internal structure of Pt-containing nanocomposites grown by room temperature electron beam induced deposition"

Material grown by room temperature electron beam induced deposition (EBID) using (CH3)3CH3C5H4Ptprecursor consists of platinum nanocrystals embedded in an amorphous matrix. The crystallites are shown to intermix with the amorphous oxide on a Si substrate. The extent of intermixing scales with the electron energy density delivered to the material during growth. Dependencies on electron flux, fluence, and exposure time indicate that the intermixing process is athermal, electron-activated, and rate limited by mass transport inside the solid. Furthermore, the degree of deposit crystallinity is shown to scale with the electron flux and fluence used for EBID. We discuss mechanisms behind the observed changes in nanostructure and implications for the growth of functional materials by EBID. [J119]

"Effect of Ti incorporation on the interfacial and optical properties of HfTiO thin films"

Interfacial and optical properties of HfTiO films with different Ti concentration grown by radio frequency reactive magnetron sputtering have been investigated by x-ray photoelectron spectroscopy (XPS) and spectroscopy ellipsometry (SE). XPS spectra indicate that interfacial layer is formed unavoidably for Ti doped and undoped

HfO2thin films and the interfacial structure is stable for Ti doped films. The composition of interfacial layer is most likely silicate and SiOx. Meanwhile, SE results indicate that the band gap of HfTiO thin films decreases with the increase in Ti concentration. Further results show that the valence band offset (Delta Ev)decreases from 2.32 to 1.91 eV while the conduction band offset (Delta Ec)decreases from 2.05 eV to 0.99 with the increase in Ti content. The optical constants consist of refractive index and extinction coefficient have also been investigated to provide the valuable references to prepare and select the HfTiO thin films for future high-kgate dielectrics. [J120]

"Phase separation and microstructure of BaTiO 3 -CoFe 2 O 4 epitaxial nanocomposite films deposited under low working pressure"

0.6 BaTiO3-0.4CoFe2O4(BTO-CFO) composite thin films were deposited under various working pressures on SrTiO3(100) substrates by pulsed laser deposition. The phase separation and the microstructure of the composite film were investigated by x-ray diffraction, scanning electron microscopy, high resolution transmission electron microscopy, and energy dispersive x-ray spectroscopy. The separation of the BTO and CFO phases started at a lower substrate temperature and full width at half maximum values for BTO and CFO were smaller in the heteroepitaxial composite film deposited under a low working pressure of 0.1 mTorr than the composite film deposited under 100 mTorr. The BTO-CFO heteroepitaxial nanocomposite film exhibited a typical 1-3 nanostructure, rectangular-shaped CFO nanopillars with a lateral size of 20-50 nm embedded in the continuous BTO matrix phase, when deposited at 750 °Cunder 0.1 mTorr. [J121]

"Nanostructure band engineering of gadolinium oxide nanocrystal memory by CF 4 plasma treatment"

Nanostructure band engineering accomplished by CF4plasma treatment on Gd2O3nanocrystal memory was investigated. Under the CF4plasma treatment, the fluorine was incorporated into the Gd2O3film and resulted in the modification of energy-band. A physical model was proposed to explain the relationship between the built-in electric field in Gd2O3nanostructure and the improved program/erase (P/E) efficiency and data retention characteristics. The memory window of the Gd2O3-NCmemory with CF4plasma treatment and postplasma annealing was increased to 3.4 V after 104P/Ecycling. It is demonstrated that the Gd2O3-NCmemory with nanostructure band engineering is promising for future nonvolatile memory application. [J122]

"Picosecond ultrasonic experiments with water and its application to the measurement of nanostructures"

The propagation of ultrashort sound pulses in water has been studied by using the picosecond ultrasonic technique and a pulse time-of-flight technique for measuring the depths of deep channels in Si-based nanostructure was demonstrated. The sound pulses were generated when light was absorbed in a metal transducer film and detected by a time-delayed probe light pulse. First, the attenuation and velocity of sound of frequency 4.8 GHz in water were measured through an analysis of the Brillouin frequency oscillations in the reflectivity of the probe light. Measurements at frequencies up to about 11 GHz were made by sending a sound pulse across a thin layer of water and measuring the change in shape of the returning echo due to the attenuation of the different Fourier components. Second, we also report on proof-of-concept ultrasonic experiments to acquire spatial profile information from nanostructures, where sound pulses propagate down narrow channels in patterned nanostructures. We have been able to detect acoustic echoes for sound propagating along a channel as narrow as 35 nm. [J123]

"Electron field emission from the Si nanostructures formed by laser irradiation"

The technology of nanostructure formation by laser radiation on Si surface for the electron field emitter is proposed. n-type Si wafers are used in the experiments. The nanometer size, conelike nanostructures with nanosphere on top of the cone were created on the surface as a result of laser irradiation. The electron field emission from such nanostructures has been investigated. It has some peculiarities, namely, (i) a decrease in the threshold field in subsequent measurements and (ii) two slopes of Fowler-Nordheim curves (higher slope at low fields and lower slope at high fields). Analysis of the scanning electron microscopy micrographs and electron field emission curves allows the authors to estimate (i) the electron field enhancement coefficient, beta ≈100, (ii) work functions, Phi 1=6.8eVat the first measurement and from the two slopes in subsequent measurements Phi 2=3.9eV, Phi 3=2.38eV, and (iii) the effective emission area, alpha =(3Ч10-8)-(1.8Ч10-5)cm2. The experimental results obtained have been explained in frame of the proposed model which takes into account formation of native oxide and/or positive dipoles (Si+-O-)due to oxygen adsorption on the Si surface. [J124]

"Design of a Reverse-Connected Module for Nanostructure Removal From Display Color Filters"

This paper proposes a new design module for reverse-connected microelectrochemical machining (μ-ECM), which is based on a novel electrochemical reaction that offers the fast removal of indium-tin-oxide (ITO) nanostructures from the surfaces of color filters in displays. Unlike general μ-ECM models, the reverse-connected μ-ECM model is implemented by connecting a workpiece to the cathode and an electrode to the anode of a dc power supply. During the course of machining, electrons travel from the cathode to the anode, so that the ITO film is lifted and removed at high speed by an electric field. In general μ-ECM models, a workpiece is connected to the anode, an electrode is connected to the cathode, and the material removal is achieved by dissolution. In contrast, the reverse-connected μ-ECM model provides higher removal efficiency and higher surface quality of color filters in displays during machining processes, thereby breaking new ground in superfine machining for applications in the photoelectric semiconductor industry. [J125]

"Stress-induced Sn Nanowires from Si-Sn Nanocomposite Coatings"

The growth of stress-induced tin (Sn) whiskers has been considered responsible for the failure of many electronic devices and many approaches have been developed to mitigate their growth. In this report, however, we describe a simple approach based on the same mechanism to promote the growth of Sn nanowires. The thermal expansion induced stress was utilized as the driving force to initiate the growth of Sn nanowires from Si-Sn phase-separated nanocomposite coatings. The nanostructure of the Si-Sn matrix was the key to controlling the shape and diameter of Sn nanowires. This approach provides additional flexibility for making desirable metallic nanowires with controlled dimensions. [J126]

"Self-organized, gratinglike nanostructures in polymer films with embedded metal nanoparticles induced by femtosecond laser irradiation"

The self-organized formation of periodic superstructures in thin plasma polymer films containing noble metal nanoparticles upon femtosecond laser irradiation has been studied in detail. By applying several hundred laser pulses on average per spot, the nanostructure of the metal layer is persistently changed into an approximate line grating with periodical changes in particle size and shape as observed by scanning and transmission electron microscopy. The formation of the structures is only possible within rather narrow ranges of laser intensity and metal content. The orientation of the lines is given by the laser polarization, while their spatial periodicity depends on laser wavelength and incidence angle. These observations give evidence that interference of incident light with light scattered into the film plane is the main mechanism controlling the nanostructure formation. We also discuss the optical spectra of the irradiated regions, in particular the observed dichroism and its relation to the prepared periodic structures. [J127]

"Angular effects of nanostructure-covered femtosecond laser induced periodic surface structures on metals"

In this paper, we study nanostructure-covered laser induced periodic surface structures (NC-LIPSSs) on metals produced by femtosecond laser pulses incident at various angles. For the first time, we show that the dependence of NC-LIPSS period on the incident beam angle deviates significantly from that of regular LIPSSs studied previously using longer laser pulses. Our study shows that this deviation is due to the nanostructures on LIPSSs that can be explained by the Maxwell-Garnett theory of effective media. [J128]

"A Closer Look at DNA Nanotechnology"

A nanosystem in which multiple nanoscale functional components made of a variety of nanomaterials are integrated with a microelectromechanical system (MEMS) becomes increasingly important as a key device for the next generation. A deoxyribonucleic acid (DNA) nanotechnology is expected to play an important role to bridge the gap between the nanoscale components (nanocomponents) and the microscale MEMS as a complementary approach for top-down manufacturing technique and bottom-up manufacturing technique to realize nanosystems. From the design viewpoint of a system, such as large-scale integrated circuits (LSI), MEMS, and nanosystem, it should be noted that the complexity is an essence to generate its functionality. The functionality of LSI/MEMS/nanosystem, where functional components are simply arranged in a periodic order, is limited. Periodic nanostructure can be a part of a nanosystem as a nanocomponent, but it is not enough. Interaction and cooperation of multiple nanocomponents with different features make it possible to generate a unique and useful functionality of a nanosystem. [J129]

"Domain structures and nanostructures in incommensurate antiferroelectric Pb x La 1-x (Zr 0.9 Ti 0.1)O 3"

The details of the domain structure of the incommensurate antiferroelectric structure in La-doped zirconium-rich

lead zirconate titanate have been revealed in detail for the first time. The structure is dominated by 60° domain boundaries close to {101} planes of the primitive perovskite cell; and tilts of the perovskite sublattice of about 0.5° are also noted at such boundaries consistent with a small tetragonal distortion of the primitive cell. Within each domain a streaked nanostructure is revealed under weak diffraction conditions perpendicular to the long b-axis of the incommensurate supercell, which appears to be a consequence of planar faulting perpendicular to this b-axis. 90° domain boundaries are also observed but are less frequent than 60° boundaries and in contrast to previous reports, these often have rather curved and irregular boundary planes. The close similarity of all these features, with the one exception of the streaked nanostructure, to the domain structure of the commensurate antiferroelectric PbZrO3, demonstrates the close relationship of the two phases and leads one to speculate that the atomic structures of the phases are also closely related. [J130]

"Silver/silicon nanostructure for surface-enhanced fluorescence of Ln 3+ (Ln Nd, Ho, and Er)"

The surface-enhanced fluorescence of lanthanide ions (neodymium ions Nd3+, holmium ions Ho3+, and erbium ions Er3+) owing to resonant plasmons oscillation on the surface of Ag/Si nanostructure was described. In the presence of Ag/Si nanomaterials, the fluorescence peaks were significantly enhanced, which resulted in a typical 185-fold enhancement at 592 nm for Nd3+, 82-fold at 550 nm for Ho3+, and 80-fold at 533 nm for Er3+at the concentration of 0.05 M. This Ag/Si nanostructure had larger enhancement factor than that caused by unsupported Ag nanoparticles, which might be attributed to the local field overlap originated from the closed and fixed Ag nanoparticles on silicon nanowires. [J131]

"Correlation of electron backscatter diffraction and piezoresponse force microscopy for the nanoscale characterization of ferroelectric domains in polycrystalline lead zirconate titanate"

The functional properties of ferroelectric ceramic bulk or thin film materials are strongly influenced by their nanostructure, crystallographic orientation, and structural geometry. In this paper, we show how, by combining textural analysis, through electron backscattered diffraction, with piezoresponse force microscopy, quantitative measurements of the piezoelectric properties can be made at a scale of 25 nm, smaller than the domain size. The combined technique is used to obtain data on the domain-resolved effective single crystal piezoelectric response of individual crystallites in Pb(Zr0.4Ti0.6)O3ceramics. The results offer insight into the science of domain engineering and provide a tool for the future development of new nanostructured ferroelectric materials for memory, nanoactuators, and sensors based on magnetoelectric multiferroics. [J132]

"Field-induced hot-electron emission model for wide-band-gap semiconductor nanostructures"

For field emission from wide-band-gap semiconductor nanostructures, nonlinear plots on Fowler-Nordheim (FN) coordinates and unacceptably large field enhancement factors (beta FN)are often obtained by fitting based on FN equation. In the present work, the field-induced hot-electron emission model is developed and is found to give theoretical findings consistent with the experimental observation. The hot electrons are produced by heating effect of penetration field into the emitting tip of the nanostructure. This energy is expressed by effective electron temperature Te, which is much higher than the temperature of bulk structure. By combining the effective electron temperature with thermal emission function and Murphy and Good integration function, the relation between emission current density and external field is derived and the field enhancement factor (beta Te)can be calculated quantitatively. For evaluation of the theoretical model, ZnO nanostructure is selected as a concrete example. The results are found to agree with experiment findings. Extremely large field enhancement factor is not needed in our model and nonlinear property of saturation region emerges in nature in our calculation. [J133]

"Annealing induced nanostructure and photoluminescence property evolution in solution-processed Mg-alloyed ZnO nanowires"

Solution-processed Mg-alloyed ZnO nanowire arrays have been achieved recently without using high temperature annealing process. By introducing thermal annealing processes in oxygen-rich ambient condition, the UV near-band-edge (NBE) emission was surprisingly mitigated until disappeared with annealing temperature increasing from 400 to 900 °C. As the annealing temperature increased, intensity of UV peak decreased while intensity of visible peak (490-520 nm) increased. The structure evolution upon thermal annealing was revealed to be responsible for these abnormal photoluminescence property variations, where unusual (Zn,Mg)1.7SiO4epitaxially evolved on ZnMgO nanowires surface and contributed to the quenching of UV NBE emission. The structure evolution induced UV-NBE quenching and nanoscale localized alloying in semiconductor ZnMgO nanowires could bring up opportunities in catalysis, optoelectronics, spintronics, and sensors. [J134]

"Fabrication and photoluminescence of ZnS :Mn 2+ nanowires/ZnO quantum dots/SiO 2

heterostructure"

In this paper, we demonstrated the encapsulation of ZnS:Mn2+nanowires (NWs) and ZnO quantum dots (QDs) with a layer of mesoporous SiO2shell for the purpose of integrating dual emission property into one common nanostructure. The average diameter of ZnS:Mn2+NWs, ZnO QDs, and ZnS:Mn2+/ZnO@SiO2heterostructure was about 10 nm, 6 nm, and 22 nm, respectively. Within ZnS:Mn2+/ZnO@SiO2nanocomposites, the intensity of the yellow-orange emission contributed by ZnS:Mn2+NWs and the UV emission contributed by ZnO QDs was three and ten times higher than their individual components, respectively. The fluorescence intensity ratio of the dual emission can be tuned by adjusting the hydrolysis time of tetraethyl orthosilicate. The peak energy of the yellow-orange and UV emission showed blueshift and redshift as increasing the temperature, respectively. The anomalous enhancement of the integrated intensity for the UV emission with the temperature indicated that the high surface state density existing in ZnO QDs can overrun the influence of temperature quenching and even alter the photoluminescent properties. [J135]

"An algorithm to sculpt photon dispersion in a subwavelength nanostructure"

We introduce a method of gradient-based optimization that continuously deforms a periodic dielectric distribution to generate photonic structures that possess any desired figure of merit expressible in terms of the electromagnetic eigenmodes. As an example, we generate forbidden regions between specified bands at extremely low dielectric contrast. [J136]

"Effects of electron-beam irradiation on conducting polypyrrole nanowires"

Conducting polypyrrole (PPy) nanowires (NWs) were irradiated by a relatively high energy (300 keV-2 MeV) electron-beam (e-beam) generated from a linear electron accelerator in an atmospheric environment. From the current-voltage characteristics of pristine and 2 MeV e-beam irradiated PPy NWs, we observed a dramatic variation in resistance from 8.0Ч102to 1.45Ч108Omega, that is, we observed a transition from conducting states to nonconducting states through the e-beam irradiation. To discern conformational changes and the doping states of PPy NWs through the e-beam irradiation, we measured Raman and ultraviolet-visible absorption spectra for the PPy NWs. As the energy of the e-beam irradiation increased, we observed that the PPy NWs were changed from doping states to dedoping states with conformational modification including the variation in pi -conjugation length. [J137]

"Thickness-gradient dependent Raman enhancement in silver island films"

We show evidence of a dependence of the enhancement of the Raman scattering cross section on the length of the gradient in graded silver island films. A factor-of-three increase in the Raman signal is observed for gradients with length of the order of 0.5 mm when compared to gradients of the order of 9 mm. Scanning electron microscopy reveals the nanostructure of the two films to be statistically similar. We attribute the observation to differences in plasmon hybridization in the gradients arising from long range structural differences. [J138]

"A subwavelength near-infrared negative index material"

A single layer of a subwavelength negative index material (NIM) operating at a wavelength of 1mcmis demonstrated. The geometrical parameters of the nanostructure are determined by characterizing its optical transmission spectrum. We show through photonic band calculations that these parameters give rise to a negative index in a corresponding bulk NIM. The fabrication inaccuracies in the dielectric spacer thickness that are likely to be introduced in a prism composed of multiple layers of this structure are shown through full-wave simulations to be within a range that preserves its negative refractive behavior. [J139]

"In situ small-angle x-ray scattering study of nanostructure evolution during decomposition of arc evaporated TiAlN coatings"

Small-angle x-ray scattering was used to study in situ decomposition of an arc evaporated TiAlN coating into cubic-TiN and cubic-AlN particles at elevated temperature. At the early stages of decomposition particles with ellipsoidal shape form, which grow and change shape to spherical particles at higher temperatures. The spherical particles grow at a rate of 0.18E/°Cwhile coalescing. [J140]

"Small anisotropy, weak thermal fluctuations, and high field superconductivity in Co-doped iron pnictide Ba (Fe 1-x Co x)2 As 2"

We performed high-field magnetotransport and magnetization measurements on a single crystal of the 122-

phase iron pnictide Ba(Fe1-xCox)2As2. Unlike the high-temperature superconductor cuprates and 1111-phase oxypnictides, Ba(Fe1-xCox)2As2showed practically no broadening of the resistive transitions under magnetic fields up to 45 T. We report the temperature dependencies of the upper critical field Hc2both parallel and perpendicular to the c-axis, the irreversibility field Hirrc(T), and a rather unusual symmetric volume pinning force curve Fp(H)suggestive of a strong pinning nanostructure. The anisotropy parameter gamma =Hc2ab/Hc2cdeduced from the slopes of dHc2ab/dT=4.9T/Kand dHc2c/dT=2.5T/Kdecreases from 2near Tc, to 1.5at lower temperatures, much smaller than gamma for 1111pnictides and high-Tccuprates. [J141]

"Optimized optical generation and detection of superlattice acoustic phonons"

We present a device for the optimization of the folded acoustic phonon signal in femtosecond pump-probe experiments through the spatial decoupling of the generation and detection processes in two different GaAs/AlAs superlattices separated by a thick GaAs layer. A thickness gradient in one of them allows a fine tuning of the generation and detection spectral responses. In the optimal overlap condition, a clear enhancement of the signal is observed at a time delay that matches the travel time of acoustic phonons through the intermediate layer. This nanostructure provides a sensitive tool for studying terahertz phonon propagation over long distances. [J142]

"Multiple scattering effects in strain and composition analysis of nanoislands by grazing incidence x rays"

Experiments and numerical simulations based on finite element modeling show that the x-ray intensity scattered by comparatively large nanostructures on a substrate is not simply related to their strain in experiments using either grazing incidence or exit because of multiple scattering effects. However, whatever the nanostructure size, the composition profiles are correctly extracted from grazing incidence multiwavelength anomalous scattering. These effects are illustrated for the structural analysis of Ge dome-shaped islands grown on Si(001). [J143]

"High thermoelectric performance BiSbTe alloy with unique low-dimensional structure"

We report a detailed description of an innovative route of a melt spinning (MS) technique combined with a subsequent spark plasma sintering process in order to obtain high performance p-type Bi0.52Sb1.48Te3bulk material, which possesses a unique low-dimensional structure. The unique structure consists of an amorphous structure, 5-15 nm fine nanocrystalline regions, and coherent interfaces between the resulting nanocrystalline regions. Measurements of the thermopower, electrical conductivity, and thermal conductivity have been performed over a range of temperature of 300-400 K. We found that MS technique can give us considerable control over the resulting nanostructure with good thermal stability during the temperature range of 300-400 K and this unique structure can effectively adjust the transport of phonons and electrons, in a manner such that it is beneficial to the overall thermoelectric performance of the material, primarily a reduction in the lattice thermal conductivity. Subsequently, this results in a maximum figure of merit ZTvalue of 1.56 at 300 K for p-type Bi0.52Sb1.48Te3bulk material. This ZTvalue is over a 50% improvement of that of the state of the art commercial Bi2Te3materials. We also report results of thermal cycling of this material for over one hundred cycles between 300-400 K. Our work offers an innovative route for developing high performance bismuth telluride based alloys and devices, which have even broader prospects for commercial applications. This technique may also be applicable to other thermoelectric materials. [J144]

"Multiple negative differential resistances in crossed carbon nanotubes"

An oscillatory dependence of the drain current on the drain voltage is found in a nanostructure consisting of two crossing semiconductor carbon nanotubes that are suspended over a dielectric trench, which is backed by a doped silicon substrate that acts as a gate. Alternating positive and negative differential resistance regions are generated as a function of the drain-source voltage values and can be slightly shifted by the gate voltage. Moreover, the negative differential resistance is retrieved in a large bandwidth, of up to 100 MHz, when the structure is excited with ac signals. [J145]

"Vanadium oxide nanowire phase and orientation analyzed by Raman spectroscopy"

Phase-selective growth of VO2and V2O5nanowires was realized via catalyst-free physical vapor deposition from bulk VO2powder. Single nanowire Raman spectroscopy was used to analyze the distribution of the vanadium oxide phases within the reactor. VO2(V2O5)nanowires were identified by characteristic peaks at 197, 224, and 620cm-1(149, 700, and 994cm-1). Electron diffraction and polarization-dependent Raman spectra indicated that the growth directions of VO2and V2O5nanowires were [100] and [010]. Analysis of Raman spectra in two polarization configurations is sufficient to distinguish between low-index nanowire growth directions for the V2O5phase. Single nanostructure Raman measurements thus provide a means to rapidly analyze the phase and growth direction of anisotropic nanostructures. [J146]

"Effects of pulse bias duty cycle on fullerenelike nanostructure and mechanical properties of hydrogenated carbon films prepared by plasma enhanced chemical vapor deposition method"

Fullerenelike hydrogenated carbon films were produced by pulse bias-assisted rf inductively coupled plasma enhanced chemical vapor deposition (ICPECVD). The effects of pulse duty cycle on the microstructure and mechanical properties of the resultant films were investigated by means of high resolution transmission electron microscopy (HRTEM), Raman spectroscopy, nanoindentation, and stress measurement. The low pulse duty cycle was found the key in the formation of fullerenelike structure in hydrogenated carbon films, and thus increased the hardness, elasticity, and internal stress of the films. The role of pulse duty cycle in evolution of fullerenelike structure was also discussed in terms of ion bombardment, hydrogen removal, and "annealing" effects. [J147]

"Directional light emission through a metallic nanostructure"

In this paper, we numerically investigate the highly directional beaming effect when a transverse magnetic plane wave passes through a metallic slit-bumps nanostructure by using the finite difference time domain method. We find that the narrow bump with width w 0.1lambda sppcan serve as a good light emitter and two arrays of narrow bumps with suitable separation can diffract the surface plasmons into highly directional collimated beams. The number and the direction of the beams can be controlled by adjusting the geometry parameters of the nanostructure. The structure with optimized parameters has practical applications as directional surface plasmon polaritons couplers in integrated photonic devices. [J148]

"Optical, structural, and magnetic properties of cobalt nanostructure thin films"

We report on optical, structural, and magnetic properties of two substantially different cobalt nanostructure thin films deposited at an oblique angle of incidence of 85° away from the substrate normal. Comparison is made between an achiral columnar thin film grown without substrate rotation and a chiral nanocoil sculptured thin film by glancing angle deposition with substrate rotation. Generalized spectroscopic ellipsometry is employed to determine geometrical structure properties and the anisotropic optical constants of the films in the spectral range from 400 to 1000 nm. The magnetic properties are analyzed with a superconducting quantum interference device magnetometer. Both nanostructure thin films show highly anisotropic optical properties such as strong form birefringence and large dichroism. In particular, Co slanted columnar thin films are found to possess monoclinic optical properties. Magnetic measurements at room temperature show hysteresis anisotropy with respect to a magnetic field either parallel or perpendicular to the nanostructures' long axis. We find extremely large coercive fields of approximately 3 kOe for our achiral columnar nanostructures. [J149]

"Exchange bias of NiO/FeNi ordered nanocaps on curved substrate"

The magnetic NiO/Fe19Ni81nanostructure bilayer is deposited onto the colloidal spheres grown on a Si wafer by the self-assembly technology. The nanocap and the nanodot arrays form on the spherical surface and the Si substrate, respectively, which are confirmed by scanning electron microscopy and transmission electron microscopy measurements. Compared to the flat bilayer with the same composition deposited on the Si substrate, the exchange bias field HEfrom the nanocap is twice as large. The enhancement of HEin the nanocap is ascribed to the decreased thickness of the ferromagnetic layer induced by the sphere surface. The size and space of the biased caps are estimated based on the thickness variations induced by the sphere surfaces. [J150]

"Curvature estimate for multilayer rolled-up nanostructures with cubic crystal anisotropy under initial strains"

The generalized plane strain solution for anisotropic multilayer nanostructures with cubic crystal symmetry under the influence of initial strains has been derived. This solution can be used to estimate equilibrium curvature radius and strains/stresses of rolled-up anisotropic multilayer nanostructures, whose deformations are induced by crystal lattice mismatch. The solution has been applied for calculation of curvature radii and strain components of a bilayer In0.2Ga0.8As/GaAsrolled-up nanostructure. The results are in agreement with those obtained by a finite element analysis. [J151]

"Contrast mechanisms in cross-sectional scanning tunneling microscopy of GaSb/GaAs type-II nanostructures"

Cross-sectional scanning tunneling microscopy results on GaSb quantum wells and dots in GaAs are found to exhibit a narrow, sharply defined contrast of the nanostructure at negative sample bias, but a smoothly

broadened contrast at positive sample bias. This contrast is related to the specific type-II band alignment of GaSb/GaAs heterostructures in combination with tip-induced band bending. The corresponding model is quantitatively verified by numerical simulations of band bending and tunnel current profiles combined with calculations of cleavage-induced strain relaxation. [J152]

"Microwave absorption properties of the hierarchically branched Ni nanowire composites"

Microwave absorber using hierarchically branched Ni nanowires based composite was introduced in this work. The nanostructure constituents greatly suppressed the eddy current and improved the magnetic anisotropy. Their composite with wax matrix showed strong and broadband electromagnetic attenuation around 8.23 GHz where the magnetic mode was excited. The resonance absorption character was discussed by fitting the permeability spectrum using well-known theoretical equations (Landau-Lifshitz-Gilbert equation and Kittel formula). [J153]

"Epitaxial self-assembly of multiferroic nanostructures"

The morphology and structure of interfaces in PbTiO3-CoFe2O4films on SrTiO3substrates of various orientations are studied. It is found that for film with thickness more than 100 nm with columnar two-phase morphology, the average orientations of the interfaces between the phases reside on the {110}, {111}, and {112} planes for films normal to substrates oriented along, , and correspondingly. These macroscopic interfaces consist of {111} nanofacets. The study of very thin film less than 30 nm shows that the interfaces between nanosize phases are {111} planes. Available theoretical results on morphology of multiferroic thin film nanostructure allow us to conclude that for thick films (100nm), two-phase columnar morphology (shape of constituent phases, their arrangement, and average crystallographic orientations of the interfaces) is essentially determined by the trend for minimization of elastic energy, while the trend to minimize the energy of interfaces results in faceting interfaces along the {111} planes. Possibility of long range ordering in phase arrangement is discussed. [J154]

"Fabrication of (Fe ,Mn)3 O 4 ferromagnetic oxide nanostructure using molybdenum nanomask atomic force microscope lithography"

We reported the fabrication of Fe2.5Mn0.5O4(FMO) ferromagnetic oxide nanostructure using molybdenum (Mo) nanomask atomic force microscope (AFM) lithography technique for oxide nanospintronics applications. This technique enables us to prepare transition metal oxide nanostructures down to 200nm. The hard x-ray photoemission spectroscopy revealed that the resulting nanostructures preserve a fine electric structure as spintronics oxide same as unprocessed films. The resulting FMO nanostructure showed the magnetoresistance of about -0.11%to -0.14%at the magnetic field of 3000Oe, which value was similar to that of FMO film. These indicate that this technique can construct well defined nanoscale oxides both in structure and physical properties. [J155]

"Size and surface orientation effects on thermal expansion coefficient of one-dimensional silicon nanostructures"

We perform classical molecular dynamics simulations based on the Tersoff interatomic potential to investigate the size and surface orientation dependence of lattice constant and thermal expansion coefficient of one-dimensional silicon nanostructures. Three different surface orientations of silicon are considered, i.e., Si(110), Si(111), and Si(100) with 2Ч1reconstruction. For each surface orientation, we investigate nanostructures with thicknesses ranging from 0.3 to 5.0 nm. We compute the vibrational amplitude of surface atoms, lattice constant, and thermal expansion coefficient as a function of size and temperature, and compare them for different surface orientations. An analytical expression is developed to compute the variation of the thermal expansion coefficient with size of the nanostructure. [J156]

"Proximity effects in asymmetric layered ferromagnet/superconductor nanostructures"

The asymmetric four-layered F'/S'/F"/S"nanostructure consisting of rather dirty superconducting (S)and ferromagnetic (F)metals is studied within the theory of the proximity effect taking detailed account of the boundary conditions. The new pi phase superconducting states are obtained for the F'/S'/F"/S"structure in addition to the known "superlattice" states. The dependence of critical temperatures versus the Flayer thicknesses is explored for a wide range of parameters. Decoupled superconductivity is predicted for this nanostructure and an optimal set of parameters is determined for which the difference between the critical temperatures for different states becomes significant. The complicated phase diagram of the asymmetric four-layered F'/S'/F"/S"nanostructure is constructed, explored, and compared with the ones for F/Sbilayers, symmetric F/S/Fand S/F/Strilayers, and F/Ssuperlattices. [J157]

"Analytic modal solution to transmission and collimation of light by one-dimensional nanostructured subwavelength metallic slits"

Light transmitting through a subwavelength slit on an ordinary metal plate is diffracted to all directions but if the exit plane of the slit is patterned with periodical nanostructures, the diffracted light may be compressed into a collimated beam within a small angle. In this paper, we develop a rigorous theoretical method for solving the surface wave induced beam collimation in nanostructured subwavelength metallic slits. The method combines the analytical modal expansion method, the supercell technique, the transfer-matrix method, and the conventional Kirchhoff's diffraction theory. It allows for quantitative investigation of coupling of the incident light into the guided wave of the slit and coupling of the guided wave out of the nanostructured exit plane. We have used the method to examine light transmission through the nanostructured metallic slit and the corresponding diffraction and beam collimation behaviors. We have extensively analyzed the angular transmission spectrum as a function of the nanostructure period and the incident light wavelength and revealed the condition at which good beam collimation can take place. The result shows that the beam collimation is caused by the excitation of the surface waves supported on the periodical nanostructured pattern and subsequent coupling into the radiation light. Several scattering channels can coexist for coupling the surface waves into the observed diffraction waves and they can act constructively to create one or more collimation beams with excellent directionality and high brightness. The diffraction field patterns in the large area confirm the angular spectrum analysis. [J158]

"Novel methodology for estimating the enhancement factor for tip-enhanced Raman spectroscopy"

Enhancement factor and spatial resolution are two of the most important metrological parameters defining the quality of a tip-enhanced Raman spectrometer. A high degree of variability in the reported values of enhancement factor is highlighted in this work, and the possible reasons for the discrepancies are discussed. A methodology for estimating enhancement factor in tip-enhanced Raman imaging using a one-dimensional nanostructure such as single wall carbon nanotube is suggested. This methodology is verified using tip-enhanced Raman images from our laboratory, and an image from another group published previously. [J159]

"The dielectric response of the H 2 Ti 3 O 7 nanotube investigated by valence electron energy loss spectroscopy"

The dielectric response of an anisotropic nanostructure, individual H2Ti3O7nanotube with 8-10nmdiameter, has been investigated using both momentum transfer dependent and spatially resolved valence electron energy loss spectroscopies. The dielectric response of an individual nanotube is found to be dominated by several surface related excitations and defect states, although its basic electronic structure (such as the band gap and single electron interband transitions) is similar to that of TiO2. The possible origins of the surface excitations in such a tubular structure are also discussed. [J160]

"Magneto-optic material selectivity in self-assembled BiFeO 3 -CoFe 2 O 4 biferroic nanostructures"

Material selective sensitivity of a magneto-optical polar Kerr effect to magnetic contributions from different inclusions in self-organized magnetic nanostructures is presented. The method is supported by modeling of the magneto-optic response based on the effective medium approximation and by hysteresis loop measurement of the multiferroic BiFeO3-CoFe2O4self-assembled nanostructure. Magneto-optic selective sensitivity is demonstrated and explained as an effect of different complex diagonal and off-diagonal permittivity tensor elements of two materials. [J161]

"Defect mediated tuning of exchange bias in IrMn/CoFe nanostructure"

A simple nanofabrication process is introduced to tune the exchange bias in the magnetic nanostructures with a feature size below 15 nm. The IrMn/CoFe films are deposited on the porous alumina oxide (AAO) with different pore diameters from 10 to 48 nm, keeping the center-to-center distance almost the same at 60 nm, which is fabricated on Si wafers. A large enhancement in the exchange field Hex(2.3 times) and the coercivity Hc(8 times) is observed in the nanostructure compared to the continuous film. The exchange field is decreased with increasing pore diameter; on the other hand Hcincreases continuously with increase in pore diameter. However, the values of Hexand Hcfor all the exchange bias nanostructures are larger than those of the continuous film. These effects are mainly ascribed to the creation of domain walls or domains due to the pinning effect and the physical limitations that the pore size and edge-to-edge distance impose on both ferromagnetic and antiferromagnetic layers. Our results strongly support that exchange bias can be tuned by the AAO pores. [J162]

"On the physical understanding of quantum rings self-assembly upon droplet epitaxy"

A quantitatively kinetic model has been established to address the quantum rings (QRs) self-assembly upon the droplet epitaxy. Taking the GaAs system as an example, we found that the diffusion of Ga atoms away from the droplet and the trapping of As atoms play crucial roles in the final shape formation of GaAs nanostructures. By calculating the amounts of the produced GaAs in each point, we performed the shape evolution of GaAs nanostructures during the crystallization process. The proposed kinetic theory nicely elucidates the physical mechanisms of the self-assembly of GaAs nanostructures including the single and double QRs and the holed nanostructure upon the droplet epitaxy. [J163]

"Annealing behavior of atomic layer deposited HfO 2 films studied by synchrotron x-ray reflectivity and grazing incidence small angle scattering"

New results are presented for the annealing behavior of ultrathin complementary-metal-oxide-semiconductor (CMOS) gate dielectric HfO2films grown by atomic layer deposition (ALD). A series of ALD HfO2dielectric films has been studied by a combination of x-ray reflectivity (XRR) and grazing-incidence small-angle x-ray scattering (GISAXS) measurements. By using these techniques together, we have shown that the surface, interfaces, and internal structure of thin ALD films can be characterized with unprecedented sensitivity. Changes in film thickness, film roughness, or diffuseness of the film/substrate interface as measured by XRR are correlated with the corresponding changes in the internal film nanostructure, as measured by GISAXS. Although the films are dense, an internal film structure is shown to exist, attributed primarily to ≈2nm"missing island" porosity features close to the substrate; these are most likely associated with coalescence defects as a result of initial ALD growth, as they are not observed in the upper regions of the film. Some 8-9 nm heterogeneities are also present, which may indicate a widespread modulation in the film density pervading the entire film volume, and which likely also give rise to surface roughness. Comparison of the data between different scattering geometries and among a carefully designed sequence of samples has enabled important insights to be derived for the annealing behavior of the ALD HfO2films. The main effects of single, brief, high temperature excursions to above 900 °Care to anneal out some of the fine voids and reduce the mean roughness and interfacial diffuseness of the film. These changes are indicative of densification. However, depending on the film thickness-, the annealing behavior at temperatures between 650 and 800 °Cis quite different for single excursion and cyclic anneals. Particularly for thin, just-coalesced films, XRR indicates marked increases in the film thickness and in the mean roughness/diffuseness dimension for cyclic anneals. GISAXS also shows an increase, rather than a reduction, in the void microstructure under these conditions. These changes in the film microstructure appear sufficient to overcome the expected film densification at elevated temperatures with implications for the gate dielectric performance of the films after extended high temperature exposure and cycling, as may occur during gate dielectric fabrication. [J164]

"Self-assembled Gd silicide nanostructures grown on Si(001)"

The growth of self-assembled gadolinium silicide nanostructures on Si(001) was studied over a range of metal coverages and growth temperatures. Scanned probe microscopy was used to study the nanostructure morphology. The analyses of cross-sectional transmission electron microscopy images, plan view transmission electron microscopy moire fringe patterns, and nanobeam electron diffraction patterns show that the Gd silicide nanostructures fall into two classes: elongated nanowires with hexagonal crystal structure and rectangular islands with orthorhombic (or tetragonal) crystal structure. These results indicate that the nanostructure morphology is controlled by the magnitude and direction of the lattice mismatch with respect to the substrate. Optimum growth conditions for preferential growth of either nanowires or islands are described. In addition, the phase transformation from hexagonal to the more stable orthorhombic (or tetragonal) phase is observed and discussed. [J165]

"Ballistic electron transport in hybrid ferromagnet/two-dimensional electron gas sandwich nanostructure: Spin polarization and magnetoresistance effect"

We have theoretically investigated ballistic electron transport through a combination of magnetic-electric barrier based on a vertical ferromagnet/two-dimensional electron gas/ferromagnet sandwich structure, which can be experimentally realized by depositing asymmetric metallic magnetic stripes both on top and bottom of modulation-doped semiconductor heterostructures. Our numerical results have confirmed the existence of finite spin polarization even though only antisymmetric stray field Bzis considered. By switching the relative magnetization of ferromagnetic layers, the device in discussion shows evident magnetoconductance. In particular, both spin polarization and magnetoconductance can be efficiently enhanced by proper electrostatic barrier up to the optimal value relying on the specific magnetic-electric modulation. [J166]

"Thickness-modulated optical dielectric constants and band alignments of HfO x N y gate

dielectrics"

Thickness-modulated optical dielectric constants and band alignments of HfOxNyfilms grown by sputtering have been investigated by spectroscopic ellipsometry (SE) and x-ray photoelectron spectroscopy. Based on SE measurements, it has been noted that an increase in optical dielectric constant and band gap has been observed as a function of the film thickness. Analyses of thickness-dependent band alignment of the HfOxNy/Sisystem indicate that the valence band offset increases, but only slight change in the conduction band offset, resulting from the thickness-induced change in the structure. The suitable optical dielectric constants and band offsets relative to Si make sputtering-derived HfOxNyfilm a promising candidate for high-kgate dielectrics. [J167]

"Enhanced effect of electron-hole plasma emission in Dy, Li codoped ZnO nanostructures"

Pink branched Dy3+and Li+codoped ZnO nanowires were synthesized by simply annealing the polymeric precursor. For the undoped sample, electrons at the bottom of the conductor band return to the ground state via a process of free exciton and defect intermediate level, and subsequently emit 3.2 and 2.4 eV photons. Furthermore, their intensities both increase while their positions are almost invariant with increasing excitation intensity. For the doped nanostructure, compositional inhomogeneity results in localization of nonequilibrium carriers and enhances the photoluminescence performance. The near-band edge emission shows higher emission efficiency and is dominated by the transition of free electrons to free holes. Moreover, it also exhibits a power-dependent redshift and a broader and more asymmetric line shape on its lower-energy side with increasing excitation intensity. For the green emission in codoping ZnO nanostructures, the formation of deeper traps from the complexes of defects and impurities results into a redshift to 523 nm. Additionally, its position remains invariant with increasing excitation intensity. It is proposed that the charge compensation, surface passivation, and carrier delocalization lead to the fully suppressed green emission at higher excitation intensity. [J168]

"Focusing surface plasmon polariton trapping of colloidal particles"

We report focusing surface plasmon polariton (SPP) trapping of colloidal particles without optical interactions. Using a silver nanostructure, we demonstrate SPP launching and propagation under a p-polarized incident laser. In-plane Fresnel zone plate (FZP) is used to focus the SPP waves. Colloidal particles can be trapped at the silver nanostructure in the illumination region and the FZP focus area by focusing SPP force. The SPP tweezers open new perspectives in the subwavelength trapping and applications to lab-on-chip devices. [J169]

"Silicon-Germanium Nanostructures for Light Emitters and On-Chip Optical Interconnects"

In this paper, we review the present status of light emitters based on SiGe nanostructures. In order to be commercially valuable, these light emitters should be efficient, fast, operational at room temperature, and, perhaps most important, compatible with the ldquomainstreamrdquo complementary metal-oxide-semiconductor (CMOS) technology. Another important requirement is in the emission wavelength, which should match the optical waveguide low-loss spectral region, i.e., 1.3-1.6 mum. Among other approaches, epitaxially grown Si/SiGe quantum wells and quantum dot/quantum well complexes produce efficient photoluminescence and electroluminescence in the required spectral range. Until recently, the major roadblocks for practical applications of these devices were strong thermal quenching of the luminescence quantum efficiency and a long carrier radiative lifetime. The latest progress in the understanding of physics of carrier recombination in Si/SiGe nanostructures is reviewed, and a new route toward CMOS compatible light emitters for on-chip optical interconnects is proposed. [J170]

"Contact resistance in carbon nanostructure via interconnects"

We present an in-depth electrical characterization of contact resistance in carbon nanostructure via interconnects. Test structures designed and fabricated for via applications contain vertically aligned arrays of carbon nanofibers (CNFs) grown on a thin titanium film on silicon substrate and embedded in silicon dioxide. Current-voltage measurements are performed on single CNFs using atomic force microscope current-sensing technique. By analyzing the dependence of measured resistance on CNF diameter, we extract the CNF resistivity and the metal-CNF contact resistance. [J171]

"Co-Doping Effect of Nanoscale C and SiC on Superconductor"

MgB2was thought as a promising superconductor used at temperatures around 20 K for cryogen-free magnet. Nanostructure materials were often selected as MgB2additives due to their high chemical reactivity. In this paper, the mixture of nano-C and nano-SiC was doped to MgB2bulks and tapes. The co-doping effect of C and SiC on the phase formation, microstructure, and critical current density of MgB2bulks and tapes were systematically

investigated. The mechanisms for the superconducting properties improvement in co-doped MgB2superconductor was analyzed based on the characterization and measuring results. [J172]

"Ultrafast Laser Pulses to Detect and Generate Fast Thermomechanical Transients in Matter"

The use of femtosecond laser pulses to impulsively excite thermal and mechanical transients in matter has led, in the last years, to the development of picosecond acoustics. Recently, the pump-probe approach has been applied to nano-engineered materials to optically generate and detect acoustic waves in the gigahertz-terahertz frequency range. In this paper, we review the latest advances on ultrafast generation and detection of thermal gradients and pseudo-surface acoustic waves in 2-D lattices of metallic nanostructures. Comparing the experimental findings to the numeric analysis of the full thermomechanical problem, these materials emerge as model systems to investigate both the mechanical and thermal energy transfer at the nanoscale. The sensitivity of the technique to the nanostructure mass and shape variations, coupled with the phononic crystal properties of the lattices, opens the way to a variety of applications ranging from hypersonic waveguiding to mass sensors with femtosecond time resolution. [J173]

"Solid-state electric generator based on chemically induced internal electron emission in metal-semiconductor heterojunction nanostructures"

Internal electron emission induced by hydrogen oxidation to water on surface of Pd/n-SiCheterojunction nanostructures is observed and the possibility for a new type of chemoelectrical power generator is discussed. The noble metal nanolayer serves both as reaction catalyst and emitter of hot electrons traveling over Schottky barrier and toward semiconductor anode. In situ chemical process provides significantly higher output of hot electrons compared to devices with externally heated cathodes. Large fraction of the hot electrons is generated nonadiabatically to complement the usual thermal excitation, leading to very high total internal quantum efficiency of the device, reaching 0.20 for the nanostructure studied here. [J174]

"Assembly and magnetic properties of nickel nanoparticles on silicon nanowires"

The directed assembly of magnetic Ni nanoparticles at the tips of silicon nanowires is reported. Using electrodeposition Ni shells of thickness from 10 to 200 nm were selectively deposited on Au catalytic seeds at the ends of nanowires. Magnetic characterization confirms a low coercivity (≈115Oe)ferromagnetic behavior at 300 K. This approach to multifunctional magnetic-semiconducting nanostructure assembly could be extended to electrodeposition of other materials on the nanowire ends, opening up additional approaches to device integration. Such magnetically functionalized nanowires offer an approach to developing highly localized magnetic probes for high resolution magnetic resonance force microscopy. [J175]

"Control of morphology and nucleation density of iron oxide nanostructures by electric conditions on iron surfaces exposed to reactive oxygen plasmas"

The possibility to control the morphology and nucleation density of quasi-one-dimensional, single-crystalline alpha -Fe2O3nanostructures by varying the electric potential of iron surfaces exposed to reactive oxygen plasmas is demonstrated experimentally. A systematic increase in the oxygen ion flux through rf biasing of otherwise floating substrates and then an additional increase of the ion/neutral density resulted in remarkable structural transformations of straight nanoneedles into nanowires with controlled tapering/aspect ratio and also in larger nucleation densities. Multiscale numerical simulations relate the microscopic ion flux topographies to the nanostructure nucleation and morphological evolution. This approach is applicable to other metal-oxide nanostructures. [J176]

"Geometric effect on surface enhanced Raman scattering of nanoporous gold: Improving Raman scattering by tailoring ligament and nanopore ratios"

We have synthesized nanoporous gold (NPG) films with a nanostructure consisting of small nanopores and large gold ligaments by the combination of chemical dealloying and electroless plating. The NPG films exhibit dramatic improvement in surface enhanced Raman scattering (SERS) in comparison with the conventional NPG. The superior SERS effect of the NPG films results from the confluence effect of enhanced local surface plasmon fields and electromagnetic coupling between ligaments, as well as the weak plasmon damping with increasing gold ligament sizes. [J177]

"Evaluation of Atmospheric-Pressure Plasma for Improving Photoelectrochemical Response of Titania Photoanodes"

A synergistic combination of nanostructure synthesis and surface engineering was used to enhance the photoelectrochemical activity of titanium dioxide (TiO2) photoanodes. Titania nanotubular arrays were synthesized by electrochemical anodization of Ti thin foils. An atmospheric-pressure helium plasma followed by exposure to nitrogen was used to modify the surface properties of TiO2nanotubes. The photocurrent from plasma-treated samples was approximately 25% higher than that from untreated samples. This increase in photoactivity could be ascribed to the following: 1) increased absorption of visible light due to bandgap reduction; 2) efficient charge separation; 3) production of optimal oxygen vacancies; and 4) increased surface area and, hence, enhanced electrode-electrolyte area to provide maximum optical adsorption and efficient charge transfer. The diffused reflectance Ultraviolet-visible (DR-UV-Vis) absorption spectra indicated a marginal increase in absorbance for the plasma-treated samples in the visible region, suggesting a change in surface electronic structure, although bulk electronic properties remain unchanged during plasma treatment. [J178]

"Novel Epitaxial Nanostructures for the Improvement of InGaN LEDs Efficiency"

We demonstrated that the efficiency of an InGaN LED can be improved by using a novel epitaxial nanostructure, namely, the nanostructured semipolar (NSSP) gallium nitride (GaN). The NSSP GaN template was fabricated on a c-plane GaN surface using a standard GaN metal-organic chemical vapor deposition tool on c-plane sapphire substrates. We showed that the surface of NSSP GaN consisted of two semipolar orientations: (10-11) and (11-22). InGaN/GaN multiple quantum wells (MQWs) fabricated on NSSP GaN exhibited negligible quantum-confined Stark effect (QCSE) and a 30% improvement in internal quantum efficiency as compared to planar c-plane InGaN/GaN MQWs. Using time-resolved photoluminescence (PL), a considerable improvement in radiative recombination lifetime was also observed. We fabricated and characterized semipolar InGaN LEDs on NSSP GaN that emitted at 543 nm and showed negligible QCSE. The NSSP GaN structure can also be applied to improve the photon extraction efficiency of InGaN-based LEDs. The surface texturing was performed insitutogether with the LED epitaxy without additional exsituetching processes. The insitusurface texturing improved the PL intensity by a factor of two. An electrical injection LED structure employing insitusurface texturing was also demonstrated. [J179]

"Nanostructure Core Fiber With Enhanced Performances: Design, Fabrication and Devices"

We report a new type of silica-based all-solid fiber with a 2-D nanostructure core. The nanostructure core fiber (NCF) is formed by a 2-D array of high-index rods of sub-wavelength dimensions. We theoretically study the birefringence property of such fibers over a large wavelength range. Large-mode-area (LMA) structure with a typical high birefringence in the order of 10-4can be easily realized. The attenuation of the fabricated NCF is as low as 3.5 dB/km at 1550 nm. Higher macro- and micro-bending losses compared with those of the single-mode fiber (SMF) due to the reduced index difference have been observed experimentally, which suggests that the NCF is potentially useful for curvature and strain sensing applications. A fiber Bragg grating (FBG) inscribed in such a novel fiber is side-polished to make use of its evanescent field for refractive index sensing. The refractive index sensitivity obtained is one order of magnitude higher than that of the side-polished FBG in SMF, while the temperature and strain performances are comparable with those of the SMF-based FBG. [J180]

"An electron's spin---Part I"

Recent advances in nanotechnology have made it possible to manipulate the quantum mechanical spin of a single electron trapped in a tiny semiconductor nanostructure called a quantum dot. Experimental techniques for orienting and measuring a single electron's spin have also been demonstrated. These advances raise hopes for a brand new digital electronics technology predicated on the use of the spin degree of freedom of an electron, in lieu of the charge degree of freedom, to store, process, and transmit digital information. This new brand of electronics, that we have termed "single spintronics," is capable of extremely energy efficient computing and signal processing. Part I of this work describes classical single spintronics, where a single electron's spin is utilized for classical computing. Part II (to be published in the July/August 2009 issue) will provide an introduction to the use of single spintronics for quantum computation. [J181]

"Guest Editorial on Microstructured Fibers"

The 21 papers in this special issue on microstructured fibers cover most recent advances in designs, fabrication and applications in the area of photonic crystal fibers (PCF), photonic band-gap fibers (PBGF), nanostructured fibers and hole assisted fibers (HAF), including high speed DWDM transmission over PCF, nonlinear properties and applications, microstructured fiber lasers and amplifiers, nanostructure core fibers and devices, HAF with zero dispersion in the near infrared and visible wavelength regions, fluid-filled solid core PBGF, gas and pressure sensors using PBGF, chirped PCF for guiding sub-100-fs pulses, microstructured fiber gratings, PCF for THz transmission, linear core array microstructured fibers, and polymer microstructured fibers. [J182]

"Local Ordering Study of Nanostructure FeMnAl Alloys"

Fe55Mn10Al35alloys were prepared by mechanical alloying. Local ordering around the central atom was examined with milling time by using extended X-ray absorption fine structure. The structural and magnetic evolution was analyzed by EXAFS and Mossbauer study as a function of milling time. The first shell of the Fourier transformed spectra changed with milling time, indicating a change in the local ordering around the central Fe atom. X-ray diffraction patterns indicate a bcc phase after 24 h milling time. For 1 h milled sample, Mossbauer spectra analysed three sextets as bcc-Fe phase, broad sextet and Fe surrounded Al and Mn phase. The magnetization showed decrease with milling time corresponding to magnetic dilution. [J183]

"Fabrication of Multilayered Thin Films and Their Flux Pinning Properties"

We prepared the multilayered MgB2/Ni thin films with the Ni layer spacings of 32, 23 and 16 nm. The MgB2/Ni multilayer nanostructure was confirmed to be obtained from the scanning transmission electron microscope observation. The clear enhancement of Jcwas observed in the multilayered MgB2/Ni thin film when the magnetic field was applied parallel to the film surface. Moreover, the peak position of Fp- Bcurves shifted to higher magnetic field with decreasing the Ni layer spacing. [J184]

"Magnetorheological Characteristics of Polymer Coated Magnetite Particle Composites With Carbon Nanotube Nanohybrid"

This study demonstrates physical adsorption of polymer coated nano-sized magnetite (Fe3O4) onto multiwalled carbon nanotube (MWNT) surface. A new hybrid material was made following four consecutive procedures of co-precipitation, polymer coating, functionalized MWNT, and ultrasonication method. Polymer coated magnetite particle (MaPAm) composites with MWNT nanohybrid (MaPAmNT) were acquired. Transmission electron microscopy (TEM) and scanning electron microscopy (SEM) have been used to investigate their nanostructure and morphology, thus verifying that polyacrylamide coated magnetite particles were well adsorbed onto surface of the MWNT. From thermogravimetric analysis (TGA) data, we also confirmed compositions of the MaPAmNT. Magnetorheological (MR) properties of the MaPAmNT under an external magnetic field were investigated, exhibiting typical MR behavior of yield stress and shear stress. [J185]

"Magnetic Properties of Nanocrystalline Barium Hexaferrite Thin Films Prepared by Sol-Gel Method"

Single-phase nanocrystalline BaFe12O19thin films have been prepared on Si (110) substrates by sol-gel method. The efforts have been done to reduce the crystallite size of the single-phase barium hexaferrite thin films in order to develop the thin films for high-density magnetic recording media. Precursor solutions were primed with various Fe/Ba ratios and two kinds of basic agents. Then the coated films were heat treated at different temperatures. The effects of calcination temperature, molar ratio of Fe/Ba, and basic agent on phase composition, crystallites size, morphology, and magnetic properties were investigated using X-ray diffraction (XRD), scanning electron microscopy (SEM), atomic force microscopy (AFM), and vibrating sample magnetometery (VSM) techniques. The results showed that the lowest calcination temperature for production of the single-phase barium hexaferrite thin film by sol-gel method was 700degC. This product exhibited a nanostructure with high in-plane coercivity. [J186]

"Nanostructural origin of the spin and orbital contribution to the magnetic moment in Fe 3-x O 4 magnetite nanoparticles"

5 nm Fe3-xO4nanoparticles were synthesized either by high-temperature decomposition in organic phase or in low-temperature aqueous conditions. In the first case oleic acid was covalently bonded to the nanoparticles; in the second case polyvinyl alcohol (PVA) yielded a protective coating without chemical bond. Magnetization measurements and x-ray magnetic circular dichroism showed a saturation magnetization close to bulk magnetite and an orbital moment effectively quenched in covalently bonded nanoparticles. PVA-coated nanoparticles showed a reduced value of the magnetization and 3fold increase in the orbital moment. High resolution electron microscopy suggested that this was related to the nanostructure of the samples. [J187]

"High-frequency surface acoustic wave propagation in nanostructures characterized by coherent extreme ultraviolet beams"

We study ultrahigh frequency surface acoustic wave propagation in nickel-on-sapphire nanostructures. The use of ultrafast, coherent, extreme ultraviolet beams allows us to extend optical measurements of propagation dynamics of surface acoustic waves to frequencies of nearly 50 GHz, corresponding to wavelengths as short as

125 nm. We repeat the measurement on a sequence of nanostructured samples to observe surface acoustic wave dispersion in a nanostructure series. These measurements are critical for accurate characterization of interfaces beneath very thin films using this technique. [J188]

"Magnetic correlations in nanocomposite FePt:Au and FePt:C films"

The nanostructure and magnetism of L10-ordered FePt crystallites in matrices of Au and C are investigated as a function of the Au and C contents. Emphasis is on the relation between hysteresis-loop shape, magnetic correlation length, and structural disorder, as relevant to magnetic recording media. The highly (001) textured thin films are produced by annealing [Fe/Pt/X]nmultilayers. The coercivity and the hysteresis-loop slope at coercivity increase and decrease, respectively, with increasing volume fraction of the matrix. The magnetic force microscopy images show that the slope decrease is accompanied by a reduction in the magnetic correlation length. These changes are due to the reduced intergranular exchange coupling, and a simple model describes how interparticle exchange cooperatively increases both the loop slope and the correlation length. [J189]

"Co nanostructure arrays in patterned polymeric template"

Nanostructured polymer (polymethyl methacrylate) has been fabricated replicating the hexagonal symmetry ordering of an anodized Al template. A magnetic material, in this case Co, is then sputtered onto the polymer surface giving rise to a nanostructured surface thin layer keeping the high ordering induced by the precursor template. The study of this magnetic nanostructure allows one to conclude the presence of intrinsic distribution of magnetic anisotropy and the identification of single or multidomain structures inside Co depending on the controlled periodicity of the nanostructured Al template. [J190]

"Enhanced exchange bias in sub-50-nm IrMn/CoFe nanostructure"

The exchange bias field (Hex)of IrMn/CoFe deposited on a large-area nanoporous anodized alumina (AAO) is tailored by varying the pore density (D)and the network width (w)of AAO. The Hexincreases with increasing Dand reaches its maximum at D=5.6Ч1010cm-2and w 28nm. The enhancement in Hex, twice larger than that of the continuous film, is attributed to the reduction in antiferromagnetic (AFM) and ferromagnetic (FM) domain sizes. The suppression of Hexis observed for further increase in D, which may result from the excessive misalignment of AFM and FM spins and weakened AFM anisotropy. [J191]

"Three-dimensional composite metallodielectric nanostructure for enhanced surface plasmon resonance sensing"

The authors simulated, fabricated, and characterized a mushroomlike composite metallodielectric nanostructure that shows improved characteristics for surface plasmon resonance sensing applications with an enhancement in the normal electric field compared to the conventional nanohole structure. A fabrication method is introduced to give controllable linewidth by an oblique metal deposition process. A sensor built with the composite nanostructure was then used to determine the hydrophilicity of its surface by monitoring the resonant wavelength shift and computing the corresponding adsorption thickness. [J192]

"Optical modeling of the plasmon band of monolayer-protected nanometal clusters in pure and in polymer matrix thin films as a function of heat treatment"

The plasmon band shape of thin films of gold nanoparticles and their composites can be quantitatively modeled in a surprisingly simple way by taking into account (i) quantum-size effect of the Au core on its permittivity, (ii) nanostructure effect of the core shell and matrix on the effective medium, and (iii) optical properties of thin films in a transfer-matrix formalism. From the excellent agreement achieved with the optical spectra of these films, neat and when dispersed in poly(3,4-ethylenedioxythiophene) matrices, details of the nanocrystal relaxation, desorption of the ligand shell, and ultimate surface melting and core-core coalescence to give percolating conductive paths during heat treatment were extracted. [J193]

"Crystallography of self-assembled DySi 2 nanowires on a Si substrate"

A recently developed crystallographic model, edge-to-edge matching, has been used to interpret the crystallographic features of self-assembled DySi2nanowires on Si substrates. All of the observed orientation relationships (ORs) and interface orientations of the DySi2on Si(111), (001), and (110) were predicted by one criterion. The calculated results are fully consistent with the previous high-resolution transmission electron microscopy observations. The preference for each OR and interface was discussed in terms of the competition between thermodynamics and kinetic factors. This model can also be used in other epitaxy systems and has strong potential for future nanostructure design. [J194]

"Synthesis and magnetic properties of multifunctional CoPtAu nanoparticles"

We present the synthesis and magnetic properties of multifunctional CoPtAu alloy nanoparticles of three compositions, Co0.33Pt0.33Au0.33, Co0.2Pt0.2Au0.6, and Co0.4Pt0.4Au0.2, by a modified polyol process. The x-ray diffraction and transmission electron microscopy analyses confirm the formation of the alloy nanostructure comprising Au-rich and Pt-rich nanophases, with a narrow distribution of particle sizes and provides the detailed structural arrangements. The magnetic study shows the composition dependence of the magnetic properties of the nanoparticles, from superparamagnetic for both Co0.33Pt0.33Au0.33and Co0.4Pt0.4Au0.2to soft ferromagnetic for Co0.2Pt0.2Au0.6. [J195]

"Nanostructure and optical properties of Si O 2 films prepared by reactive midfrenquency magnetron sputtering"

Nanocrystalline silicon dioxide (SiO2)films for optical applications were deposited on aluminium substrates by reactive midfrenquency magnetron sputtering. The composition of the coating is varied by changing the oxygen gas flow during the depositiongs. The structural properties and the surface morphology of films deposited with various deposition parameters were investigated by x-ray photoelectron spectroscopy and atomic force microscopy. The optical properties were measured and calculated by spectrophotometer and thin-film analyzer. It was found that the composition of silicon dioxide films varies from nearly pure Si, SiO to SiO2, controlled by O2flow rate. The reflection index of nanocrystalline SiO2film-aluminum system accords with the mixture rule. All SiO2films are transparent and the evolution of the transmittance as a function of the films is investigated, and opportunities for their optimization are described. [J196]

"Deep reactive ion etching as a tool for nanostructure fabrication"

Deep reactive ion etching (DRIE) is investigated as a tool for the realization of nanostructures and architectures, including nanopillars, silicon nanowires or carbon nanotubes on Si nanopillars, nanowalls, and nanonetworks. The potential of combining top-down fabrication methods with the bottom-up synthesis of one-dimensional nanocomponents is assessed. The field-emission properties of carbon nanotubes/Si pillars hybrid structures are measured, as well as the transport properties of large-area nanowires obtained via nanowire lithography. The potential of DRIE for the fabrication of three-dimensional nanostructures is also revealed. [J197]

"Circuit Modeling of High-Frequency Electrical Conduction in Carbon Nanofibers"

We show that the simplest possible circuit model of high-frequency electrical conduction in carbon nanofibers from 0.1 to 50 GHz is a frequency-independent resistor in parallel with a frequency-independent capacitor. The resistance is experimentally determined and represents the total dc resistance of the nanofiber and its contacts with the electrodes. The capacitance is obtained as a free parameter and has not been previously observed. The experimental method utilizes a ground-signal-ground test structure whose two-port scattering parameters (S-parameters) can be described to within plusmn0.5 dB and plusmn2deg using a simple lumped-element circuit model. The nanostructure is placed in the signal path of the test structure, and its equivalent circuit is deduced by determining what additional elements must be added to the test structure circuit model to reproduce the resulting changes in the S-parameters. This methodology is applicable to nanowires and nanotubes. [J198]

"Nanostructure fabrication on an Al surface by chemical and electrochemical multiprocess and nanoscale molecular patterning on the nanostructured Al surface"

A chemical and electrochemical multistage process was conducted on an Al surface in order to create new types of nanostructures on the Al surface. The multistage processing was a combination of fabrication processes of linked crater and highly oriented line types of nanostructures on an Al surface. At the first stage, a highly oriented line structure was fabricated by treatment with acetone and subsequent anodization. The line separation was estimated approximately 30-40nm. At the second stage, the nanostructure formed from the first stage was modified by treating with the chemical agent Semiclean and ultrasonic agitation. Dynamic force microscopy measurements showed that a tilted-step structure, or sawtoothed structure, was created from the highly oriented line structure. In the sawtooth structure, nanoscale sawtooth-shaped structures, which were composed of tilted steps, were created over 5mcm2areas and were aligned along the original highly oriented lines. Furthermore, molecular and polymer patterns were created on this unique nanostructure using copper phthalocyanine (CuPc) and polyaniline. The CuPc molecules were deposited on the nanostructure from toluene droplets containing CuPc while aniline monomers were polymerized on the sawtooth structure. In the case of CuPc deposition, a nanoscale pattern was created along the original sawtooth structure. In the case of polyaniline deposition resulted in a lot of grain-shaped polyaniline structures were grown on the tilted steps while a large tree-shaped

polyaniline fiber was found crossing the tilted steps. [J199]

"Bounds on the dynamic magnetic properties of multiresonant nanostructure composites in exchange resonance model"

Existing bounds expression established on the sum of the gyromagnetic losses is limited by static magnetic interactions. In this paper, we deduce a bounds relation from the Bloch-Bloembergen theorem to depict both the uniform resonance and exchange resonance. It is shown to agree with experiments, of particular relevance to the competition between static magnetic force and exchange interaction. An analytic explanation on favorable multiresonance phenomenon in nanocrystalline iron flakes is achieved. [J200]

"Correlation of the energy product with evolution of the nanostructure in the Y,Dy,Nd-(Fe, Co)-B magnetic alloy"

The devitrification behavior of nanocrystalline MRE2(Fe,Co)14B+ZrC(MRE=Nd+Y+Dy)was studied using differential scanning calorimetry (DSC), synchrotron high temperature x-ray diffraction, and analytical transmission electron microscopy (TEM) techniques. Alloy ribbons were melt spun at 25 m/s to obtain an amorphous structure. Optimum hard magnetic properties (Br=7.2kG, Hc=12.7kOeand (BH)max=10.8MG Oe) were obtained in ribbons annealed at 750 °Cfor 15 min. A reduced annealing temperature of 638 °Cand holding time from 0 to 11 min were chosen based on DSC analysis. Large changes in both microstructure and hard magnetic properties were found in a narrow window of annealing time, 4.5-6 min, resulting in a dramatic increase in energy product, remanence and coercivity: 0.96MG Oe, 5.2 kG, 2.7 kOe to 5.7MG Oe, 7.2 kG, 8.5 kOe for (BH)max, Brand Hc, respectively. Energy dispersive x-ray spectroscopy and energy filtered TEM analyses indicate that Zr- and C-rich particles (5nm)and thin grain boundary layers (1-2 nm thick) are formed surrounding 2-14-1 hard phase grains when the annealing time is over 6 min. Further annealing resulted in a more distinct hard phase surrounded by a nonmagnetic g- rain boundary phase 1nmin thickness. The thin grain boundary layer phase starts to disappear with annealing time over 11 min. The partitioning behavior of various elements at different annealing conditions appears to be associated with significant changes in magnetic properties, leading to an improved optimum microstructure. [J201]

"Three-dimensional molecular dynamics simulation of nanostructure for reciprocating nanomachining process"

Three-dimensional molecular dynamics simulations are conducted to investigate the effect of reciprocating nanomachining process on the subsurface damaged layers, surface integrity, cutting force, stress variation of subsurface, and changes of energy and defects in the workpiece. Results show that there is no obvious shear zone ahead the tool during nanomachining. Dislocation nucleations are near the free surface ahead the tool and the interface of the tool and the workpiece and propagate in the surface and downward in the workpiece. There are the generations of dislocation jog and dislocation loops ahead the tool during the reciprocating cutting. The values of the reciprocating cutting force for the (111) orientation and (100) orientation under offset distance of 0a0are not zero but 11.756 and 13.0498 nN, respectively. When the offset distance of the tool is up to 10a0, the ratio of primary cutting force to reciprocating force is nearly 90%. The shape of the machined groove in the (111) orientation remains better than that in the (111) orientation in cases of both the primary cutting process and the reciprocating process. Reciprocating cutting with the offset distance of 5a0of the tool results in the pile-up atoms filling in the primary machined groove and forming the order lattice by surface reconstruction. Primary cutting force decreases with the reduction of workpiece sizes, which shows the size effects. With the increasing cutting depths, average primary cutting force and average reciprocating force increase. It is noted that reciprocating cutting force in the case of the (111) workpiece is larger than that of the (100) orientation except for the offset distance of 0a0. With the increasing offset distance of the tool, the residual shear stress increases in the subsurface of the workpiece, and the order degree of subsurface atoms of the workpi- ece decreases in the cases of both the (111) orientation and (100) orientation. It is denoted that, with the offset distance at 5a0, the peak of the average shear stress is highest during the reciprocating cutting. Meanwhile, the order degree of subsurface atoms in the case of the (111) orientation is better than that of the (100) orientation. [J202]

"High Bs nanocrystalline alloys with high amorphous-forming ability"

The soft magnetic property and the structure of the new type nanocrystalline Fe-(P,B,Si,Nb,Cu) alloy with high Fe content about 80at. %have been investigated. In this paper Fe77.9P3B14Nb5Cu0.1alloy has a supercooled liquid region (Delta Tx)of 33 K defined by the difference between the glass transition temperature (Tg)and crystallization temperature (Tx), which would be relating to the high glass-forming ability leading a thickness of 140mcmmelt-spun ribbon with a glassy phase. The Fe80.9P2B10Si2Nb5Cu0.1alloy with the higher Fe content can be melt spun into the thick ribbon with thickness of 65mcmdue to rather large amorphous-forming ability. In

addition, a homogeneous nanostructure composed of alpha -Fegrain with around 15 nm in diameter was realized after crystallization, and the nanostructured alloy exhibits the high Bsof 1.55 T and the low coercivity (Hc)of 4.6 A/m. The Bsand the glass or amorphous-forming ability of the alloys are superior to those for typical nanocrystalline. Therefore, the miniaturization and the realization of higher efficiency of power supply circuits in electric devices are able to be expected using these nanocrystalline Fe-(P,B,Si,Nb,Cu) alloys. [J203]

"Carbothermal reduction vapor phase transport growth of ZnO nanostructures: Effects of various carbon sources"

ZnO nanostructures were grown via carbothermal reduction vapor phase transport with carbon black, activated carbon, and graphite powders. Nanostructures can be grown at significantly lower temperatures with carbon black and activated carbon, although with different morphologies compared to graphite. The surface areas of the carbon black and activated carbon are higher than those of graphite; this has been used previously to explain the origin of such growth and morphology differences. We use different ZnO/graphite ratios to equalize surface areas compared to carbon black and eliminate this effect, but differences in nanostructure growth and morphology remain. We discuss the effects of thermodynamics and carbon purity and conclude that the high surface activities of the carbon black and activated carbon are the reason for our results. [J204]

"Magnetic force microscopy analysis of magnetization reversal in exchange-biased Co/CoO nanostructure arrays"

Asymmetry in the magnetization reversal processes of exchange bias Co/CoO rectangular nanodot arrays is revealed by magnetic force microscopy. One-step switching is found along the descending branch of the hysteresis cycle whereas rotational or multidomain processes are involved along the ascending branch. From a statistical analysis of the environment of each dot during reversal, it is concluded that dipolar interactions do not significantly influence the magnetization reversal processes. [J205]

"MEMS Composite Porous Silicon/Polysilicon Cantilever Sensor for Enhanced Triglycerides Biosensing"

A novel composite porous silicon/polysilicon microcantilever for biosensing applications with enhanced sensitivity is reported. It is fabricated by surface micromachining of polysilicon cantilevers followed by the formation of the surface porous layer after release by Reaction Induced Vapor Phase Stain Etch. The microcantilevers with porous surface layer are characterized by their morphology that exhibits a dual macro and nanostructure for very effective immobilization of biomolecules. The current work focuses on the fabrication of composite porous silicon/polysilicon microcantilevers, characterization of their morphology and resonance frequency, as well as demonstration of improved immobilization of enzyme resulting in enhanced sensing of triglycerides. [J206]

"Materials Processing for High Anisotropy Granular Media"

For vapor deposited FePt to be realized as a magnetic recording medium, a basic understanding of the fundamental materials processes in chemical ordering and their interactions with sputter deposition is required. For such applications, a magnetically decoupled nanostructure is necessary as used for longitudinal and perpendicular schemes. The elevated temperatures required for FePt chemical ordering is a major paradigm shift from conventional fabrication. With an understanding of the role of individual materials processes involved with chemical ordering, their implications on physical vapor deposition or other manufacturing systems can be addressed. The feasibility of such processing is shown here with examples of FePt +carbon and FeCuPt+ SiO2deposited at elevated temperature. [J207]

"Atmospheric-Microplasma-Assisted Nanofabrication: Metal and Metal-Oxide Nanostructures and Nanoarchitectures"

In this paper, we report on the fabrication of Mo-oxide nanostructures and nanoarchitectures using an atmospheric-microplasma (AMP) system. This AMP system shows a high degree of flexibility and is capable of producing several different nanostructures and nanoarchitectures by varying the process parameters. The low-cost and simplicity of the process are important characteristics for nanomanufacturing, and AMPs offer such advantages. In addition, AMPs have shown the ability of promoting self-organization of nanostructures. [J208]

"Strain Effects on Electronic Bandstructures in Nanoscaled Silicon: From Bulk to Nanowire"

In this paper, we present a comparative computational study on strain effects in Si nanostructures including bulk, thin film, and nanowire configurations. We employed a first principles calculation to identify the bandstructure

parameters such as band splitting energy and transport effective mass. As a result, we found that bulk Si and Si thin film have similar strain effects on the bandstructure parameters under uniaxial lang110rang strain. Particularly, the effective mass reduction of electrons due to uniaxial lang110rang strain is expected even in Si thin film. On the other hand, Si nanowire structure with nanoscale cross section has lighter transport effective mass than the other structures, regardless of the amount of uniaxial strain. [J209]

"Tuning exchange bias in Ni /FeF 2 heterostructures using antidot arrays"

The transition from positive to negative exchange bias can be systematically tuned with antidot arrays artificially introduced into Ni/FeF2ferromagnetic/antiferromagnetic heterostructures. These results are a consequence of the energy balance and suggest that the nanostructure plays a key role in the formation of pinned uncompensated spin regions in the antiferromagnetic FeF2layer. These noninterfacial magnetic moments created at the antidot faces favor the onset of positive exchange bias at lower cooling fields. [J210]

"Enhancement of light transmission by coupling to surface plasmon polaritons of a layer-plus-islands silver layer"

Enhanced light transmission through coupling incident light with surface plasmon polaritons (SPPs) on a layer-plus-islands nanostructure Ag layer, surrounded by symmetric ZnO dielectrics (ZnO/Ag/ZnO), was investigated. The couple and decouple processes at ZnO/Ag and Ag/ZnO grating interfaces were considered to confine the incident light to SPPs (near field) and then to excite the SPPs to radiate light (far field), which enhanced light transmission. A broad range of light transmission enhancement showed a blueshift with increasing Ag midlayer mass thickness. The physical reasons for light transmission enhancement were theoretically discussed using both the metal/dielectric grating interface model and the Drude-Lorentz free electron model. [J211]

"Photon statistics in enhanced fluorescence from a single CdSe/ZnS quantum dot in the vicinity of silver nanoparticles"

Single-photon emission behavior in the enhanced fluorescence from single colloidal quantum dots (QDs) near silver nanoparticles (AgNPs) was investigated using a single molecule fluorescence spectroscopy technique. It was found that the degree of fluorescence enhancement from single QDs with AgNPs increased with decrease in the lifetime and the probability of single-photon emission, that is, highly enhanced fluorescence with a shortened lifetime exhibited a low probability of single-photon emission. The present results yield new insights into fundamentals of QD-metal nanostructure interactions, and are also important to understand the mechanism of the fluorescence enhancement by localized surface plasmon of metal nanostructures. [J212]

"Electrical control of magnetic remanent states in a magnetoelectric layered nanostructure"

We report experimental results on electrical control of magnetic remanent states (i.e., nanoscale remanent domain patterns) in a magnetoelectric layered nanostructure, Ni nanobar/lead zirconate titanate film. First, with application of different external magnetic fields as a baseline characterization, the magnetic single domain in the Ni nanobar presents time-dependent nanoscale remanent domain patterns which were observed under a magnetic force microscope. Based on this baseline characterization, we further successfully demonstrate that these time-dependent nanoscale magnetic domain patterns could be instantaneously controlled with an application of electric fields due to the converse magnetoelectric effect. The magnetic-field-induced changes are correlated with the electric-field-induced changes. [J213]

"Conductive atomic force microscopy study of self-assembled silicon nanostructures"

Understanding the electrical transport properties of nanostructures and metal-nanostructure contacts is important before these can be fabricated into electronic devices. Conductive atomic force microscopy investigations of self-assembled silicon nanostructures are reported here, where the nanostructures are fabricated using electron-beam rapid thermal annealing, a self-assembly process that has been shown to produce field-emission devices using CMOS-compatible technology. Unambiguous correlations between current flow and topography are found, and local current-voltage (IV)spectroscopy measurements are used to determine the ideality factors (1.83-3.20) and barrier heights (0.28-0.49eV)for the metal-nanostructure contacts. [J214]

"Self-aligned fabrication of 10 nm wide asymmetric trenches for Si/SiGe heterojunction tunneling field effect transistors using nanoimprint lithography, shadow evaporation, and etching"

Fabrication of an asymmetric source/drain structure is important to heterojunction tunneling transistors but is extremely difficult to achieve reliably due to the stringent requirement of nanometer overlay alignment. Here the authors propose and demonstrate a simple self-aligned asymmetric nanotrench fabrication method, which has

achieved a 10 nm wide (35 nm deep) trench in source region with an alignment accuracy better than 3 nm. The method is based on asymmetric shadow evaporation of the metal with the gate as a mask, creating an area uncovered by the metal only in the source but not in the drain, and a subsequent reactive ion etching with the evaporated metal as the etching mask. The accuracy of this method was found experimentally and theoretically to be within 5 nm. [J215]

"Nonlinear Auto-Oscillator Theory of Microwave Generation by Spin-Polarized Current"

This paper formulates a general analytic approach to the theory of microwave generation in magnetic nano-structures driven by spin-polarized current and reviews analytic results obtained in this theory. The proposed approach is based on the universal model of an auto-oscillator with negative damping and nonlinear frequency shift. It is demonstrated that this universal model, when applied to the case of a spin-torque oscillator (STO) based on a current-driven magnetic nano-pillar or nano-contact, gives adequate description of most of the experimentally observed properties of STO. In particular, the model describes the power and frequency of the generated microwave signal as functions of the bias current and magnetic field, predicts the magnitude and properties of the generation linewidth, and explains the STO behavior under the influence of periodic and stochastic external signals: frequency modulation, phase-locking to external signals, mutual phase-locking in an array of STO, broadening of the generation linewidth near the generation threshold, etc. The proposed nonlinear auto-oscillator theory is rather general and can be used not only for the development of practical nano-sized STO, but, also, for the description of nonlinear auto-oscillating systems of any physical nature. [J216]

"Site-controlled InAs quantum dots grown on a 55 nm thick GaAs buffer layer"

We present site-controlled low density InAs quantum dots grown by molecular beam epitaxy with a template based overgrowth technique allowing enlarged buffer layers upto 55 nm. Growing a seeding layer of InAs quantum dots in etched holes reduces closing of the holes, so that a second layer of InAs quantum dots can be aligned to the holes after a buffer layer overgrowth. Confocal microphotoluminescence measurements show a significant decrease of the low temperature photoluminescence linewidth of the quantum dots to an average value of 500mu eVand a minimum width of 460mu eV. This is to be compared to 2 to 4 meV of quantum dots grown on thin buffer layers. This improvement is due to the enlarged distance to residual defects at the overgrown surface. [J217]

"An energetic stability predictor of hydrogen-terminated Si nanostructures"

We present a linear relationship between the cohesive energies and the H/Si ratio for hydrogen-terminated Si semiconductor nanostructures based on our model analysis and first-principles calculations. The H/Si ratio is shown to be a universal predictor of the nanostructure's energetic stability and allows easily searching of magic numbers in Si quantum dots. Our findings substantially improve the understanding of nanostructure stability and make practical the prediction of structural properties. [J218]

"Study of temporal current stability and fluctuations of field emitted electrons from ZnO nanostructure films"

Stable field emission currents and low fluctuations are important feasibility requirements for the application of materials in field emission devices and displays, more than the low turn on fields that are generally considered. The current stability and current fluctuations of field emitted electrons from ZnO nanostructures were investigated over the period of 2, 12, and 24 h. The films with nanoneedle structure having density around ten/mcm2showed better short and long-term (temporal) stability over a period of 24 h. The short- and long-term stability and the current fluctuations of the nanostructures are reported and the causes for the degradation of the emission current are discussed. [J219]

"The size effect of catalyst on the growth of helical carbon nanofibers"

Cu-catalyzed carbon nanofibers are investigated by means of transmission electron microscopy. Straight and helical carbon nanofibers are observed to connect to the catalyst particles of octahedron or triangular prism in the samples prepared using the same processing conditions. Statistic analysis of the results leads to evidence that the morphology of the nanofibers depends on the size of the catalyst particles. Small size of catalyst particles favors formation of the helical fibers, while large size of catalysts results in the straight fibers. Based on the observed results, growth, and morphology formation of the carbon nanofibers are discussed. The growth model in which the rotating catalysts catalyze the growth of the carbon nanostructure in a helical way is proposed. [J220]

"Fabrication of high efficiency III-V quantum nanostructures at low thermal budget on Si"

We fabricate high efficiency GaAs/AlGaAsquantum nanostructure active layer for intersubband detectors and light emitting devices on a silicon substrate. The whole process of formation of the GaAs/AlGaAsactive layer was realized via droplet epitaxy and migration enhanced epitaxy maintaining the growth temperature ≤350°C, thus resulting in a low thermal budget procedure compatible with back-end integration of the fabricated materials on integrated circuits. The realized quantum nanostructures show optical efficiencies comparable to those achievable with state of the art quantum dot materials grown on GaAs substrates. [J221]

"The influence of ammonia on the electrical properties of detonation nanodiamond"

Detonation nanodiamonds (DNDs) are an interesting class of materials for sensing applications, but little is currently understood about their electrical properties. Here, aggregated DNDs are explored with impedance spectroscopy and are found to offer near-to-ideal dielectric characteristics, which is intriguing given their nanostructure. When exposed to ammonia, two highly conductive pathways emerge through the material; these appear to be associated with grain boundary and grain interior processes, the latter potentially due to surface transfer doping. This process is reversible given modest temperature increases suggesting DNDs may offer a solid state electrical platform for ammonia sensing applications. [J222]

"Nanoscale phase separation of a binary molecular system of copper phthalocyanine and di-indenoperylene on Ag(111)"

Alternating copper phthalocyanine (CuPc) and di-indenoperylene (DIP) molecular chain arrays have been fabricated via nanoscale phase separation of this CuPc:DIP binary molecular system on Ag(111). In situ low-temperature scanning tunneling microscopy has been used to investigate the molecular self-assembling processes on surface and the structural property of the well-ordered nanostructure arrays. The results show that the formation of these supramolecular structures is governed by the noncovalent molecule-molecule interactions. [J223]

"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. [J224]

"Connecting fabrication defects to fault models and SPICE simulations for DNA self-assembled nanoelectronics"

The self-assembly of nanoelectronic devices provide an opportunity to achieve unprecedented density and manufacturing scale in the post-Moore's Law era. Bottom-up DNA self-assembly has emerged as a promising technique towards achieving this vision and it has been used to demonstrate precise patterning and functionalisation at resolutions below 20 nm. However, a lack of understanding of fabrication defects and their impact on circuit behaviour are major obstacles to the eventual application of these substrates to circuit design. The authors present a classification of defects observed in our experimental work on self-assembled nanostructures. Atomic force microscope (AFM) images are used to study these defects and determine their relative frequencies. The authors connect these defects to fault models and predict their likely impact on the behaviour of logic gates. Based on simulation program with integrated circuit emphasis simulation data for proposed layouts, the authors conclude that there is a predictive connection between faulty logic behaviour and physical defects for future DNA self-assembled nanoelectronics. This work will be useful in predicting the potential success of defect-tolerance techniques for DNA self-assembled nanoelectronic substrates. [J225]

"Surface plasmon resonance in nanostructured metal films under the Kretschmann configuration"

We systematically investigated the surface plasmon resonance in one-dimensional (1D) subwavelength nanostructured metal films under the Kretschmann configuration. We calculated the reflectance, transmittance, and absorption for varying the dielectric fill factor, the period of the 1D nanostructure, and the metal film thickness. We have found that the small dielectric slits in the metal films reduce the surface plasmon resonance

angle and move it toward the critical angle for total internal reflection. The reduction in surface plasmon resonance angle in nanostructured metal films is due to the increased intrinsic free electron oscillation frequency in metal nanostructures. Also we have found that the increasing the spatial frequency of the 1D nanograting reduces the surface plasmon resonance angle, which indicates that less momentum is needed to match the momentum of the surface plasmon-polariton. The variation in the nanostructured metal film thickness changes the resonance angle slightly, but mainly remains as a mean to adjust the coupling between the incident optical wave and the surface plasmon-polariton wave. [J226]

"Theoretical prediction of GaN nanostructure equilibrium and nonequilibrium shapes"

A wide variety of nanostructure shapes have been observed for GaN under different growth conditions. These shapes include but are not limited to hexagonal pyramid, prismatic, triangular cross-section nanowires, and arrow-headed shapes. Using Wulff's plot and kinetic Wulff's plot for GaN under thermodynamic equilibrium and under various kinetic conditions, we present a model to theoretically predict and explain these faceted nanostructure shapes. Legendre transformation on Wulff's plot and kinetic Wulff's plot has been extensively utilized to obtain the faceted equilibrium shapes in equilibrium. In addition, equilibrium and nonequilibrium faceted geometry of nanostructures have also been predicted by numerical simulations using level set methods and the proposed kinetic Wulff's plot. [J227]

"Thermal nitridation passivation dependent band offset and electrical properties of AlO x N y /GaAs gate stacks"

Fermi level pinning attributed to oxides at the GaAs/high-kinterface is a major obstacle to develop GaAs-based metal-oxide-semiconductor devices with high performance. In this letter, thermal nitridation treatment of GaAs surface prior to the high-kdeposition is proposed to solve the issue of interface pinning. Results have confirmed that nitridation passivation effectively suppresses the oxides formation and leads to a shift in the Fermi level toward the conduction band minimum on the GaAs surface, which increases the conduction band offset at the GaAs/AlOxNyinterface, followed by a saturated accumulation capacitance with reduced gate leakage current. [J228]

"Characteristics of SiC pillar-shaped nanostructure Schottky diode"

The effect of geometrical shape on the electrical transport was analyzed in SiC nanostructure Schottky diode. Two different contacts, the pillar-shaped nanostructure contact and nanoscale contact, were fabricated separately from top down method. Compared with nanoscale contact, the nanostructure contact showed the low current level, but similar Schottky barrier property. This is attributed by the fact that pillar-shaped nanostructure has smaller base areas which prevent the electrons from efficient transport into the nanostructure. This led to the decrease in electron mobility, resulting in the higher resistance in the I-Vcurves. From Fowler-Nordheim plot, it was almost linear for higher voltage region, but the linear behavior disappeared in the lower one. This implied that the electron tunneling was the main transport mechanism at higher electric field in this structure. [J229]

"Injection of carriers from a ZnO nanostructured shell to a ZnS based microsphere core"

ZnO nanostructures were synthesized on a microsphere ZnS:Cu,Cl (ZC) with various optical emission bands. Using an electroluminescence (EL) device with a semiliquid type of active layer, the carrier injection phenomenon through the nanostructure was observed. The EL from ZnO nanorods on the cubic ZC and the ZnO plate on the hexagonal ZC showed a nonlinear voltage-color characteristic and deep blue color, respectively, as explained by the carrier injection through the ZnO nanostructures. Both carrier injection cases appear to have been caused by the lowered band-gap energy at the boundary and by the structural factors that focused the applied electric field. [J230]

"Enhancement in optical absorption of silicon fibrous nanostructure produced using femtosecond laser ablation"

Fibrous nanostructures are proposed for the application of solar cell. Irradiation of silicon surface with a few hundred femtosecond laser pulses of fluence 13kJ/m2at 13 MHz pulse frequency in air atmosphere results in the formation of fibrous nanostructure layer on the treated surface that leads to a significant decrease in the reflection of visible radiation. For the visible wavelength, the decreased reflection is a result of the nature of the nanostructure. The Raman peak shift in the irradiated surface confirms that the surface is changed to amorphous silicon due to fibrous nanostructure formation. [J231]

"Inductance in One-Dimensional Nanostructures"

The physical origin of kinetic inductance is examined for 1-D nanostructures, where the Fermi liquid theory prevails. In order to have appreciable kinetic inductance, ballistic transport must exist, with no inelastic scattering inside the nanowires. Kinetic inductance is assigned to the nanowire itself and independent of its surroundings, whereas magnetic inductance is assigned to the nanowire and substrate. Kinetic and magnetic inductances are in series in an equivalent circuit representation. If there are m transmission modes and n multiwalls in the nanostructure, kinetic inductance decreases by a factor of 1/(mn). The relation of the predicted results to preliminary experimental findings is discussed. [J232]

"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. [J233]

"Oscillating current observed in field emission from a single zinc oxide nanostructure and the physical mechanism"

A phenomenon of field emission instability is reported. Field emission current oscillation was observed when a single zinc oxide (ZnO) one dimensional nanostructure operated at high current density. As a result, the radius curvature of the nanoemitter apex was sharpened to less than 15 nm. This indicates the oscillation was associated with melting of the emitter material. We found that the oscillation may be ascribed to (i) the behavior of charging and (ii) the shape changing of a metallic liquid ball that exists at the tip apex under high electric field. The net force of electric force and surface tension modifies the radius of the apex periodically, which results in the oscillation of field emission current. This finding may enhance the understanding of the physical process of field emission from ZnO nanostructures. [J234]

"Carrier transport by field enhanced thermal detrapping in Si nanocrystals thin films"

The carrier transport at high voltage region in Si nanocrystal (SiNC) thin films has been investigated. The current-voltage measurements demonstrate that at high voltage region, conductance exponentially depends on V1/2. The activation energy, measured from the temperature dependence of the current-voltage (I-V)characteristics, decreases with an increase in the applied voltage. These results indicate that field enhanced detrapping dominates transport mechanism in the SiNC films at high voltage region. The possible influence of metal/semiconductor contacts on V1/2dependence has been excluded through the activation energy measurement on different work-function metals as electrodes. The position of the traps contributing to the detrapping processes is concluded to be at interfaces of SiNC/SiO2since H2annealing drastically decreases the activation energy. The reasons why experimental results demonstrate no accordance with the material parameter V*of Poole-Frenkel expression have been discussed based on nanostructure characteristics of SiNC film. [J235]

"Optimal control of the local electromagnetic response of nanostructured materials: Optimal detectors and quantum disguises."

We consider the problem of optimization of an effective trapping potential in a nanostructure with a quasi-one-dimensional geometry. The optimization is performed to achieve certain target optical properties of the system. We formulate and solve the optimization problem for a nanostructure that serves either as a single molecule detector or as a "quantum disguise" for a single molecule. [J236]

"Nanostructured solid-state hybrid photovoltaic cells fabricated by electrostatic layer-by-layer deposition"

We report on the fabrication of hybrid organic/inorganic photovoltaic cells utilizing layer-by-layer deposition of water-soluble polyions and nanocrystals. A bulk heterojunction structure was created consisting of alternating layers of the p-conductive polythiophene derivative poly[2-(3-thienyl)-ethoxy-4-butylsulfonate] and n-conductive TiO2nanoparticles. We fabricated working devices with the heterostructure sandwiched between suitable charge carrier blocking layers and conducting oxide and metal electrodes, respectively. We analyzed the influence of the thickness and nanostructure of the active layer on the cell performance and characterized the devices in terms

of static and transient current response with respect to illumination and voltage conditions. We observed reproducible and stable photovoltaic behavior with photovoltages of up to 0.9 V. [J237]

"Enhanced resolution of poly(methyl methacrylate) electron resist by thermal processing"

Granular nanostructure of electron beam resist had limited the ultimate resolution of electron beam lithography. The authors report a thermal process to achieve a uniform and homogeneous amorphous thin film of polymethyl methacrylate electron resist. This thermal process consists of a short time-high temperature backing process in addition to precisely optimized development process conditions. Using this novel process, they patterned arrays of holes with diameter smaller than 5 nm and line edge roughness and surface roughness of the resist reduced to 1 nm and 100 pm, respectively. In addition, etch resistance of the resist verified and the resist pattern transferred to a metal thin film. [J238]

"Structural, optical, and photocatalytic properties of ZnO:Al nanowall structure deposited on glass substrate by spray pyrolysis"

This study reports the fabrication of undoped and Al-doped ZnO nanowall structures on ordinary glass substrate by low cost spray pyrolysis technique at low deposition temperature of 350°C. Structural, surface, optical, and photocatalytic studies of these nanostructures have been performed. Surface study confirms the nanowall structure of the fabricated ZnO. Structural study reveals that the fabricated ZnO nanostructures are polycrystalline in nature and crystallinity of the samples depends on the Al doping concentration. Band gap of the ZnO nanostructure has been determined from the transmission spectra. For undoped ZnO, the band gap was obtained 3.27eVand the band gap decreases up to 3.06eVwith the increase in Al doping concentration up to 4%. Photocatalytic decomposition of methanol has been studied and found that the fabricated ZnO nanowalls can successfully decomposes methanol under UV-visible light irradiation without any surface treatment, and improvement in the photocatalytic activity was obtained after Al doping. [J239]

"Parallel generation of nanochannels in fused silica with a single femtosecond laser pulse: Exploiting the optical near fields of triangular nanoparticles"

We present experiments to prepare highly ordered nanochannels with subdiffraction dimensions on fused silica surfaces with femtosecond laser light. For this purpose, we exploit the strongly enhanced near field of highly ordered triangular gold nanoparticles. We demonstrate that after a single laser shot, 6mcmlong nanochannels with a mean depth of 4 nm and an average width of 96 nm, i.e., well below the diffraction limit, are generated. These nanochannels are prepared by ablation, caused by the localization of the near field. The crucial parameters, besides the applied fluence, are the polarization direction of the incoming laser light with respect to the triangular nanoparticles and the size of the nanoparticles. [J240]

"Analysis of terahertz generation via nanostructure enhanced plasmonic excitations"

In this paper, we conduct a quantitative study on the physical mechanism of electrons dynamics near the nanostructured metal film surfaces, as well as the efficiency of generated terahertz radiation associated with different types of nanostructures. The simulation results show that although the oscillating motion of emitted electrons outside the metal surface may affect the terahertz generation efficiency to some extent, this efficiency is predominantly determined by the electric field magnitude inside the metal film associated with nanostructure enhanced plasmonic excitations. Due to the field enhancement effect of the nanostructure, an appropriately designed nanostructured surface could greatly enhance the strength of generated terahertz signal via the increased nonlinear interactions between the light and the nanostructures. [J241]

"New Excellent Soft Magnetic FeSiBPCu Nanocrystallized Alloys With High of 1.9 T From Nanohetero-Amorphous Phase"

The melt-spun Fe83.3-84.3Si4B8P3-4Cu0.7(at%) alloys have heterogeneous amorphous structures including a large amount of alpha-Fe clusters with less than 3 nm in size after rapid solidification, due to the unusual effect of the simultaneous addition of the small amounts of P and Cu. A homogeneous nanocrystalline structure composed of alpha-Fe grains with a size of about less than 20 nm can be realized by crystallizing the heteroamorphous alloys. The Fe83.3-84.3Si4B8P3-4Cu0.7nanocrystalline alloys show significantly high saturation magnetic flux density of 1.88-1.94 T almost comparable to the commercial silicon steel. The Fe83.3-84.3Si4B8P3-4Cu0.7alloys exhibit excellent magnetic softness; low coercivity of 7-10 A/m, relatively high effective permeability of 16 000-25 000 at 1 kHz due to the simultaneous realization of the uniform nanostructure composed by fine alpha-Fe grains and a small magnetostriction of 2-3 times 10-6. The nanocrystalline alloys also exhibit much smaller W than the silicon steel over the Bmrange up to 1.7 T due to significantly higher

Bsand excellent magnetic softness. Therefore, the Fe-Si-B-P-Cu alloys have a great advantage for engineering and industry, and, thus, should make a contribution to energy saving and conservation of earth's resources and environment. [J242]

"From nanoparticle to nanocable: Impact of size and geometrical constraints on the optical modes of Si /SiO 2 core/shell nanostructures"

In the extinction spectra of Si/SiO2core/shell nanostructures, peak features in the near UV region (3-5 eV) appear when the nanostructure geometrical configuration changes from spherical nanoparticles to cylindrical nanocables, with the peak features become more intense in the nanocables of smaller core diameter. Similar feature at 4.2eVis also observed in the spatially resolved electron energy loss spectra (SREELS) of individual nanocable, but not in the nanoparticle. The EELS simulations unravel the origin of such excitation as the monopolar interface plasmon in cylindrical nano-objects, being responsible for the observed near UV extinction modes in nanocables. [J243]

"Self-organized vertically aligned single-crystal silicon nanostructures with controlled shape and aspect ratio by reactive plasma etching"

The formation of vertically aligned single-crystalline silicon nanostructures via "self-organized" maskless etching in Ar+H2plasmas is studied. The shape and aspect ratio can be effectively controlled by the reactive plasma composition. In the optimum parameter space, single-crystalline pyramid-like nanostructures are produced; otherwise, nanocones and nanodots are formed. This generic nanostructure formation approach does not involve any external material deposition. It is based on a concurrent sputtering, etching, hydrogen termination, and atom/radical redeposition and can be applied to other nanomaterials. [J244]

"Ultrafast dynamics of femtosecond laser-induced nanostructure formation on metals"

We perform a comparison study on femtosecond laser-induced nanostructures on three noble metals, Cu, Ag, and Au. Under identical experimental conditions, the three metals each gain a different amount of surface area increase resulting from nanostructuring. We show that the different surface area increase from nanostructuring directly relates to the competition of two ultrafast processes, electron-phonon coupling and hot electron diffusion, following femtosecond laser heating of metals. [J245]

"Dimensionality Control and Magnetism of Fe on Nanopatterned Au(111) Surface"

Scanning tunneling microscope (STM) is used to explore the room-temperature (RT) growth and multistep growth of Fe on Au(111) herringbone surface. The statistical analysis of island size and arrangement, combined with a phenomenological magnetic anisotropy energy (MAE) model, can describe the previously reported magnetic behavior of Fe two-dimensional (2-D) island array very well. While increasing the Fe coverage, MAE is dominated by edge atoms, surface atoms, and then shape MAE, sequentially. The multistep growth, combing nucleation seeds, Xe buffer layer, and annealing treatment, reveals the possibility for manipulating the Fe growth into desired multilayer islands. [J246]

"A ZnO Nanostructure-Based Quartz Crystal Microbalance Device for Biochemical Sensing"

We report a ZnO-nanostructure-based quartz crystal microbalance (nano-QCM) device for biosensing applications. ZnO nanotips are directly grown on the sensing area of a conventional QCM by metalorganic chemical vapor deposition (MOCVD). Scanning electron microscopy (SEM) shows that the ZnO nanotips are dense and uniformly aligned along the normal to the substrate surface. By using superhydrophilic nano-ZnO surface, more than tenfold increase in mass loading sensitivity of the nano-QCM device is achieved over the conventional QCM. The ZnO nanotip arrays on the nano-QCM are functionalized. The selective immobilization and hybridization of DNA oligonucleotide molecules are confirmed by fluorescence microscopy of the nano-QCM sensing areas. [J247]

"Nano electrostatic discharge"

As nanostructures become smaller, the electrostatic sensitivity increases, leading to new failure mechanisms. In many new electrostatically actuated devices, electric forces lead to the motion of structural elements. Electrostatically actuated devices, magnetic recording devices, photomasks, RF switches, and micromachines have air gaps, which can lead to a breakdown across surfaces and in the air gap; the failure mechanism can lead to both latent and functional failures of the structure. Significant challenges are ahead of us in providing protection to these nanostructures from electrostatics. [J248]

"Dual-Chirality Helical Nanobelts: Linear-to-Rotary Motion Converters for Three-Dimensional Microscopy"

A linear-to-rotary motion converter is demonstrated using 3-D SiGe/Si dual-chirality helical nanobelts (DCHNBs). Analytical and experimental investigation shows that the motion conversion has excellent linearity for small deflections. The conversion ratios of displacement and load for a SiGe/Si DCHNB (an 8-nm-thick Si0.6Ge0.4and a 10-nm-thick Si layer) are found to be 171.3deg/mum and 2.110 times 10-6Nmiddotm/N, respectively. The stiffness (0.033 N/m) is much smaller than that of bottom-up synthesized helical nanostructures, which is promising for high-resolution force measurement in nanoelectromechanical systems. To perform torque measurement, two atomic force microscope cantilevers are used for simultaneous characterization of axial and radial properties of the same nanostructure. An application related to 3-D imaging is shown in a scanning electron microscope. The ultracompact size makes it possible for DCHNBs to serve as rotary stages for creating 3-D scanning probe microscopes or microgoniometers. [J249]

"Size Distribution and Anisotropy Effects on the Switching Field Distribution of Co/Pd Multilayered Nanostructure Arrays"

We use ion beam proximity lithography (IBPL) to produce 4 mm times 4 mm arrays of 220-nm dots in perpendicularly oriented Co/Pd multilayered media. A novel technique of overlapping neighbors is used with IBPL to generate samples with controllable size distribution sigmaDof the nanoarrays. The switching field distribution sigmaHcr/HCris measured for each sample before and after irradiation, and a linear relationship is experimentally found between sigmaHcr/HCrand sigmaD. Empirical calculations support our determination that self-demagnetization fields are responsible for a portion of the switching field distribution. Using the zero intercept of the experimental data, we find the inherent anisotropy distribution in the Co/Pd samples is on the order of 10%. We further irradiate the samples with He+ ions to alter the anisotropy and better understand the role of shape anisotropy. As interface anisotropy is reduced in the Co/Pd bit-patterned medium (BPM) samples, shape anisotropy has a much greater contribution on the switching field distribution of the BPM samples. [J250]

"Synthesis and Magnetic Properties of Multifunctional Fe O -AuPt Core-Shell Nanoparticles"

This paper describes the synthesis and magnetic properties of multifunctional Fe3O4-AuPt core-shell nanoparticles. The Fe3O4-AuPt core-shell nanoparticles were synthesized by a one-pot polyol process in two consecutive steps from Fe, Au, and Pt precursors. The structural characterization and property analysis proves the formation of the core-shell nanostructure fusing the multifunctionality in a single entity. The TEM observation shows that the Fe3O4-AuPt core-shell nanoparticles are highly crystalline and uniform in size distribution, with an averaged particle size of ~12.5 nm in diameter, whereas the X-ray diffraction patterns provide further substantiation. The surface plasmon resonance arising from the AuPt nano-shell was revealed by UV-vis spectroscopy, while the magnetic measurements by VSM and PPMS demonstrate the well-defined superparamagnetic and/or soft-ferromagnetic behavior of the Fe3O4-AuPt core-shell nanoparticles. [J251]

"Degradation assessment of nanostructured superhydrophobic insulating surfaces using multi-stress methods"

This paper describes the electrical insulation property of modified superhydrophobic surfaces, which are prepared on epoxy based composites by using special nano-particles. After surface modification the samples exhibit an extreme unwettability with a static contact angle thetasges130deg. In order to investigate the long term stability under multiple stress, the specimens are subjected to electric fields and moisture in accelerated aging tests like modified-rotating-wheel-dipping-test (MRWDT), clean fog test and condensation test, according to the critical outdoor and indoor service conditions, respectively. It is shown that leakage current and effective power dissipation of contamination layers are significantly suppressed in the presence of superhydrophobic insulating surfaces. Thus, the pollution performance of the insulation systems can be enhanced to a great extent in clean fog test and MRWDT, whereas the insulating surfaces covered with nanoparticles seem to have no beneficial effect during the condensation experiments because of the different wetting mode. In addition, the impact of release agents and fillers on the surface superhydrophobicity is also examined in this study. Moreover, the surface analyses are employed to characterize the topographical change of the nanostructure in connection with the material degradation. [J252]

"A Model for the Self Structuring of Nanotubes in Titanium Oxide"

An electrostatic model is presented to explain the closed packing observed in anodic production of nanotubes. The model is suggested by the experimental results of impedance spectroscopy performed during the growth of titanium oxide nanotubes in a polar nonaqueous electrolyte. The dynamics of the process is represented with the

capacitance and the dc current. Accordingly, a combination of electrostatic and chemical activity defines the structure formation, ranging from of porous random materials to self-structured materials. In this model, the geometry of the nanostructure can be controlled with the voltage. [J253]

"Enhanced partial discharge resistance of epoxy/clay nanocomposite prepared by newly developed organic modification and solubilization methods"

Frequency accelerated partial discharge (PD) aging of epoxy nanocomposite with 5 wt % additions of clay was investigated in comparison with that of epoxy without clay in terms of PD erosion depth. It was found that the change in the erosion depth is far smaller in specimens with clay than those without clay. The newly developed organic modification and solubilization methods give comparable PD resistance characteristics. The latter would be more resistant to PD's than the former, if specimens were prepared properly. It was clarified that nano-micro mixed composites were superior to the single nanocomposite. Nano segmentation with some interaction zone effect is proposed as a mechanism of improvement in PD resistance. [J254]

"Fabrication of field-emission cathode ray tube with a unique nanostructure carbon electron emitter"

A field-emission cathode ray tube (FE-CRT) has been fabricated using a unique nanostructure carbon electron emitter called carbon nanometer electron exit (CNX) which has been developed on stainless rod substrate with a special plasma chemical vapor deposition technique. Field emission from CNX has been investigated in a vacuum of 3Ч10-6Torrby using a diode configuration with a 5mmdiameter anode and an A-Kgap of 1mm, which shows that a emission current density of 1mA/cm2can be obtained at an electrical field of 0.95V/mcm. When the electrical field was increased to 2.4V/mcm, an emission current density of 1.568A/cm2was observed. Scanning electron microscopy images and micro-Raman spectrum were used to characterize the CNX film. The design of the emission system of electronic gun was optimized by simulating the equal-potential lines using a commercial software. Finally, a 4.5in.FE-CRT with a specially designed emission system has been fabricated. [J255]

"Effects of Mo seeding on the formation of Si nanodots during low-energy ion bombardment"

Effects of seed atoms on the formation of nanodots on silicon surfaces during normal incidence Ar+ion bombardment at room temperature are studied with real-time grazing-incidence small-angle x-ray scattering (GISAXS), real-time wafer curvature stress measurements and ex situ atomic force microscopy. Although Si surfaces remain smooth during bombardment at room temperature, when a small amount of Mo atoms is supplied to the surface during ion bombardment, the development of correlated structures ("dots") is observed. Stress measurements show that initially a compressive stress develops during bombardment, likely due to amorphization of the surface and insertion of argon. However, seeding causes a larger tensile stress to develop with further bombardment, possibly due to the formation of higher density regions around the Mo seed atoms on the surface. Detailed fits of the GISAXS evolution during nanostructure growth show that the instability is larger than predicted by the Bradley-Harper theory of curvature-dependent sputter yield. These results suggest that the tensile stress is playing a dominant role in driving the nanodot formation. [J256]

"Optoelectronic Signatures of Biomolecules Including Hybrid Nanostructure-DNA Ensembles"

Biological macromolecules such as DNA, proteins, and polysaccharides often display unique absorptive signatures in the THz region, useful in their identification and imaging through Raman and Fourier transform transmission spectroscopy. The optoelectronic properties of nanostructure-DNA complexes immobilized on transparent, semi-rigid substrates such as polymethyl methacrylate (PMMA) have been studied. By chemically modifying the PMMA substrates with amine terminal groups and using suitable linking agents, amine terminated DNA can be localized on these substrates. THz Fourier transform transmission spectroscopy was used to detect low-frequency vibrational modes (10-25 cm-1) within single- and double-stranded DNA molecules immobilized on PMMA attached to TiO2nanoparticles. Additionally, DNA strands end terminated with TiO2nanoparticles are used in this study to cleave the DNA at guanine (G) rich sites due to trapping of photo-induced charge carriers from the TiO2at these sites. Theoretical modeling of charge transport through DNA via polaron transport is discussed in detail. By examining the vibrational modes of DNA, as well as the transport of charge in DNA this study underlies potential applications involving DNA micro-arrays, DNA-based sensors, and DNA-based THz devices. [J257]

"A Novel SR Latch Device Realized by Integration of Three-Terminal Ballistic Junctions in InGaAs/InP"

In this letter, a novel sequential logic device based on three-terminal ballistic junctions (TBJs) is proposed and

demonstrated. Two TBJs and two in-plane gates are laterally integrated in a high-electron-mobility InGaAs/InP quantum-well material by a single-step lithography process. Electrical measurements reveal that the integrated device functions as a set-reset (SR) latch with voltage gains at room temperature. The demonstrated device provides a new and simple circuit design for SR latches in digital electronics. [J258]

"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. [J259]

"Polarized Neutron Reflectometry for the Analysis of Nanomagnetic Systems"

In recent years, polarized neutron reflectometry (PNR) has played an essential role for the exploration of magneto- and spintronic structures. Well known systems extensively studied include exchange coupled magnetic superlattices, exchange bias systems between ferromagnetic and antiferromagnetic films, exchange spring valves between soft and hard magnetic films, and more recently magnetic semiconductors and ferromagnetic Heusler alloy films and superlattices. In addition to studies of laterally extended layered systems, neutron scattering has now been applied to the exploration of periodic magnetic arrays, such as stripes and islands on the submicrometer scale. Although the competition with magneto-optics and X-ray resonant magnetic scattering (XRMS) has increased in recent years, there are some advantages PNR offers that are hard to challenge. One of those is the quantitative analysis of the data via fits to theoretical models based on the distorted wave Born approximation (DWBA), which accounts for both specular and off-specular scattering. The second one is spin flip (SF) scattering, which has no counterpart in XRMS. SF scattering probes magnetization fluctuations transverse to the mean magnetization direction and gives access to magnetic roughness and magnetic domain states. Specular and off-specular PNR work is exemplified by most recent work on spintronic materials and on patterned and functionalized magnetic layers. [J260]

"Experimental Study of a Silver Layer on an Antireflection Subwavelength-Structured Surface"

The optical characteristics of a silver layer deposited on an antireflection subwavelength-structured surface are investigated. The experimental results of the reflectance and the transmittance of several different thicknesses of silver layer on the subwavelength-structured surface are carried out. A subwavelength structure with the spatial period and diameter of about 230 nm and height of about 150 nm on polyethylene terphthalate film is fabricated by microreplication process. It is shown that such an element with the suitable silver layer deposited on an antireflection subwavelength-structured surface has high transmittance and low glare in the visible spectral range and high reflectance in the infrared range. Obviously, the optical film with silver layer can not only obtain the high performance of heat insulation but also give an application in automobile and house windows. [J261]

"Fabrication of three-dimensional nanostructures by focused ion beam milling"

The fabrication of an extended three-dimensional nanostructure with dimensions much larger than the feature size using a focused ion beam is described. By milling two identical patterns of pores with a designed diameter of 460 nm in orthogonal directions, a photonic crystal with an inverse woodpile structure was made in a gallium phosphide single crystal. The patterns are aligned with an unprecedented accuracy of 30 nm with respect to each other. The influence of GaP redeposition on the depth, shape, and size of the pores is described. A literature study revealed that the redeposition of GaP during milling is more pronounced than that of Si found in

previous studies. An explanation for this phenomenon is given. [J262]

"Electron beam induced deposition of iron nanostructures"

Electron beam induced deposition is among the most prospective methods for size- and position-controllable nanofabrication of three-dimensional structures. Direct-write maskless nanostructure fabrication was performed with a scanning electron microscope. Three-dimensional iron structures were obtained by locally confined electron induced dissociation of an iron carbonyl (Fe(CO)5)precursor. Vertical nanopillars consisting of Fe with O and C contaminations were deposited. Two different growth regimes-electron induced growth and autonomous growth-were observed. The precursor pressure was shown to have a significant influence on the growth mode. [J263]

"In(Ga, Al)As quantum dot/wire growth on InP"

The authors have investigated the growth of dots/wires on InP substrates by tuning the In(Ga, Al)As compositions for dots/wires and buffer layers. Dots and wires with compositions including InAs, In0.95Al0.05As, In0.95Ga0.05As, and In0.90Ga0.10Aswere grown on In0.53Ga0.26Al0.21Asand In0.52Al0.48Asbuffer layers, respectively. In(Ga)As nanostructure grown on InAlAs ternary buffer layer forms elongated dots along the [0-11] direction. On the other hand, In0.95Ga0.05Asand In0.90Ga0.10Asnanostructures grown on InGaAlAs buffer layer form quantum wire arrays of high uniformity. The In0.90Ga0.10Asquantum wires have a photoluminescence spectrum of emission peak at lambda 1680nmand a narrow full width at half maximum of 65meVat 10K. For the growth of In0.95Al0.05Asnanostructures, dot formations are observed on the InAlAs and InGaAlAs buffer layers. [J264]

"Novel in situ setup to study the formation of nanoparticles in the gas phase by small angle x-ray scattering"

An in-house built aerosol generator setup for in situ gas phase studies of aerosol and nanoparticles is described. The aerosol generator with an ultrasonic ceramic disk mist maker provides high enough particle concentrations for structural gas phase analysis by synchrotron small angle x-ray scattering (for water 4Ч108droplets/swith a droplet size of 2.5mcm). The working principle was proved by scattering of gold nanoparticles. For evaporation induced self-assembly studies of nanostructured particles, an additional thermal treatment chamber was included in the setup. The first on-line gas phase data with our setup for mesostructured silica particles are presented for different thermal treatments. Scanning electron microscope imaging revealed the average particle size to be 1mcm. Furthermore, to quantify their internal nanostructure, diffraction experiments of deposited silica aerosols were carried out and the corresponding electron density map indicates a silica wall thickness of about 1nm. [J265]

"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. [J266]

"Dark current and band profiles in low defect density thick multilayered GaAs/InAs self-assembled quantum dot structures for infrared detectors"

We report results of a systematic study of the structural and photoresponse properties of GaAs/{InAs quantum dot (QD)/InGaAs quantum well/GaAs} Чmmultiple quantum dot (MQD) structures with mfrom 1 to 20 placed in n-GaAs/i(MQD)/n-GaAsconfiguration to act as quantum dot infrared photodetectors (QDIPs). Extremely low dislocation densities inferred from cross-sectional and plan-view transmission electron microscopy and the observed linear increase in photoluminescence intensity with MQD thickness reveal the high quality of these QDIP structures. Temperature and bias dependent dark and photocurrent measurements reveal dark current activation energies (Ea)increasing with the number of QD layers in a manner that indicates that Earepresents the built-in potential in the MQD region. These studies indicate the need for more quantitative modeling to guide optimal doping strategies and profiles to realize high photocurrents while maintaining acceptable dark current. [J267]

"Epitaxial growth of quantum rods with high aspect ratio and compositional contrast"

The epitaxial growth of quantum rods (QRs) on GaAs was investigated. It was found that GaAs thickness in the

GaAs/InAs superlattice used for QR formation plays a key role in improving the QR structural properties. Increasing the GaAs thickness results in both an increased In compositional contrast between the QRs and surrounding layer, and an increased QR length. QRs with an aspect ratio of up to 10 were obtained, representing quasiquantum wires in a GaAs matrix. Due to modified confinement and strain potential, such nanostructure is promising for controlling gain polarization. [J268]

"Regulating self-organizing nanostructures via external mechanism"

Self-organizing nanostructures are ubiquitous in both natural and synthetic materials. They are not only appealing scientifically, by revealing the intrinsic atomic and molecular interactions that might be difficult to detect otherwise, but may also hold the key for the development of novel functional structures and devices. For their technological potential to be fully realized, the size, morphology, and distribution of the self-organizing nanostructures must be regulated. In this paper, we investigate the principles under which the self-organizing nanostructures can be regulated via external mechanisms. Using nanomesa and nanowell formation in polyvinylidene fluoride trifluoroethylene copolymer film as an example, we demonstrate that the external mechanism, if appropriately applied, can not only change the structure stability and trigger pattern formation in the otherwise stable films where self-organizing nanostructure is impossible to form, but can also regulate the size, morphology, and distribution of self-organizing nanostructures in a very effective manner. While the analysis is carried out for a particular system, the principles should be applicable for a wide range of self-organizing materials and structures. [J269]

"Composition dependence of electronic structure and optical properties of Hf 1-x Si x O y gate dielectrics"

Composition-dependent electronic structure and optical properties of Hf1-xSixOy(0.1≤x≤0.6)gate dielectrics on Si at 450 °Cgrown by UV-photo-induced chemical vapor deposition (UV-CVD) have been investigated via x-ray photoemission spectroscopy and spectroscopy ellipsometry (SE). By means of the chemical shifts in the Hf 4f, Si 2p, and O 1sspectra, the Hf-O-Si bondings in the as-deposited films have been confirmed. Analyses of composition-dependent band alignment of Hf1-xSixOy/Sigate stacks have shown that the valence band (VB) offset (Delta Ev)demonstrates little change; however, the values of conduction band offset (Delta Ec)increase with the increase in the silicon atomic composition, resulting from the increase in the separation between oxygen 2porbital VB state and antibonding dstates intermixed of Hf and Si. Analysis by SE, based on the Tauc-Lorentz model, has indicated that decreases in the optical dielectric constant and increase in band gap have been observed as a function of silicon contents. Changes in the complex dielectric functions and band gap Egrelated to the silicon concentration in the films are discussed systematically. From the band offset and band gap viewpoint, these results suggest that Hf1-xSixOyfilms provide sufficient tunneling barriers for electrons and holes, making them promising candidates as alternative gate dielectrics. [J270]

"Scanning near-field optical microscopy study of metallic square hole array nanostructures"

We fabricate periodic arrays of simple-square and composite-square air hole nanostructures on a 120 nm thick Au film deposited on glass substrate by focused ion beam technology and study their optical properties by examining the optical near-field distribution via scanning near-field optical microscopy in the near-infrared region. The simple-square nanostructure only contains one square air hole in each unit cell, while the composite-square one contains the same size square air hole in the center and eight smaller square air holes in the periphery. The measured optical near-field patterns for the two nanostructures show very different distribution features. High intensity light spots locate within the central square air hole in the simple-square structure, while they sit at the peripheral smaller square air holes in the composite-square structure. Numerical simulations based on the plane-wave transfer-matrix method have been carried out to analyze the optical near-field patterns for the two metallic nanostructures and agree well with the experimental data. The results indicate that light interaction with metallic nanostructures is very sensitive to even a small change in the subtle geometrical feature. Meanwhile, by comparing near-field patterns with dielectric nanostructures theoretically, we also find that optical confinement is better for gold nanostructures than for dielectric nanostructures. [J271]

"Dielectric and ferroelectric properties of strain-relieved epitaxial lead-free KNN-LT-LS ferroelectric thin films on Sr Ti O 3 substrates"

We report the growth of single-phase (K0.44,Na0.52,Li0.04)(Nb0.84,Ta0.10,Sb0.06)O3thin films on SrRuO3coated oriented SrTiO3substrates by using pulsed laser deposition. Films grown at 600°Cunder low laser fluence exhibit a textured columnar grained nanostructure, which coalesce with increasing deposition temperature, leading to a uniform fully epitaxial highly stoichiometric film at 750°C. However, films deposited at lower temperatures exhibit compositional fluctuations as verified by Rutherford backscattering spectroscopy. The

epitaxial films of 400-600nmthickness have a room temperature relative permittivity of 750and a loss tangent of 6%at 1kHz. The room temperature remnant polarization of the films is 4mu C/cm2, while the saturation polarization is 7.1mu C/cm2at 24kV/cmand the coercive field is 7.3kV/cm. The results indicate that approximately 50% of the bulk permittivity and 20% of bulk spontaneous polarization can be retained in submicron epitaxial KNN-LT-LS thin film, respectively. The conductivity of the films remains to be a challenge as evidenced by- the high loss tangent, leakage currents, and broad hysteresis loops. [J272]

"Optical emission from erbium-doped silica nanowires"

Infrared optical emission from erbium-doped silica nanowires is shown to have property characteristic of the material nanostructure and to provide the basis for the fabrication of integrated photonic devices and biosensors. Silica nanowires of approximately 150 nm diameter were grown on a silicon wafer by metal-induced growth using a thin (20 nm) sputter-deposited palladium layer as a catalyst. The resulting wires were then ion implanted with 110 keV ErO-ions and annealed at 900 °Cto optically activate the erbium. These wires exhibited photoluminescence emission at 1.54mcm, characteristic of the 4I15/2-4I13/2transition in erbium; however, comparison to similarly implanted fused silica layers revealed stronger thermal quenching and longer luminescence lifetimes in the nanowire samples. The former is attributed to an increase in defect-induced quenching partly due to the large surface-volume ratio of the nanowires, while the latter is attributed to a reduction in the optical density of states associated with the nanostructure morphology. Details of this behavior are discussed together with the implications for potential device applications. [J273]

"Specific spectral features in electron emission from nanocrystalline silicon quasi-ballistic cold cathode detected by an angle-resolved high resolution analyzer"

A display-type analyzer with ±20°acceptance angle and high-energy resolution has been applied to analysis of the operation mechanism in a nanocrystalline polysilicon quasiballistic emitter. Angle-resolved emission patterns and the corresponding energy distributions are measured as a function of the applied device voltage in the range from 10to20V. The experimental data suggest that there are two kinds of emission band in the energy spectra. The one emission peak at lower energies exhibits definitely directional features, whereas a significantly large angular dispersion is observed in another emission peak at higher energies. The intensity of the latter emission band becomes dominant in the range of the applied device voltage higher than 15V. These results can be explained from the correlation between the silicon nanostructure in the device and the major carrier transport mode there. The analysis presented here supports the previously proposed model that the quasiballistic emission is based on the field-induced generation of energetic electrons in nanocrystalline silicon diode. [J274]

"Dependence of magnetic properties on micro- to nanostructure of CoNiFe films"

The magnetic properties of electrodeposited CoNiFe films with thicknesses varying from 0.20 to 10mcmwere studied. The films show a single face-centered-cubic CoNiFe phase with grain sizes ranging from 23 to 29 nm. The coercivity is controlled by a combination of the morphology and nanocrystalline structure of the deposits. The nanocrystalline grain size determines the intrinsic coercivity associated with crystalline anisotropy as in the random anisotropy model, whereas an additional morphology term of coercivity is controlled by the thickness inhomogeneity on a submicron scale. The thin films show considerable roughness and a higher coercivity, up to a level of 560A m-1(7.0 Oe) in 250 nm films. The thick films show coercivity values of as low as 16A m-1(0.2 Oe). The coercivity dependence on thickness was fitted using a simple model combining a morphology dependent additional contribution term to the random anisotropy model as Hc=Hcmorph+Hcanis. Good agreement between the model and the experimental results was obtained. [J275]

"Drying-induced bifurcation in a hydrogel-actuated nanostructure"

Hydrogels have enormous potential for making adaptive structures in response to diverse stimuli. In a structure demonstrated recently, for example, nanoscale rods of silicon were embedded vertically in a swollen hydrogel, and the rods tilted by a large angle in response to a drying environment [Sidorenko etal, Science 315, 487 (2007)]. Here we describe a model to show that this behavior corresponds to a bifurcation at a critical humidity, analogous to a phase transition of the second kind. The structure adapts to the drying environment in two ways. Above the critical humidity, the rods stand vertical, enabling the hydrogel to develop tension and retain water. Below the critical humidity, the rods tilt, enabling the hydrogel to reduce thickness and release water. We further show that the critical humidity can be tuned. [J276]

"Characterization of magnetic force microscopy probe tip remagnetization for measurements in external in-plane magnetic fields"

A quantitative analysis of magnetic force microscopy (MFM) images taken in external in-plane magnetic fields is difficult because of the influence of the magnetic field on the magnetization state of the magnetic probe tip. We prepared calibration samples by ion bombardment induced magnetic patterning with a topographically flat magnetic pattern magnetically stable in a certain external magnetic field range for a quantitative characterization of the MFM probe tip magnetization in point-dipole approximation. [J277]

"Fabrication of Ag-tetracyanoquinodimethane nanostructures using ink-jet printing/vapor-solid chemical reaction process"

In this study, microscale patterns of the charge-transfer organic compound silver-tetracyanoquinodimethane (Ag-TCNQ) were prepared using a novel two-step ink-jet printing/vapor-solid chemical reaction process. First, silver nanoparticles were patterned on silicon using a piezoelectric ink-jet printer. Ag-TCNQ nanostructures were then processed on these patterned surfaces using a vapor-solid chemical reaction growth process. Scanning electron microscopy revealed that 50-100nmwide, 2mcmlong Ag-TCNQ nanocones, crystallites, and ribbons were fabricated using this two-step process. Patterns with a higher number density of silver nanoparticles demonstrated a greater number of nanocone structures. Micro-Raman spectroscopy results confirmed charge transfer between silver and TCNQ in the Ag-TCNQ nanostructure. Patterned Ag-TCNQ nanostructures fabricated using this novel two-step ink-jet printing/vapor-solid chemical reaction process could find use in high density, high-speed optical memory devices, magnetic devices, field effect transistors, organic light emitting diodes, metal/insulator/metal photoswitches, biosensors, and other advanced devices. [J278]

"Field Emission From Hydrothermally Grown ZnO Nanoinjectors"

An injector-like nanostructure of ZnO fabricated by hydrothermal method was tested for field emission (FE) properties. The turn-on field of 3.8 V/mum was obtained at a current density of 0.1 muA/cm2. Above the turn-on field, the emission current density quickly raised up to 1 mA/cm2at about 12.8 V/mum. The field enhancement factor beta was estimated to be 2556 and 1226 in the low and high field regions, respectively. The two-slope FE behavior was attributed to the adsorbates and defects which were introduced in the fabrication process in aqueous solution at low temperature. The good FE properties of the ZnO nanoinjectors indicate that they are applicable as low-cost and low-temperature cathode materials for FE-based devices. [J279]

"Design and Simulation of a Nanophotonic Traceable Memory Using Localized Energy Dissipation and Hierarchy of Optical Near-Field Interactions"

Optical near-field interactions allow energy localization at scales smaller than the diffraction limit of light. They also show intrinsic hierarchical responses, meaning that optical near-fields exhibit different physical behavior at different scales. In this paper, by combining the localized energy dissipation and hierarchy properties, we present an architecture for a novel traceable optical memory that records memory access events to each bit, which is useful in applications such as high-security information transfer. The basic principles are demonstrated by numerical simulations using a metal nanostructure. [J280]

"Focused in beam fabrication of metallic nanostructures on end faces of optical fibers for chemical sensing applications"

Focused ion beam (FIB) fabrication of fiber optic sensors, mainly chemical sensors, which are based on plasmonics-active nanostructures formed on the cleaved tips of optical fibers, is reported. The nanostructures fabricated included nanoholes in optically thick metallic films as well as metallic nanopillars and nanorods. The sensing mechanism is based on detecting shifts in surface plasmon resonances (SPRs) associated with nanoholes in metallic films and localized SPRs of metallic nanopillars and nanorods, when the refractive index of the medium surrounding the nanostructures is changed. These sensors can be employed for the detection of chemical agents in air as well as liquid media surrounding the sensors. FIB milling was employed to fabricate ordered arrays of nanoholes in optically thick (100-240nm)metallic films deposited on cleaved end faces of multimode, four-mode, and single-mode optical fibers. Separately, metallic nanorods and nanopillars were formed by first depositing a metallic (gold or silver) film on tips of optical fibers, which was followed by FIB milling large area patterns to form freestanding nanorods and nanopillars. Utilizing FIB allows engineering nanostructure geometries, i.e., nanostructure shapes and sizes that are chosen based on the plasmon resonances associated with them. Formation of periodic arrays of nanoholes provides a means of tuning plasmon resonance peaks, associated with extraordinary transmission of light through the array of nanoholes in the metallic films, based on periodicity and shape of the nanoholes as well as on refractive index changes to form sensitive chemical sensors. [J281]

"Plasma-controlled metal catalyst saturation and the initial stage of carbon nanostructure array

growth"

The kinetics of the nucleation and growth of carbon nanotube and nanocone arrays on Ni catalyst nanoparticles on a silicon surface exposed to a low-temperature plasma are investigated numerically, using a complex model that includes surface diffusion and ion motion equations. It is found that the degree of ionization of the carbon flux strongly affects the kinetics of nanotube and nanocone nucleation on partially saturated catalyst patterns. The use of highly ionized carbon flux allows formation of a nanotube array with a very narrow height distribution of half-width 7 nm. Similar results are obtained for carbon nanocone arrays, with an even narrower height distribution, using a highly ionized carbon flux. As the deposition time increases, nanostructure arrays develop without widening the height distribution when the flux ionization degree is high, in contrast to the fairly broad nanostructure height distributions obtained when the degree of ionization is low. [J282]

"Measurement of anisotropic fracture energies in periodic templated silica/polymer composite coatings"

We report measurements of the fracture energies of hexagonal honeycomb structured silica/polymer composite films that were produced through an evaporation induced self-assembly process. These films exhibit large anisotropy with their hexagonal pore axes aligned with the dip-coating direction. The experimental strategy included depositing films onto a flexible Kapton substrate and then straining them, in situ, under a microscope. To study the effect of the anisotropic microstructure on the fracture energy, cracks were propagated both parallel and perpendicular to the cylindrical pore axis directions. For both cases, the geometries of the evolving crack patterns with loading were micrographically recorded and the desired energy release rates were calculated using a two-dimensional steady-state channeling crack model. The model was implemented using the ANSYS finite element program. The experimental observations showed significant inelastic film deformation prior to crack propagation. These deformations were fully captured in the model, with properties obtained directly from the experiments. The calculated energy release rates were 12.3±0.5J/m2for the parallel direction and 6.7±0.5J/m2for the perpendicular direction. These numbers are significantly larger than the bulk silica value of roughly 4J/m2, indicating the role of the local nanostructure in blunting and deflecting the crack tips. Experimental validation of the highly anisotropic energy release rates was obtained through transmission electron microscopy images of fractured films. [J283]

"Investigation of morphological changes in platinum-containing nanostructures created by electron-beam-induced deposition"

Focused electron-beam-induced deposition (EBID) allows the rapid fabrication of three-dimensional nanodevices and metallic wiring of nanostructures, and is a promising technique for many applications in nanoresearch. The authors present two topics on platinum-containing nanostructures created by EBID. First, they report on a TEM study of the microstructure of nanodeposits created from Pt(PF3)4. They have performed imaging and electron energy loss spectroscopy with a transmission electron microscope (TEM). The deposited material, composed mainly of platinum, phosphor, oxygen, and trace amounts of fluorine, is amorphous. Platinum is evenly distributed in the nanostructure, while phosphorus is observed to cluster. The size and amount of phosphorus clusters depend on the thickness of the structure. Second, they document an aging process in structures created from MeCpPtMe3, which have a resistivity which increases with the time they are exposed to air, from 2Ч105to 1.8Ч108mu Omega cmover 55days. They demonstrate that covering the structures with an EBID-deposited insulating protective layer of TEOS can prevent this oxidation. In doing so, they achieved the lowest reported resistivity for EBID from this platinum precursor, of 1.5Ч103mu Omega cm. [J284]

"Three-dimensional alignment with 10 nm order accuracy in electron-beam lithography on rotated sample for three-dimensional nanofabrication"

Three-dimensional (3D) alignment with 10nmorder accuracy in 3D electron-beam (EB) lithography has been achieved by means of highly accurate rotation control and mark location using the transmission electron signal. Accurately aligned EB writing from various directions on micron order resists blocks on a small substrate provides great structural flexibility in the creation of 3D nanostructures. As a demonstration of the accuracy, a 3D hydrogen silsesquioxane nanostructure was made by 3D EB writing and two-step development using different developers. Moreover, a 3D poly(methyl methacrylate) nanostructure was made by repeated 3D EB writing and development to demonstrate 3D nanofabrication with great structural flexibility. [J285]

"The interaction between a monolayer of single-molecule magnets and a metal surface"

We calculate within density functional theory (DFT) and the LSDA+Uformalism the electronic properties of a nanostructure in which single-molecule magnets Mn12are adsorbed via thiol groups onto the Au(111) surface. Our DFT calculation shows 1.23 electrons being transferred from the surface to the Mn12molecule, dominated by

the tail on the electronic charge distribution from the gold slab. LSDA+Ucalculations reveal that the on-site Coulomb repulsion Udoes not alter the direction of the electronic charge transfer obtained from DFT, because the gold Fermi level still lies above the lowest unoccupied molecular orbital (LUMO). The Uterm opens up the energy gap between the highest occupied molecular orbital (HOMO) and the LUMO for an isolated standard Mn12but it minimally affects the gap for a sulfur-terminated Mn12. [J286]

"Contribution of the surface plasmon resonance to optical and magneto-optical properties of a Bi:YIG-Au nanostructure"

We have studied the optical and magneto-optical properties of bismuth-substituted yttrium iron garnet (Bi:YIG) films with Au nanoparticles dispersed on their top surfaces. These structures exhibit surface plasmon resonances due to light coupling to Au nanoparticles, showing, for any direction of polarization of the incoming light beam, an absorption band in the spectral range of 500-750nm. For transmitted light beams with the plasmon-resonant wavelengths, the plane of polarization rotates slightly when the structure is not magnetized. Polarization-resolved transmission spectra show that this rotation is due to anisotropy of light propagation through the array of Au nanoparticles. For the structure comprising the 90-nm-thick Bi:YIG film and the array of Au nanoparticles of several tens of nanometers, the Faraday rotation angle enhances as compared with that for the original Bi:YIG film of the same thickness. [J287]

"Fabrication of magnetic porous hollow silica drug carriers using Ca C O 3 /Fe 3 O 4 composite nanoparticles and cationic surfactant double templates"

Magnetic porous hollow silica nanosphere is a new class of structured nanomaterials for drug delivery. In this paper, we report a synthesis of magnetic porous hollow silica nanospheres (MPHSNs) using CaCO3/Fe3O4composite nanoparticles and cationic surfactant double templates. Fe3O4nanoparticles were first mixed into CaCO3using rotating packed bed forming CaCO3/Fe3O4composite nanoparticles. Tetraethoxysilane was then added as precursor to form silica layer on the surface of CaCO3/Fe3O4composite nanoparticles, while hexadecyltrimethylammonium bromide was used as a second template to direct the formation of porous silica shells. After the calcination of the surfactants and etching away CaCO3, MPHSNs were formed with the magnetite nanoparticles remaining in the cores. Transmission electron microscopy was applied for the nanostructure determination. The pore size can be measured by micromeritics analyzer. Magnetic properties of MPHSNs were measured by a superconducting quantum interface device. Zero-field-cooled and field-cooled magnetization data in the temperature range of 5-300Kshow that the MPHSNs are superparamagnetism above the blocking temperature and ferromagnetism below the blocking temperature after the calcination. The MPHSNs can be used as potential nanocarriers for targeted delivery and controlled releasing. [J288]

"Three dimensional simulations of spin Hall effect in magnetic nanostructures"

We investigate the spatial distribution of spin/charge current in a nonlocal geometry of a magnetic nanostructure with Py/I/Cuand Cu/Ptcontacts and analyze the spin Hall effects by applying finite element method in three dimensions. We find that the inhomogeneous current distribution appears in the Cu/Ptconnection area, suggesting the possibility of the spin-signal enhancement by controlling the contact shape and the width of the electrodes. The calculated spin Hall voltage is consistent with the experimentally observed Hall resistance. [J289]

"Nanostructure and magnetic properties of L10 Fe Pt :X films"

Nonepitaxial FePt:Xfilms (X=Cu,Au,CuAu)with tunable magnetic properties are fabricated and investigated. Emphasis is on controlling and adjusting the magnetic properties of high-density perpendicular recording media through exchange decoupling and anisotropy. The films are initially deposited as multilayers with the structure [FePt/X]nand have individual thicknesses from about 0.06to1.1nm. To create an (001)-oriented granular L10structure, the films are then annealed at temperatures of 600°Cfor 5minand 550°Cfor 10min. The data indicate that Cu enters the L10lattice whereas Au segregates at the grain boundaries and reduces the intergranular exchange coupling. For X=CuAu, we obtain coercivities Hcbelow 10kOe, and slopes alpha =(dM/dH)Hcof about 1. For X=Cu, we find a favorable reduction in Curie temperature and Hc. [J290]

"Silica-Based Nanostructure Core Fiber"

We report the fabrication and characterization of a new type of silica-based all-solid fiber with a two-dimensional (2-D) nanostructure core. The nanostructure core fiber (NCF) was formed by a 2-D array of high-index rods of sub wavelength dimensions. The NCF's attenuation of as low as 3.5 dB/km at 1550 nm has been obtained experimentally. We also measured the chromatic dispersion, differential group delay, and polarization-dependent loss of the NCF. Higher macro-and microbending losses compared with that of the single-mode fiber due to the

reduced index difference has been observed experimentally, and this result suggests that NCF is potentially useful for curvature and strain sensing applications. [J291]

"Silica-Based Birefringent Large-Mode-Area Fiber With a Nanostructure Core"

Nanostructure photonic crystals with two-fold symmetry are introduced into a silica-based fiber core to induce high birefringence between the two nearly orthogonal fundamental modes. We theoretically study and provide our preliminary findings on the birefringence property of such fibers over a large wavelength range. A large-mode-area structure with a typical high birefringence in the order of is easily realized. [J292]

"Synthesis of monosized magnetic-optical AuFe alloy nanoparticles"

We report the preparation and characterization of multifunctional AuFe alloy nanoparticles of three compositions, Au0.25Fe0.75, Au0.5Fe0.5, and Au0.75Fe0.25, by a polyol process. It is found that the fusion of the two elements into one nanostructure entity retains the optical and magnetic properties of the individual components. The x-ray diffraction and transmission electron microscopy analyses confirm the formation of the alloy nanostructure with a narrow distribution of particle sizes and provides the detailed structural arrangements. The magnetic investigation shows the superparamagnetic or soft ferromagnetic behavior of the nanoparticles at room temperature, whereas the UV-visible measurements display the variation of the absorption bands at 560nm. The AuFe nanoparticles are rendered water soluble after thiolation. [J293]

"Micromagnetic calculation of spin wave propagation for magnetologic devices"

The propagation of magnetic wave packets in magnetic nanowires was calculated as a function of wire width, field strength, field ramp time, field area size, and geometry of a magnetic nanowire. Spin waves are excited locally by applying a small perturbation in the magnetization in a 20nmwide region. A wave packet is emitted from the input region and travels along the wire with a velocity of 740m/s. The finite element micromagnetic simulations show that wave packets can be guided along a bent nanostructure without losses due to geometry; amplitude and frequency are exactly the same as in a straight wire with equal distance between excitation point and probe. The wave amplitude was found to decrease with increasing rise time of the excitation field with an upper limit of 100ps. For a Permalloy wire with a thickness of 10nm, the frequency peak changes from 10GHzin a wire with 60nmwidth to 6GHzin a wire with 140nmwidth. [J294]

"Effects of postdeposition annealing on the structure and optical properties of Y O x N y films"

High-kgate dielectric YOxNyfilms were prepared by reactive sputtering. The effects of postdeposition annealing on the structure and optical properties of YOxNyfilms have been investigated. The x-ray diffraction result shows that the crystallization starts at the annealing temperature of 500°C. Spectroscopic ellipsometry was employed to determine the optical properties of a set of YOxNyfilms annealed at various temperatures. It was found that the refractive index (n)of YOxNyfilms decreased with the increase of annealing temperature below 600°C, whereas it increased with increasing annealing temperature above 600°C. The annealing-temperature dependence of the optical band gap of YOxNyfilms was also discussed in detail. It has indicated that the optical band gap of YOxNyfilms shifts to higher energy after higher temperature annealing, which is likely due to the reduction of N content and the change of crystalline structure in YOxNyfilms. [J295]

"Effects of d -electrons in pseudopotential screened-exchange density functional calculations"

We report a theoretical study on the role of shallow dstates in the screened-exchange local density approximation (sX-LDA) band structure of binary semiconductor systems. We found that inaccurate pseudo-wave functions can lead to (1) an overestimation of the screened-exchange interaction between the localized dstates and the delocalized higher energy sand pstates, and (2) an underestimation of the screened-exchange interaction between the dstates. The resulting sX-LDA band structures have substantially smaller band gaps compared with experiments. We correct the pseudo-wave functions of dstates by including the semicore sand pstates of the same shell in the valence states. The correction of pseudo-wave functions yields band gaps and d-state binding energies in good agreement with experiments and the full potential linearized augmented plane wave sX-LDA calculations. Compared with the quasiparticle GWmethod, our sX-LDA results shows not only similar quality on the band gaps but also much better d-state binding energies. Combined with its capability of ground-state structure calculation, the sX-LDA is expected to be a valuable theoretical tool for the II-VI and III-V (especially the III-N) bulk semiconductors and nanostructure studies. [J296]

"CuO three-dimensional flowerlike nanostructures: Controlled synthesis and characterization"

CuO three-dimensional (3D) flowerlike nanostructures were successfully synthesized on copper surface by a

simple solution method. CuO nanostructure was systematically studied by scanning electron microscopy, transmission electron microscopy, x-ray powder diffraction, and x-ray photoelectron spectrum. The factors to control the morphology and size of the CuO nanostructures were explored, showing that the reaction time and the concentration of starting regents play important roles in the formation of the CuO 3D nanostructures. [J297]

"Study of the temporal current stability of field-emitted electrons from ultrananocrystalline diamond films"

The temporal current stability and the current fluctuations of the field emission current obtained from ultrananocrystalline diamond (UNCD) films were investigated. The films were synthesized by Ar-rich dc plasma assisted hot filament chemical vapor deposition. The field emission properties were correlated to the films' composition (sp2and sp3bonded carbon volume fractions) and nanostructure. The compositional analysis was done by modeling the films' spectroscopic ellipsometry [Psi (E), Delta (E)] data by using a two layer structure and the Bruggeman effective medium approximation. The results indicate that the local field enhancement in UNCD films is related to their intrinsic morphology at the diamond-grain boundary-vacuum interface, and the sp3/sp2carbon volume fraction plays a significant function on the short- and long-term current stabilities of field emitted electrons. [J298]

"Enhanced terahertz detection by localized surface plasma oscillations in a nanoscale unipolar diode"

By using a two-dimensional ensemble Monte Carlo method, we have studied the terahertz-frequency response of a self-switching device (SSD), which is a semiconductor rectifier consisting of an asymmetric nanochannel. The simulations reveal that the performance can be improved by adjusting the shape and dielectric material filling of the insulating trenches that define the SSD. We show that the rectified current of the SSD has a nonmonotonic frequency dependence with a pronounced peak occurring just below the cutoff frequency. Through optimizations of the geometry, the peak current can reach twice that at low frequencies, enabling not only a higher detection sensitivity but also a degree of frequency selectivity. The effect is discussed in terms of a localized surface plasma oscillation in the asymmetric nanostructure. [J299]

"Structural modulations in Bi 2 Te 3"

Bi2Te3is known for its large thermopower, a low thermal conductivity, and thereby a large thermoelectric figure of merit ZTat room temperature. Particularly, the low thermal conductivity is attributed to a high structural disorder. Electron probe microanalysis, transmission electron microscopy (TEM), and energy dispersive x-ray spectrometry in the TEM were applied on n-type Bi2(Te,Se)3and p-type (Bi,Sb)2Te3bulk materials for structural and chemical analysis. Significant variations in stoichiometry were found on the micrometer scale. Bulk materials showed a texture, grain sizes of 1-10mcm, and dislocations in the basal plane with a density of 109cm-2having a high mobility at room temperature. A structural modulation [natural nanostructure (nns)] was found on the nanometer scale. This nns was also observed in Bi2Te3thin films and Bi2Te3/Bi2(Te,Se)3superlattices and turned out to be of general character for Bi2Te3materials. The nns was analyzed in detail by stereomicroscopy in the TEM and by image simulation. The nns was found to be a pure sinusoidal displacement field with (i) a displacement vector parallel to and an amplitude of about 10 pm and (ii) a wave vector parallel to {1,0,10}and a wavelength of 10 nm. Bi2Te3samples from different batches produced under similar conditions showed different characteristics with respect to the nns: none, one, or two superimposed nns were observed. The nns is present in all parts of the sample with the same orientation. The formation of the nns is either bound to a certain stoichiometry range or to the thermal history of a sample and is related to the tendency of Te compounds to form amorphous phases. An ordered network of dislocations a few nanometers apart and chemical fluctuations on the nanometer scale as origins of the nns were ruled out. The displacement field of the nns is superimposed to the average structure and should significantly affect the thermoelectric properties. Particularly, the lattice thermal conductivity should be decreased due to phonon scattering on the sinusoidal strain field of the nns. Also, the nns should yield a one-dimensional or zero-dimensional behavior of the phonons and anisotropic transport coefficients in the basal plane. [J300]

"Turning electrospun poly(methyl methacrylate) nanofibers into graphitic nanostructures by in situ electron beam irradiation"

Using ultrathin electrospun poly(methyl methacrylate) (PMMA) nanofibers as precursor, graphitic nanofibers, nanobridges, nanocones, and fullerenelike onions could be prepared by electron beam irradiation in a controlled manner. With the help of the high resolution transmission electron microscopy, the real time processing of the carbonization and graphitization of the PMMA nanofibers could be investigated. This way to obtain graphitic nanostructures has promising applications in graphitic carbon nanostructure electronics and devices. Because

PMMA is a widely used standard high resolution electron resist, this graphitization could be combined with electron beam lithography to obtain high resolution patterned graphitic circuits. [J301]

"P-induced nanocrystallite dispersion in amorphous-nanocrystalline mixed-phase Si:H thin films"

The effects of P doping on the nanocrystalline formation in mixed-phase Si:H thin films were investigated using secondary-ion mass spectrometry, Raman spectroscopy, atomic force microscopy, cross-sectional transmission electron microscopy, and scanning Kelvin probe microscopy. We found that Si nanocrystallites in the intrinsic and weakly P-doped materials aggregate to form cone-shaped structures. The local workfunction of the nanocrystalline aggregation areas is larger than the surrounding amorphous areas. Increasing the P-doping level requires an increased hydrogen dilution to reach the similar Raman crystallinity. The nanocrystalline aggregation disappears in the heavily P-doped materials, but isolated nancrystallites appear. The effect of P-doping on the nanostructure is explained with the coverage of P-related radicals on the existing nanocrystalline surface during the deposition and the P segregation in grain boundaries, which prevent new nucleation on the surface of existing nanocrystallites. [J302]

"Influence of interactions on magnetization behavior of arrays of nanostructures with uniaxial anisotropy"

A semianalytical model is presented for representing the magnetization switching in arrays of nanostructures with uniaxial anisotropy that includes both the dipolar interactions between structures in the array and a distribution of switching fields for the structures within the arrays. The net magnetic field experienced by each individual structure is the sum of the externally applied field and the local field from the other structures. Here the local field was calculated by subdividing each nanostructure into discrete magnetic moments. The field dependence of each structure within the array was represented by assigned switching behavior. The simplest behavior assumed a structure was wholly reversed at a given axial field (square switching), while more complex behavior was also implemented using both a Stoner-Wohlfarth representation of switching and switching behavior that included a zero magnetization state to represent a vortex state. A distribution of switching fields within an array was incorporated by discretizing a normal distribution to assign switching fields to each structure. The variation from noninteracting switching to interacting was investigated for permalloy (Ni-Fe) arrays of 1.2Ч0.6mcm, 0.6Ч0.3mcm, and 0.2Ч0.1mcmellipses. The model is compared with magneto-optic Kerr effect measurements of lithographically defined arrays and shown to give good qualitative and reasonable quantitative agreement with the measurements. The effect of interactions upon the Stoner-Wohlfarth astroid is also shown. [J303]

"Increase of thermal resistance between a nanostructure and a surface due to phonon multireflections"

The thermal resistance between a nanostructure and a half-body is calculated in the framework of particle-phonons physics. The current models approximate the nanostructure as a thermal bath. We prove that the multireflections of heat carriers in the nanostructure significantly increase resistance, in contradiction with former predictions. This increase depends on the shape of the nanostructure and the heat carrier's mean-free path only. We provide a general and simple expression for the contact resistance and examine the specific cases of nanowires and nanoparticles. [J304]

"The chemical and electronic structures of Y O x N y on Si(100)"

Effects of nitrogen incorporation on interfacial property, band gap, and band alignments of high-kY2O3gate dielectrics have been investigated. It was found that the incorporation of nitrogen into Y2O3films can effectively suppress the growth of the interfacial layer between Y2O3and Si substrate. The incorporation of nitrogen into Y2O3films leads to the reduction of band gap and valence band offset, but not the conduction offset of Y2O3films. High temperature annealing will help to increase the band gap and valence band offset of YOxNyfilm due to the release of the interstitial N atoms. [J305]

"Strain development in nanoporous metallic foils formed by dealloying"

Nanoporous Au foils were formed by dealloying a Ag-Au alloy in concentrated HNO3. The resultant foils, which have a "spongelike" morphology with interconnecting ligaments, were studied using synchrotron-based diffraction. A three-dimensional visualization of the nanostructure is generated from small angle experiments and the lattice parameter is derived from diffraction. The data show the development of two interspersed nanoscale strained regions within the material: one in significant tension and one in compression. We interpret this by considering regions of high positive and negative curvatures in the material; this curvature decreases with increasing pore size resulting in a relaxation in lattice strain. [J306]

"The effect of Ti doping on the growth of Mg nanostructures by oblique angle codeposition"

Using an oblique angle codeposition technique, 0-8at.%Ti has been doped into Mg and aligned nanostructure arrays, composed of hexagonal Mg single crystals with preferred orientations, are formed. Ti doping produces nanorod structures instead of the nanoblade structures that are formed from pure Mg deposition. This is due to the pinning effect of Ti for Mg adatom diffusion. There is a linear shift of the Mg diffraction peaks toward the higher 2theta angles with the Ti dopant concentration. This is possibly caused by the partial substitution of large Mg atoms by small Ti atoms. [J307]

"Single-layer metallodielectric nanostructures as dual-band midinfrared filters"

We report a design and fabrication strategy for creating single-layer metallodielectric nanostructures with dual-band filtering properties at midinfrared wavelengths. Genetic algorithm optimization was used to determine an arrangement of nanometer-scale metal pixels within one unit cell of a two-dimensional periodic array that best satisfied the user-specified filter response and nanofabrication design rule constraints. Infrared transmission and reflection spectra measured on an optimized nanostructure array had two narrow stop bands blueshifted by 0.2mcmfrom the designed center wavelengths of 3.3 and 4.1mcm, with transmission attenuation greater than -20dBand reflection attenuation less than -1.5dBin each band. This strategy provides a practical and efficient approach to design metallodielectric nanostructures needed for photonic device applications as well as for future low-loss refractive index engineered metamaterials. [J308]

"Preparation of nanochain and nanosphere by self-assembly of gold nanoparticles"

A self-assembly method is demonstrated to link nanoparticles into nanostructure of nanochain or nanosphere. Gold nanoparticles were covered with capping molecules by forming Au-S bonds with thiol group at one terminate. Another terminating group, carboxylic acid, showed strong complex interaction with inorganic linker Zr4+to form covalent complex bond. The different nanostructures were obtained by moving a balance between two opposite interactions, the linking interaction of Zr4+and the electrostatic repulsive interaction of net surface charge. When the capping molecule with different chain length was used, the linked nanochain feature exhibited a tunable interdistance between the neighboring nanoparticles. [J309]

"Dependence of field-effect mobility and contact resistance on nanostructure in regioregular poly(3-hexylthiophene) thin film transistors"

The mobility and contact resistance of transistors based on regioregular poly(3-hexylthiophene) (P3HT) with Ti/Ptelectrodes were investigated as a function of the molecular weight (MW)of P3HT. For an increase in MWfrom 5.5to11kDa, the mobility increased from 0.04to0.16cm2V-1s-1, whereas the contact resistance decreased from 1.7to0.6MOmega . Further increases in MWyielded an apparent saturation in both the mobility and the contact resistance. A nanofibrilar morphology was observed where the width of the nanofibrils increases with MW. A qualitative model based on polymer chain folding is proposed to explain the electrical results. [J310]

"Hexahedral nanocementites catalyzing the growth of carbon nanohelices"

The formation mechanism of carbon nanohelices grown on iron needles by microwave plasma assisted chemical vapor deposition is studied by means of transmission electron microscopy and scanning electron microscopy. The catalyst assisting the helix formation is identified to be the single crystalline cementite (Fe3C)particle at the tip of each carbon nanohelix. The Fe3Cparticles show the general morphology of a hexahedron with six (different) crystallographic planes as the surface planes. The different catalytic effect of different crystallographic surface planes produces an anisotropic growth on the front surface of the carbon nanostructure, which results in a rotation of the cementite particles. The rotating particles catalyze the growth of the carbon nanostructure in a helical way. [J311]

"Modified electron-beam-induced deposition of metal nanostructure arrays using a parallel electron beam"

A modified electron-beam-induced deposition method using a parallel beam of electrons is developed. The method relies on the buildup of surface potential on an insulating surface exposed to an electron beam. Presence of sharp edges on the insulating surface implies presence of large electric fields that lead to site-specific nucleation of metal vapor on those regions. Feature sizes as small as 20nmcan be deposited without the need to use fine probes, and thus the limitation of probe size imposed on the resolution is overcome. The use of pure metal vapor also renders the process inherently clean. [J312]

"Spontaneous alignment of self-assembled ABC triblock terpolymers for large-area nanolithography"

A general method for preparation of large-area inorganic nanostructure arrays based on the use of core-shell cylinder forming ABCtriblock terpolymers is presented. The essential perpendicular cylinder alignment is achieved by the use of a low surface energy Bblock (polyisoprene), which drives spontaneous perpendicular alignment of cylindrical Cdomains (polylactide) in a matrix of A(polystyrene), eliminating the lengthy anneal steps, external field alignment procedures, or specialized surface preparations that could severely restrict potential applications. [J313]

"Thermal decomposition products in arc evaporated TiAlN/TiN multilayers"

Cubic metastable Ti0.34Al0.66N/TiNmultilayers were grown by reactive arc evaporation using Ti33-Al67and Ti cathodes in a N2atmosphere. X-ray diffractometry and high resolution transmission electron microscopy revealed that metastable c-Ti0.34Al0.66Npartly decomposes after annealing at 900 °Cinto c-TiNrich and c-AlNrich phases with retained lattice coherency. Elemental mapping by energy dispersive x-ray spectroscopy showed a homogenous distribution of Ti and Al in the as-deposited 25 nm Ti0.34Al0.66Nlayers. The annealed Ti0.34Al0.66Nlayers exhibited coherent 5 nm domains with high Al content surrounded by a high Ti content matrix. This nanostructure formation is discussed in terms of spinodal decomposition. [J314]

"In situ investigation on dynamic suspending of microdroplet on lotus leaf and gradient of wettable micro- and nanostructure from water condensation"

Dynamic suspending behavior of microdroplet on fresh lotus leaf is in situ investigated at micro- and nanolevels, by water condensation via environmental scanning electronic microscopy. The observation and analysis reveal that a gradient of wettable micro- and nanostructure is formed along the exterior surface of papilla including nanohairs during water condensation. This gradient introduces a tendency of directional movement and enables the microdroplet move out of the valley of papillae until the microdroplet is suspended on the tops of papillae. This finding is significant to understand the mechanism of self-cleaning. [J315]

"Thermal chemical vapor deposition growth of zinc oxide nanostructures for dye-sensitized solar cell fabrication"

Dye-sensitized solar cells (DSSCs) were fabricated using a quasialigned one-dimensional zinc oxide (ZnO) nanostructure. The ZnO nanostructures were grown on indium tin oxide (ITO) coated glass substrate via a thermal chemical vapor deposition (CVD). It has been considered that thermal CVD is not suitable for the growth of ZnO nanostructure on ITO/glass due to the high processing temperature. However, we have demonstrated that a densely populated ZnO nanostructure can be prepared on ITO/glass substrate by a double-source double-tube CVD process. The power conversion efficiency of our device is 0.6%. [J316]

"One-step growth and field emission properties of quasialigned Ti O 2 nanowire/carbon nanocone core-shell nanostructure arrays on Ti substrates"

Quasialigned nanoarrays consisting of TiO2nanowire cores and carbon nanocone shells have been produced directly on titanium foils via a simple one-step thermal reaction under acetone vapor at 850°C. The nanowire cores are single-crystalline rutile TiO2with diameters of 15-20nmand the conical carbon shells are amorphous with gradually decreasing thicknesses from 200-300nmat the bases to 5-10nmat the tips. Disparity of precipitation and etching of carbon shell give rise to the conical shape. Such TiO2/Cnanocone arrays on a conducting substrate are a new member of the conical nanostructures and promising field electron emitters. [J317]

"Preparation and thermoelectric properties of high-performance Sb additional Yb 0.2 Co 4 Sb 12+y bulk materials with nanostructure"

High-performance Sb excess Yb0.2Co4Sb12+y(y=0,0.3,0.6,1.0)bulk materials with nanostructure have been prepared by combining melt spinning technique with spark plasma sintering. Average grain size of the bulk samples is about 150nmwhen y=0and 0.3, and the grain size increases with the increase of y. Moderately superfluous Sb may improve the electrical transport properties effectively and the thermal conductivity of the bulk samples decreases markedly due to the nanostructure. The thermoelectric performance of the samples is significantly improved, and the maximum figure of the merit reaches 1.26 for the Yb0.2Co4Sb12.3compound at 800K. [J318]

"Temperature insensitive linewidth enhancement factor of p -type doped In As /Ga As quantum-dot lasers emitting at 1.3 mcm"

The temperature dependence of microwave properties-relaxation frequency and Henry factor-of undoped and p-type doped ten InAs/GaAsquantum-dot layer lasers is reported in the 20-80°Crange. It is shown that the linewidth enhancement factor of the p-type doped devices is temperature insensitive while that of the undoped lasers shows a strong dependence for temperatures above 40°C. [J319]

"Intermodulation atomic force microscopy"

A mode of atomic force microscopy (AFM) is demonstrated where an oscillating AFM cantilever having linear response is driven with two frequencies in the vicinity of a resonance. New frequencies in the response, known as intermodulation products, are generated when the linearity of the cantilever response is perturbed by the nonlinear tip-surface interaction. A rich structure of the intermodulation products is observed as a function of the probe-surface separation, indicating that it is possible to extract much more detailed information about the tip-surface interaction than is possible with the standard amplitude and phase imaging methods. [J320]

"Molecular simulation of the carbon nanotube growth mode during catalytic synthesis"

Catalyzed growth of carbon nanostructures occurs mainly through two modes, i.e., base growth when the metal nanoparticle remains at the bottom of the nanotube, or when it is lifted by the growing carbon nanostructure due to tip growth. A correct prediction of the dominant growth mode depends on the energy gain due to the addition of C atoms from the carbon-metal catalyst solution to the graphene sheets forming the carbon nanostructures. We determine this energy gain through atomistic scale molecular dynamics simulations. Our results suggest tip growth for Ni and base growth for Fe catalysts. [J321]

"Ultraviolet nanoimprinted polymer nanostructure for organic light emitting diode application"

Light extraction efficiency of a conventional organic light emitting diode (OLED) remains limited to approximately 20% as most of the emission is trapped in the waveguide and glass modes. An etchless simple method was developed to fabricate two-dimensional nanostructures on glass substrate directly by using ultraviolet (UV) curable polymer resin and UV nanoimprint lithography in order to improve output coupling efficiency of OLEDs. The enhancement of the light extraction was predicted by the three-dimensional finite difference time domain method. OLEDs integrated on nanoimprinted substrates enhanced electroluminance intensity by up to 50% compared to the conventional device. [J322]

"Effects of nitrogen atom doping on optical properties and dielectric constant of Hf O 2 gate oxides"

The effect of nitrogen atom doping on the optical properties and dielectric constant of HfO2films has been systematically investigated. Spectroscopic ellipsometry was employed to investigate the optical properties of nitrogen incorporated HfO2films. The values of average oscillator strength and average oscillator position extracted from spectroscopic ellipsometry demonstrated that nitrogen incorporation could influence the dipole oscillator strength and oscillator position of HfO2. A physical model of dipole structures was proposed to verify the enhancement of dielectric constant of HfO2films by nitrogen incorporation. [J323]

"Strain and composition mapping of epitaxial nanostructures"

We have used surface x-ray diffraction and a direct method of phase reconstruction to obtain subangstrom resolution maps of an ion-beam milled In0.27Ga0.73As/GaAs(001)thin film exhibiting three-dimensional (3D) epitaxial nanostructures. The 3D electron density was calculated based on the diffraction pattern along the Bragg rods measured with synchrotron radiation, from which the chemical composition, strain profile, and average nanostructure shape were extracted. The film maintained a wetting layer exhibiting a sharp strain gradient, which extended into the substrate. Atop the wetting layer, the ion-beam milled islands possessed an apical shape and were depleted in indium. [J324]

"Cool white III-nitride light emitting diodes based on phosphor-free indium-rich InGaN nanostructures"

Phosphor-free cool white emitting light emitting diodes (LEDs) have been fabricated using a dual stacked InGaN/GaNmultiple quantum wells (MQWs) comprising of a lower set of MQWs emitting yellow and an upper set of MQWs emitting blue. The lower set of MQWs incorporates indium-rich InGaN connected-dot nanostructures with a height of 1.0nmin the well. The well is first grown with an InGaN layer serving as the wetting layer, then treated with trimethylindium (TMIn) to initiate nanostructure growth of another InGaN layer to complete the well

layer. This gives a broadened yellow emission peak. With the combination of emission from the upper blue emitting InGaN/GaNMQWs subsequently grown, cool white light emission is achieved. The In-rich nanostructures formed during TMIn treatment enhance indium incorporation in InGaN well and also act as effective radiative recombination sites for carriers at the lower set of MQWs. [J325]

"First principles molecular dynamics study of CdS nanostructure temperature-dependent phase stability"

First principles molecular dynamics simulations are used to determine the relative stability of wurtzite, graphitic, and rocksalt phases of the CdS nanostructure at various temperatures. Our results indicate that in the temperature range from 300to450K, the phase stability sequence for the CdS nanostructure is rocksalt, wurtzite, and graphitic phases. The same situation holds for bulk CdS crystals under high pressure and 0K. Our work also demonstrates that although the temperature can affect the total energy of the CdS nanostructure, it cannot change its phase stability sequence in the temperature range studied in this letter. [J326]

"Relation between magnetoresistance and nanostructure of current-perpendicular-to-plane giant-magnetoresistance film with current-confined-path nano-oxide layer"

Nanostructure of a current-perpendicular-to-plane giant-magnetoresistance film with a current-confined-path (CCP) nano-oxide layer was analyzed by high-resolution transmission electron microscopy and three-dimensional atom probe. It was found that the CCP of a film with a higher magnetoresistance (MR) ratio has better crystalline orientation and higher purity than the CCP of a film with a smaller MR ratio. Moreover, the free layer on the CCP of a film with a high MR ratio is well crystallized. Both the CCP with the good crystalline orientation and high purity and the well-crystallized free layer diminish the diffusive electron scattering, which improves an MR ratio. [J327]

"Syntheses and thermoelectric properties of Bi 2 Te 3 /Sb 2 Te 3 bulk nanocomposites with laminated nanostructure"

Nanocomposites with constituent sizes of 50nmare considered as a promising approach to enhance the figure of merit of bulk thermoelectric materials. A simple route involving hydrothermal synthesis and hot pressing was used in this work to prepare Bi2Te3/Sb2Te3bulk nanocomposites. It is shown that the composites have a laminated structure composed of Bi2Te3and Sb2Te3nanolayers with the thickness varying alternately between 5 and 50nm. The transport measurements indicate that the nanoscale laminated structure improves the thermoelectric performance with the maximal dimensionless figure of merit of 1.47 for the nanocomposite hot pressed from Bi2Te3and Sb2Te3nanopowders. [J328]

"Synthesis and characterization of smooth ultrananocrystalline diamond films via low pressure bias-enhanced nucleation and growth"

This letter describes the fundamental process underlying the synthesis of ultrananocrystalline diamond (UNCD) films, using a new low-pressure, heat-assisted bias-enhanced nucleation (BEN)/bias enhanced growth (BEG) technique, involving H2/CH4gas chemistry. This growth process yields UNCD films similar to those produced by the Ar-rich/CH4chemistries, with pure diamond nanograins (3-5nm), but smoother surfaces (6nmrms) and higher growth rate (1mcm/h). Synchrotron-based x-Ray absorption spectroscopy, atomic force microscopy, and transmission electron microscopy studies on the BEN-BEG UNCD films provided information critical to understanding the nucleation and growth mechanisms, and growth condition-nanostructure-property relationships. [J329]

"Computational design of silicon-based direct-band gap nanostructure: Silicon nanonet"

We design a netlike nanostructure to truncate silicon to direct-band gap semiconductor by means of ab initio calculation. The local density approximation results show that the silicon-based nanonet has an adjustable band gap and controllable indirect-direct transition via different nanopore array designs. The indirect-direct transition is caused not only by the porosity and nanoscale wall width but also by the pore array distribution. The excellent matching characteristic with bulklike silicon makes this nanostructure promising for practical light sources on silicon chip. [J330]

"Photonic crystals with SiO 2 -Ag "post-cap" nanostructure coatings for surface enhanced Raman spectroscopy"

We demonstrate that the resonant near fields of a large-area replica molded photonic crystal (PC) slab can

efficiently couple light from a laser to SiO2-Ag"post-cap" nanostructures deposited on the PC surface by a glancing angle evaporation technique for achieving high surface enhanced Raman spectroscopy (SERS) enhancement factor. To examine the feasibility of the PC-SERS substrate, the simulated electric field around individual Ag particles and the measured Raman spectrum of trans-1,2-bis(4pyridyl)ethane on the PC-SERS substrate were compared with those from an ordinary glass substrate coated with the same SiO2-Agnanostructures. [J331]

"Evolution of the nanostructure of deposits grown by electron beam induced deposition"

Environmental scanning electron microscopy (ESEM) was used to perform electron beam induced deposition (EBID) using a WF6precursor. The deposits consist of WO3nanocrystals embedded in an amorphous matrix. Oxide formation is attributed to residual oxidizers present in the ESEM chamber during EBID. Under conditions of fixed low electron flux, the WO3grain size and the degree of deposit crystallinity increase with time. These changes correlate with the degree of electron energy deposition into the material during growth, indicating that electron beam induced modification of as-grown material is significant in controlling the nanostructure and functionality of materials fabricated by EBID. [J332]

"ZnO/Zn/sub 0.85/Mg/sub 0.15/O superlattice nanoneedles grown by pulsed laser deposition"

Superlattices of ZnO/Zn0.85Mg0.15O were grown on a sapphire (0001) substrate by the pulsed laser deposition method. Before the growth, ZnO buffer layers were grown at 650 C and an oxygen pressure of 60 Pa for 30 min. The results of the scanning electron microscope exhibit that the films with a buffer layer consist of well c-axis oriented nano-needles with a size range from 50 to 150 nm. Compared with the film without a buffer layer, the film with a buffer layer has a stronger peak energy when the well widths are almost the same. It is evident that the buffer layer could increase the quality of the superlattice and this nanostructure would be useful to research the microcavity. [J333]

"Room Temperature Ferromagnetism of FeCo-Codoped ZnO Nanorods Prepared by Chemical Vapor Deposition"

FeCo-codoped ZnO nanorods with room temperature ferromagnetic ordering have been synthesized by chemical vapor deposition. Detailed nanostructures were investigated by field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM) and nanoprobe X-ray energy dispersive spectroscopy (EDS). The ZnO nanorods were grown along c-axis of a single crystalline wurtzite structure and no second phase was observed by high resolution TEM. EDS analysis along the nanowires indicated that Co and Fe were successfully doped into the ZnO lattice with concentrations about 0.6-1.0 at.%. Magnetic measurement demonstrates a ferromagnetic ordering with Curie temperature higher than 300 K presents in the ZnO nanorods. [J334]

"Biomimetic hierarchical structure for self-cleaning"

Hierarchical roughness is beneficial for superhydrophobicity. Surfaces with microstructure, nanostructure, and hierarchical structure were fabricated by replication of micropattern and self- assembly of hydrophobic alkanes. The fabrication technique used is a low cost two step process, which provides flexibility in the fabrication of a variety of hierarchical structures. Fabricated structures and surface chemistry mimic the hierarchical surfaces of superhydrophobic and self-cleaning plant surfaces. The influence of structure on superhydrophobicity at different length scales is demonstrated by the investigation of static contact angle, hysteresis and tilt angles, and propensity of air pocket formation as well as adhesive forces. [J335]

"A planar layer configuration for surface plasmon interference nanoscale lithography"

A planar layer configuration for surface plasmon interference lithography to realize one-dimensional periodic nanostructure is proposed and numerically demonstrated in this letter. High electric field distribution compared to conventional prism based configuration is found to be achievable with this and hence facilitate high contrast and high resolution features with good exposure depth. Finite-difference time-domain simulation results indicate that the feature size approximately at sub-65-nm is achievable by using silver metal layer and a p-polarized 427 nm wavelength illumination. Simulated resist profiles, using cellular automata model, obtained through this proposed configuration is also presented. [J336]

"Martensitic transformations in Ag-Au bimetallic core-shell nanoalloys"

Combining the Gupta potential and bond order analysis in a molecular dynamics simulation, a martensitic transformation is observed in the 147-atom AucoreAgshellnanostructure at 328K. The response time for this transformation is about 7psat 350K. In pure gold clusters, it was previously thought that a similar solid-to-solid

transformation is a prelude to melting transitions. In the present case, atomic pathway snapshots show that the heating energy is used to overcome the energy barrier for initiating the spontaneous process. The subsequent twist-deformation propagation and termination are clearly observed. [J337]

"Room temperature photoluminescence from the amorphous Si structure generated under keV Ar-ion-induced surface rippling condition"

We observe room temperature (RT) visible and infrared (IR) photoluminescence (PL) bands peaked around 680 and 1020nm, respectively, from a silicon (Si) surface amorphized and patterned with ripples by 60keVAr+bombardment at 60° angle of ion incidence. However, the Si surface amorphized but not patterned under normal bombardment (0° angle of ion incidence) condition shows a drastic reduction in the intensity of the visible PL along with the complete suppression of IR emission. The present work demonstrates that Ar ion irradiation at rippling condition may yield a porouslike light emitting amorphous silicon (a-Si)nanostructure. [J338]

"Book Reviews [Jreview of Biomedical Nanostructures (Gonsalves, K. et al.; 2007)]"

Biomedical Nanostructures, written by Gonsalves et al., is an interdisciplinary text focusing on the design and fabrication of nanoscale materials. The book is divided into three sections: Nanostructure Fabrication, Bionano Interfaces, and Clinical Applications of Nanostructures. [J339]

"Characterization of a broadband all-optical ultrasound transducer-from optical and acoustical properties to imaging"

A broadband all-optical ultrasound transducer has been designed, fabricated, and evaluated for high- frequency ultrasound imaging. The device consists of a 2-D gold nanostructure imprinted on top of a glass substrate, followed by a 3 mum PDMS layer and a 30 nm gold layer. A laser pulse at the resonance wavelength of the gold nanostructure is focused onto the surface for ultrasound generation, while the gold nanostructure, together with the 30 nm thick gold layer and the PDMS layer in between, forms an etalon for ultrasound detection, which uses a CW laser at a wavelength far from resonance as the probing beam. The center frequency of a pulse-echo signal recorded in the far field of the transducer is 40 MHz with -6 dB bandwidth of 57 MHz. The signal to noise ratio (SNR) from a 70 mum diameter transmit element combined with a 20 mum diameter receive element probing a near perfect reflector positioned 1.5 mm from the transducer surface is more than 10 dB and has the potential to be improved by at least another 40 dB. A high-frequency ultrasound array has been emulated using multiple measurements from the transducer while mechanically scanning an imaging target. Characterization of the device's optical and acoustical properties, as well as preliminary imaging results, strongly suggest that all-optical ultrasound transducers can be used to build high-frequency arrays for real-time high-resolution ultrasound imaging. [J340]

"Quantum Dashes on InP Substrate for Broadband Emitter Applications"

We report on the development of InAs/InGaAlAs quantum-dash-in-well structure on InP substrate for wideband emitter applications. A spectral width as broad as 58 meV observed from both photoluminescence and surface photovoltage spectroscopy on the sample indicating the formation of highly inhomogeneous InAs-dash structure that results from the quasi-continuous interband transition. The two-section superluminescent diodes (SLDs), with integrated photon absorber slab as lasing suppression section, fabricated on the InAs dash-in-well structure exhibits the close-to-Gaussian emission with a bandwidth (full-width at half-maximum) of up to 140 nm at ~ 1.6 mum peak wavelength. The SLD produces a low spectrum ripple of 0.3 dB and an integrated power of ~ 2 mW measured at 20degC under 8 kA/cm2. The oxide stripe laser exhibits wide lasing wavelength coverage of up to 76 nm at ~ 1.64 mum center wavelength and an output optical power of ~ 400 mW from simultaneous multiple confined states lasing at room temperature. This rule changing broadband lasing signature, different from the conventional interband diode laser, is achieved from the quasi-continuous interband transition formed by the inhomogeneous quantum-dash nanostructure. [J341]

"Analysis of the Current-Confined-Paths in the Film Plane for CPP-GMR Films"

Nanostructure of current-perpendicular-to-plane giant magnetoresistance (CPP-GMR) films with a current-confined-path nano-oxide layer (CCP-NOL) is analyzed by high-resolution transmission electron microscope (HRTEM) and three-dimensional atom probe (3DAP). By HRTEM analysis, it is found that the CCP is formed on the center of the grain of a pinned layer. By 3DAP analysis, the grain size of a free layer can be visually detected and its size is about 5-10 nm. The grain of a free layer is well aligned with a CCP, suggesting that the decrease of the grain size of a pinned layer is effective for increasing the number of the CCPs per unit area. Moreover, by using a 3DAP image, the density of the CCPs per unit area can be derived. As a result, it is

clearly shown that the density of the CCPs per unit area increases with decreasing resistance area product (RA), which cannot be obtained from HRTEM analysis. By combining HRTEM result and 3DAP result, the nanostructure of the CCP can be clarified, and the decrease of the grain size of a pinned layer and the decrease of RAare preferable for an extremely small element size for a higher-density recording head. [J342]

"Synthesis and Characterization of Core-Shell Nanowires"

We report the synthesis and characterization of Fe-FeOxcore-shell nanowires by thermal conversion of the Fe nanowires from pulse electrodeposition in anodized aluminum oxide (AAO) nanotemplates under various conditions. Well-defined core-shell nanostructure of the Fe-FeOxnanowires was confirmed by TEM and corresponding elemental line scanning and point scanning. The type of the iron oxide in the shell was identified using nano-Raman spectroscopy, which exposes magnetite to be the major constituent. The magnetic measurements demonstrate that the nanowires are robustly soft magnetic, with the magnetization tunable by heat treatment parameters and a weak magnetic easy direction parallel to the nanowire axis. [J343]

"Chemical Sensors and Electronic Noses Based on 1-D Metal Oxide Nanostructures"

The detection of chemicals such as industrial gases and chemical warfare agents is important to human health and safety. Thus, the development of chemical sensors with high sensitivity, high selectivity, and rapid detection is essential and could impact human beings in significant ways. 1-D metal oxide nanostructures with unique geometric and physical properties have been demonstrated to be important candidates as building blocks for chemical sensing applications. Chemical sensors composed of a wide range of pristine 1-D metal oxide nanostructures, such as In2O3, SnO2, ZnO, TiO2, and CuO, have been fabricated, and exhibited very good sensitivity in the detection of important industrial gases, chemical warfare agents, and human breath. In this review, we provide an overview of this chemical sensing field. Various key elements of the topics will be reviewed, including 1-D metal oxide nanostructure synthesis, electronic properties of nanowire-based FETs, and their chemical sensing behaviors. In addition, this paper provides a review of the recent development of electronic nose systems based on metal oxide nanowires, which indicate great potential for the improvement of sensing selectivity. [J344]

"Enhanced thermoelectric figure of merit in nanostructured n -type silicon germanium bulk alloy"

The dimensionless thermoelectric figure of merit (ZT)of the n-type silicon germanium (SiGe) bulk alloy at high temperature has remained at about one for a few decades. Here we report that by using a nanostructure approach, a peak ZTof about 1.3 at 900 °Cin an n-type nanostructured SiGe bulk alloy has been achieved. The enhancement of ZTcomes mainly from a significant reduction in the thermal conductivity caused by the enhanced phonon scattering off the increased density of nanograin boundaries. The enhanced ZTwill make such materials attractive in many applications such as solar, thermal, and waste heat conversion into electricity. [J345]

"Structure and magnetic properties of bulk nanocrystalline Dy metal prepared by spark plasma sintering"

The structure and magnetic properties were studied for bulk nanocrystalline dysprosium (Dy) metal prepared by spark plasma sintering method. All the as-prepared samples have hexagonal close packed structure. A decrease in grain size results in remarkable changes in magnetic ordering temperature of the nanocrystalline Dy metal. At 5K, the magnetization drops by 3.35%, and the coercive force increases by three times for nanocrystalline Dy compared to those of coarse-grained bulk Dy sample. These results indicate the remarkable influence of the nanostructure on the magnetism of Dy due to finite size effect. [J346]

"Tuning the electrical switching of polymer/fullerene nanocomposite thin film devices by control of morphology"

The working principles of thin film organic memory devices remain debated and tunability has been less presented. We show that the nanostructure of [6,6]-phenyl-C61-butyric acid methyl ester (PCBM) and polystyrene (PS) allows facile tuning of switching behavior for low PCBM concentrations upon annealing above the glass transition temperature of PS. By increasing the PCBM concentration from 2 to 6wt %, the switching voltage from off to on state during the first voltage sweep systematically decreases. In subsequent voltage sweeps negative differential resistance effect is observed. Above ca. 7wt %, chains of PCBM clusters couple the electrodes, which leads to Ohmic behavior. [J347]

"Super-radiance of excitons in a single ZnO nanostructure"

Super-radiance of excitons in a single ZnO tetrapod nanostructure has been observed. The emitted pulses

exhibited very short duration, and the emission peak intensity exhibited exponential increase with the increased pump density. Multiple narrow emission peaks with short peak spacing have been observed in the emission spectra of a single ZnO tetrapod nanostructure. [J348]

"Single crystal growth via a grain rotation mechanism within amorphous matrix"

The molecular dynamics simulations were applied to study the crystallization of Ag from an amorphous matrix. The results show that the spontaneously crystallized nuclei interact with the amorphous phase, undergoing a rotation and realignment process, promote the crystallization of amorphous phase, and finally form a single crystalline nanostructure. Our results not only provide a system for the theoretical study on the amorphous formation and its function in the crystal growth but also break a path for producing single crystals. [J349]

"Molecular beam epitaxy growth of wurtzite AlN nanotips"

The characteristics of structure and morphology of AlN nanotips grown under higher V/III ratio on Si (111) with plasma-assisted molecular beam epitaxy are herein investigated. We found that the AlN nanotips were single crystalline with {1-211} inclined facets and embedded in pitlike defects of N-polarity. The density and size of the AlN nanotips can be controlled by the growth conditions. The AlN nanotip growth mechanism can be rationalized as the c-type dislocations generated between two adjacent grains due to the formation of higher strain area in the early stages of growth. The c-type dislocation would reverse the stacking sequence of the following adatoms, leading to the AlN nanotip growth with inverse polarity and higher growth rate compared to the surrounding matrix. These nanotips might serve as the ideal templates for further growth of nanostructure devices. [J350]

"Electric charging and nanostructure formation in polymeric films using combined amplitude-modulated atomic force microscopy-assisted electrostatic nanolithography and electric force microscopy"

A hybrid technique, combining lithography which exploits atomic force microscope tip manipulation with modified electric force microscopy was used to study surface electric charging (deposition and evolution) of polymethyl methacryalate and polystyrene films. Upon charging the films past a threshold voltage, two distinct regimes were observed: (1) stable feature formation related to electric breakdown and mass transport resulting in stable film deformation due to the negative surface charging (negative tip bias) and (2) no stable feature formation regime attributed to viscoelastic deformation of polymer surface followed by the surface relaxation in the case of positive surface charging (positive tip bias). [J351]

"Soft x-ray source for nanostructure imaging using femtosecond-laser-irradiated clusters"

The intense soft x-ray light source using the supersonic expansion of the mixed gas of He and CO2, when irradiated by a femtosecond Ti:sapphire laser pulse, is observed to enhance the radiation of soft x-rays from the CO2clusters. Using this soft x-ray emissions, nanostructure images of 100-nm-thick Mo foils in a wide field of view (mm2scale) with high spatial resolution (800nm)are obtained with high dynamic range LiF crystal detectors. The local inhomogeneities of soft x-ray absorption by the nanometer-thick foils is measured with an accuracy of less than ±3%. [J352]

"Control of the nanoscale crystallinity and phase separation in polymer solar cells"

Grazing-incidence x-ray diffraction and atomic force microscopy were performed on bulk heterojunction regioregular poly(3-hexylthiophene) (RR-P3HT) [6,6]-phenyl-C71-butyric acid methyl esters spin-cast films with different film processing conditions to correlate the crystalline nanostructure of P3HT with the corresponding solar cell performance. The increase in long wavelength absorption for solvent annealed films is related to highly conjugated crystal structure of RR-P3HT phase-separated in the active layer. Upon thermal annealing, the solvent annealed 50-nm-thick device shows high solar cell performance with fill factor up to 73% and power conversion efficiency of 3.80%. [J353]

"Artificial pinning enhancement by multilayer nanostructures in Mg B 2 /Ni thin films"

We prepared MgB2/Nimultilayer films on a polished Si (100) single crystal substrate by the growth of alternating layers of MgB2(15nm)and Ni (1nm)layers. We then compared the magnetic field dependence of the critical current density Jcand the global pinning force Fpbetween films with and without the multilayer nanostructure. In the multilayer MgB2/Nifilm, Jcwas higher in fields parallel to the substrate than in perpendicular fields, reflecting the layered nanostructure parallel to the substrate. The Jc-Bcurve has a plateau in parallel fields ranging between 1-5T, and Jcexceeds 1MA/cm2, even at 6T(at 4.2K). The results indicate that the multilayer nanostructure is effective to enhance flux-pinning performance in parallel fields. [J354]

"Uniform and enhanced field emission from chromium oxide coated carbon nanosheets"

Carbon nanosheets, a two-dimensional carbon nanostructure, are promising electron cathode materials for applications in vacuum microelectronic devices. This letter demonstrates a simple approach to improve the spatial emission uniformity of carbon nanosheets by coating them with a chromium oxide thin film. Photoelectron emission microscopy observations and in situ field emission tests revealed that chromium oxide coated carbon nanosheets not only have spatial uniformity but also have coating thickness dependent field emission properties. For example, a coating thickness of 1.5nmgave a substantially greater field emission than as-grown nanosheets or other thickness coatings. [J355]

"Two-dimensional vortex-pinning phenomena in Y Ba 2 Cu 3 O y films"

Anomalous superconducting properties were demonstrated in anisotropic high-critical-temperature superconductors (HTSCs) by simultaneously introducing two different planar types of vortex-pinning centers. The nanostructure, magnetic field, and field-angle dependency of critical current properties for an a-axis-grown multilayered film consisting of superconducting and semiconducting layers were characterized. Semiconductive layers running perpendicular to CuO2superconducting layers behave as novel two-dimensional vortex-pinning centers that reverse the typical magnetic response in the superconducting state observed for conventional HTSCs. The results indicate that the vortex behavior in nanostructured HTSCs can be controlled; therefore, significant potential exists for further improvement of the critical current properties. [J356]

"The effect of nitrogen concentration on the band gap and band offsets of Hf O x N y gate dielectrics"

The effect of N concentration on the band gap and band offsets of HfOxNyfilms has been systematically investigated. It was found that the band gap as well as the band offsets of HfOxNyfilms decreased with the increase of N concentration. When the N concentration reached 16.3%, the conduction band offset (Delta Ec)reduced to be 0.88eV, which is smaller than the minimal requirement of Delta Ecvalues for high-kdielectrics and, thus, leads to unacceptably high leakage currents. Therefore, nitrogen concentration should be carefully controlled to guarantee excellent properties of nitrogen incorporated high-kdielectrics. [J357]

"Magnetic properties and enhanced magnetic refrigeration in (Mn 1-x Fe x)5 Ge 3 compounds"

Magnetic and magnetocaloric effects of (Mn1-xFex)5Ge3compounds are studied systematically. The maximum of magnetic entropy changes of 8.01 J/kg K under an external field change of 5 T is obtained for (Mn0.9Fe0.1)5Ge3, which is the largest value in Mn5Ge3-based solid solutions. Moreover, the Fe substitution increases the refrigeration capacity (RC) value greatly. The largest RC value of 237 J/kg in (Mn0.8Fe0.2)5Ge3even compares favorably to that of many well-known magnetic refrigeration materials. Thus the Fe-containing (Mn1-xFex)5Ge3compounds are much-improved magnetic refrigerants for the application of room-temperature magnetic refrigeration. The increase of the RC value is probably resulted from the formation of magnetic nanostructure. [J358]

"Numerical simulation for the formation of nanostructures on the Stranski-Krastanow systems by surface undulation"

The nanostructure formation of the Stranski-Krastanow (SK) systems is investigated by simulating the surface undulation of the systems driven by the surface diffusion mechanism. Of particular interest is how the surface undulation leads to the development of faceted nanostructures and wetting layers. The results reveal that the development exhibits three common features in the coarsening SK systems, while the development also results in distinct film morphologies, controlled by the maximum surface coverage of faceted islands. The maximum surface coverage depends on the film thickness, the ratio between the two characteristic lengths of the SK system, and the effective surface energy density of flat film. [J359]

"Structural analysis of strained p -type Al Ga N /Ga N superlattice"

We investigated the nanostructure of AlGaN/GaNstrained-layer superlattice (SLS) cladding in the GaN-based violet laser diode (LD) and the AlInGaN-based ultraviolet (UV) light emitting diode (LED) with a scanning transmission electron microscope (STEM). In the p-SLS cladding, comprising 34 pairs of p-Al0.1Ga0.9N/p-GaN:Mglayers in the GaN-based LD, the Al0.1Ga0.9Nand GaN layers were distinguished as dark and bright bands 6nmwide in the high-angle annular dark-field (HAADF) STEM images. Threading dislocations (TDs) were observed. Among TDs that came from the underlying layer, some run outside through the SLS, and the others disappeared within the SLS, which discloses a role of the SLS in suppressing defect propagation. A

HAADF-STEM image of the TD with a dark line along the center of a bright contour was found. The dark line, which was darker than the surrounding matrix, is striking. One of the probable explanations for the dark line that may be considered is local segregation of light atoms (Mg or Al) in Cottrell atmosphere around the dislocation core. In the HAADF-STEM image of the UV LED wafer, the AlInGaN and AlInGaN:Si layers in the MQW were definitely resolved, appearing as dark and bright bands. HAADF-STEM also distinguished between the AlGaN and GaN layers in the p-SLS cladding in the UV LED wafer. [J360]

"Quantum dot strain engineering of In As /In Ga As nanostructures"

We present a complete study both by experiments and by model calculations of quantum dot strain engineering, by which a few optical properties of quantum dot nanostructures can be tailored using the strain of quantum dots as a parameter. This approach can be used to redshift beyond 1.31mcmand, possibly, towards 1.55mcmthe room-temperature light emission of InAs quantum dots embedded in InGaAs confining layers grown on GaAs substrates. We show that by controlling simultaneously the lower confining layer thickness and the confining layers' composition, the energy gap of the quantum dot material and the band discontinuities in the quantum dot nanostructure can be predetermined and then the light emission can be tuned in the spectral region of interest. The availability of two degrees of freedom allows for the control of two parameters, which are the emission energy and the emission efficiency at room temperature. The InAs/InGaAsstructures were grown by the combined use of molecular beam epitaxy and atomic layer molecular beam epitaxy; their properties were studied by photoluminescence and photoreflectance spectroscopies and by atomic force microscopy; in particular, by means of photoreflectance not only the spectral features related to quantum dots were studied but also those of confining and wetting layers. The proposed approach has been used to redshift the room-temperature light emission wavelength up to 1.44mcm. The optical results were analyzed by a simple effective-mass model that also offers a rationale for engineering the properties of structures for efficient long-wavelength operation. [J361]

"Optical behavior of Ga As /Al Ga As ringlike nanostructures"

Atomic force microscopy and photoluminescence (PL) measurements were carried out to investigate the role of the morphology of GaAs/Al0.3Ga0.7Asringlike nanostructures on their optical properties. A small amount of Ga material (less than three monolayers) was used to fabricate single ringlike and double ringlike (DRL) nanostructures using droplet epitaxy technique. The height of the ringlike nanostructures increased with the increase of the Ga material while the corresponding PL emission energy was found to decrease as the ringlike nanostructure height increased. The PL peak energy showed a blueshift with increasing excitation intensity that can be understood as due to state filling while increasing temperature showed that the peak energy of the larger DRL nanostructures redshifts at a lower rate than the small ones due to larger confinement potential and lower energy emissions. [J362]

"Phase configuration, nanostructure evolution, and mechanical properties of unbalanced magnetron-sputtered Ti-C x -N y thin films"

Ti-Cx-Nythin films with different amounts of C incorporated into TiN0.87were deposited on Si(100) substrates at 500 °Cby reactive unbalanced dc magnetron sputtering. Their phase configuration, nanostructure, and mechanical behavior were investigated by x-ray diffraction (XRD), x-ray photoelectron spectroscopy (XPS), high-resolution transmission electron microscopy (HRTEM), and microindentation measurements. The results indicated that the atomic ratio of (C+N)/Tiplayed a crucial role in phase configuration, nanostructure evolution, and mechanical behavior. When the ratio was less than one, a nanocrystalline (nc-)Ti(C,N) solid solution was formed by dissolution of C into the TiN lattice. Both microhardness and residual compressive stress values increased with an increase of C content. When the C reached saturation, precipitation of small amounts of sp2amorphous (a-)phase appeared with more C incorporation. Further increase of C content (up to 19at. %C) made the amorphous phase fully wet nanocrystallites, which resulted in the formation of nanocomposite thin films of 5nmnc-Ti(C,N)nanocrystallites separated by an 0.5nmamorphous phase comprised mainly of sp2disordered C, graphite, and minor CNx. Thicker amorphous matrices and smaller sized grains followed when C content was further increased. The formation of nanocomposite structure greatly decreased both hardness and residual stress values of thin films. A hardness maximum was believed to be ob--tained at nc-Ti(C,N)solid solution containing the maximum C amount. Enhancement of the hardness value was attributed to solid solution effect and high residual stress value. [J363]

"Fabrication of structurally chiral Sc 2 O 3 films and observation of Bragg resonance at deep UV wavelengths"

The authors report serial bideposition of structurally chiral films for deep ultraviolet (DUV) wavelengths. Scanning electron micrographs confirm that the Sc2O3films have a twisted columnar nanostructure similar to a double-

start screw. Observation of circular Bragg resonances in reflection and transmission at 230nmindicates a dielectric pitch of 65nm, an average refractive index of 1.75, and local in-plane linear birefringence of 0.05. Possible applications of DUV chiral media include novel thin film polarizing devices for use in the DUV spectral region, where conventional designs are currently severely constrained by material properties. [J364]

"Electron holography of single-crystal iron nanorods encapsulated in carbon nanotubes"

alpha -Fenanorods encapsulated in multiwall carbon nanotubes (CNTs) were characterized by x-ray diffraction (XRD), high resolution electron microscopy (HREM), and electron holography. HREM observations revealed that the alpha -Fenanoparticles were single crystals with a preferential growth direction of alpha -Feoriented along CNTs. Phase distributions of an alpha -Fenanorod were measured by electron holography and the remanent state was retrieved by a three-dimensional morphological model and an algorithm with the consideration of irregular nanoparticle shape. It was found that the saturated magnetization of the alpha -Fenanorod with a CNT outer shell was very close to that of bulk pure alpha -Fe, suggesting that the core-shell nanostructure effectively prevented the surface oxidation that had been found to significantly degrade the magnetic properties of nanostructured alpha -Fe. [J365]

"Long-term stability of nanostructured systems with negative heats of mixing"

This paper investigates the long-term stability of nanostructured systems with negative heats of mixing using differential scanning calorimetry (DSC) and sputter deposited Al/Ninanolaminate foils as a model system. Changes in the intermixing between nanoscale layers were investigated using DSC after three years of storage at room temperature. Using the heats measured for the total formation reaction the average thicknesses of intermixing between alternating Al and Ni layers were determined to be 6.75±1.23nmshortly after deposition and 6.99±1.16nmafter three years of storage, suggesting no decrease in stored energy. However, using the much smaller heats evolved during the shoulder prior to the first exotherm, the increase in average intermixing thickness was determined to be 1.19±0.34nmafter three years of storage. For multilayer foils with bilayer thicknesses as thin as 15nm, this increase in intermixing can produce a measurable drop in stored energy (74.77J/g). However, for foils with bilayers greater than 30nm, the decrease in stored energy is small and difficult to detect by DSC, suggesting that nanostructure systems with negative heats of mixing can have long-term stability. [J366]

"Electron screening in nanostructures"

Distributions of electrical potential and carrier concentration, the contact capacity, and its voltage dependence are calculated for Schottky contacts to various types of nanostructures, including nanolayers and nanowires of different thickness, as well as their arrays. The results demonstrate a dramatic dependence on the nanostructure geometry. Single nanostructures and planar arrays of nanowires cannot provide effective screening of the contact potential, so that the total stored charge and the structure capacity depend on the separation between external contacts. On the contrary, for nanolayer and two-dimensional nanowire arrays, the mutual electrostatic interaction between different elements provides effective screening with the screening length equal to the interelement distance, which determines the contact capacity and its voltage dependence. [J367]

"Characteristics of Hf O x N y thin films by rf reactive sputtering at different deposition temperatures"

The microstructure and optical dielectric constants of HfOxNythin films deposited by using radio frequency reactive magnetron sputtering have been investigated at various substrate temperatures. Fourier transform infrared spectroscopy spectra indicate that an interfacial layer has been formed between the Si substrate and the HfOxNythin film during deposition. Spectroscopy ellipsometry (SE) results show that the substrate temperature has a strong effect on physical properties of HfOxNythin films such as refractive index nand extinction coefficient k. Meanwhile, the optical dielectric functions of the films have determined using SE data and optical absorption properties of HfOxNythin films deposited at different substrate temperatures have also been studied. [J368]

"Photovoltaic and photoconductivity effect in thin-film phototransistors based on a heterocyclic spiro-type molecule"

We reported on photovoltaic and photoconductivity effects as the underlying mechanism in thin-film phototransistors based on 2,2',6,6'-Tetraphenyl-4,4'-spirobi[cyclopenta[2,1-b;3,4-b']dithiophene]. The responsivity and the ratio of photocurrent to dark current were 25 A/W and 290, respectively. Our devices also exhibited a field-effect mobility of (1-2)Ч10-4cm2/V sand an ON/OFF ratio of 103. Hysteresis in the transfer curve was observed after the curves were measured from the ON-state to the OFF-state and vice versa. In this case, the

gate voltage (at drain bias -20Vand drain current -1nA) shifted by 8 V at an optical power of 20mu W. [J369]

"Control of carbon nanostructure: From nanofiber toward nanotube and back"

The unique properties of carbon nanofibers (CNFs) make them attractive for numerous applications ranging from field emitters to biological probes. In particular, it is the deterministic synthesis of CNFs, which requires precise control over geometrical characteristics such as location, length, diameter, and alignment, that enables the diverse applications. Catalytic plasma enhanced chemical vapor deposition of vertically aligned CNFs is a growth method that offers substantial control over the nanofiber geometry. However, deterministic synthesis also implies control over the nanofiber's physical and chemical properties that are defined by internal structure. Until now, true deterministic synthesis has remained elusive due to the lack of control over internal graphitic structure. Here we demonstrate that the internal structure of CNFs can be influenced by catalyst preparation and ultimately defined by growth conditions. We have found that when the growth rate is increased by 100-fold, obtained through maximized pressure, plasma power, and temperature, the resulting nanofibers have an internal structure approaching that of multiwalled nanotubes. We further show that the deliberate modulation of growth parameters results in modulation of CNF internal structure, and this property has been used to control the CNF surface along its length for site specific chemistry and electrochemistry. [J370]

"Temperature-dependent structural stability and optical properties of ultrathin Hf-Al-O films grown by facing-target reactive sputtering"

The structural stability and optical properties of ultrathin HfAlOxfilms grown by facing-target reactive sputtering, depending on the postannealing temperature, have been determined via x-ray photoelectron spectroscopy and spectroscopic ellipsometry (SE). By virtue of the chemical shifts of Hf4f, Al2p, and Si2pcore-level spectra, it has been found that the structural stability of HfAlOx/Sisystem sustains up to 800°C. However, the breaking of the Hf-Al-O bond and the phase separation take place drastically at the annealing temperature of 900°C. In particular, the information of an interfacial Si-O-Si bond as the dominant reaction during the postannealing treatment has been observed, confirmed by Fourier transform infrared spectroscopy. Analysis by SE, based on the Tauc-Lorentz model, has indicated that increase in the refractive index and reduction in thickness has been observed as a function of annealing temperature, originating from the annealing-induced higher packing density. The change of the complex dielectric functions and bandgap Egcorrelated with the annealing temperature are discussed in detail. [J371]

"Characterization of ZnO:N films prepared by annealing sputtered zinc oxynitride films at different temperatures"

N-doped ZnO films were prepared by annealing zinc oxynitride films deposited by rf reactive sputtering. Two Raman peaks were observed at 274 and 580cm-1. According to the variation of the integral intensity of these two peaks, the nitrogen activation at 500 °C[the activation temperature (AT)] has been obtained. Below the AT, the integral intensities of them show a different variation trend. X-ray photoelectron spectroscopy (XPS) indicates the N chemical state variation for them and finds the activated Zn-N bond. Further analyses by photoluminescence (PL) spectra and spectroscopic ellipsometry (SE) have been carried out. The activated sample exhibits a symmetric emission peak at 3.22 eV assigned to be the A0Xemission at room temperature. SE investigation takes account of samples within the different temperature span divided by the AT. Different factors, such as nitrogen dopant (N)Oand the nanocrystal growth, which affect the redshift of the absorption edges, have been discussed. [J372]

"Thermal and chemical vapor deposition of Si nanowires: Shape control, dispersion, and electrical properties"

We investigate and compare complementary approaches to SiNW production in terms of yield, morphology control, and electrical properties. Vapor-phase techniques are considered, including chemical vapor deposition (with or without the assistance of a plasma) and thermal evaporation. We report Au-catalyzed nucleation of SiNWs at temperatures as low as 300°Cusing SiH4as precursor. We get yields up to several milligrams by metal-free condensation of SiO powders. For all processes, we control the final nanostructure morphology. We then report concentrated and stable dispersions of SiNWs in solvents compatible with semiconducting organic polymers. Finally, we investigate the electrical response of intrinsic SiNWs grown by different methods. All our SiNWs exhibit p-type behavior and comparable performance, though in some cases ambipolar devices are observed. Thus, processing and morphology, rather than the growth technique, are key to achieve optimal samples for applications. [J373]

"Synthesis and analysis of abnormal wurtzite ZnSe nanowheels"

An abnormal structure of the ZnSe nanowheels composed of teethlike extended patterns on nanoring bases has been successfully synthesized by thermal evaporation method. It is interesting to note that the as-synthesized ZnSe nanowheels are metastable wurtzite phase with the dominant exposed surfaces of ±(2110)while the stable ZnSe is typically zinc blende phase. A full picture of the growth mechanism of the metastable wurtzite phase ZnSe nanostructures will be proposed from the thermodynamic point of view. Meanwhile, the formation of the nanowheels is also explained by a two-stage mechanism. In the first stage, the base of the nanowheel begins to form by vapor-solid mechanism, while in the second stage, the teethlike extended structures grow through the self-catalyzed growth process. The cathodoluminescence spectrum of ZnSe nanowheel exhibited a band edge transition at about 460nmand a strong self-activated luminescence at 610nm. It is important to note that the discussions of the nanostructure thermodynamics and stability can be applied to understand the growth mechanism of other nanostructures which are critical for optimization of the nanostructures. [J374]

"High fidelity fabrication of microlens arrays by nanoimprint using conformal mold duplication and low-pressure liquid material curing"

The authors present a novel hyperfidelity fabrication method for microlens arrays. The method consists of the steps of (a) fabrication of a sacrificial master mold of a microlens array in a soft polymer by photolithography and thermal reflow, (b) conformal duplication of a daughter mold of complementary patterns in a hard material by dispensing an UV-curable material liquid on top of the polymer mold, planarizing the liquid with a flat quartz substrate, and curing the material, and (c) fabrication of microlens array using the hard daughter mold and nanoimprinting with an UV-curable lens material. This method has several advantages over conventional fabrication methods of microlens arrays including hyperfidelity, low cost, and high throughput. [J375]

"Ultrahigh vacuum scanning tunneling microscope manipulation of single gold nanoislands on Mo S 2 for constructing planar nanointerconnects"

The manipulation of single metallic nanoislands with a precision better than 0.5nmon a MoS2surface is demonstrated. Optimizing the metal growth conditions yields triangular-shaped nanoislands of 30nmin lateral size and 12nmin height on the MoS2surface. The manipulation of a single nanoisland was performed using the tip apex of a scanning tunneling microscope. The feedback loop conditions to achieve this manipulation are discussed. Fully planar four-pad nanostructures were constructed, and the apex of each triangular nanoisland of the nanostructure is pointing toward a central 10Ч20nm2MoS2working area where the surface atomic cleanliness is preserved. [J376]

"Membrane stacking: A new approach for three-dimensional nanostructure fabrication"

Future applications of nanotechnology, including integrated photonics, will require new three-dimensional (3D) fabrication techniques beyond those employed by the semiconductor industry. The authors investigate membrane stacking as a potential avenue for fabricating photonic crystals and other 3D structures with high yield. They fabricated membranes in silicon nitride with freestanding photonic structures and investigated the technology for stacking them. [J377]

"Thermal quenching sample chamber for grazing incidence small angle x-ray scattering studies of polymer films"

The second generation of a sample chamber designed for in situ measurement of temperature- and time-dependent polymer film nanostructure using the method of grazing incidence small angle x-ray scattering is presented. An increased operating temperature limit (from 260to400°C) with precise control (±0.1°C)at fixed temperatures as well as a fourfold increase in maximum instantaneous cooling rate (up to 73°C/s) relative to the first generation chamber [M. N. Groves et al, J. Appl. Crystallogr. 39, 120 (2006)] are reported. Thermal quenches from 220to90°Care shown to be reproducible to within ±1°Cof the final temperature. Experimental tests on spin-coated films of symmetric diblock styrene-butadiene copolymer demonstrate the ability to resolve the kinetics of orientation of lamellar domains parallel to the silicon substrate, distinct from the initial formation of randomly oriented lamellar domains immediately following the thermal quench. [J378]

"Screen effects on field emission from an array of one-dimensional nanostructures grown on silicon substrates: A simulation study using classical transport model"

In this article, the field emission properties of the one-dimensional (1D) nanostructure array grown on doped silicon substrate influenced by the screen effects have been studied via computer simulation. The classical transport equation is used to describe the carrier transport in the material and is solved together with the Poisson's equation. The field emission at the emitter-vacuum interface is modeled by the Fowler-Nordheim

equation. For an array of 1D nanostructures with different heights, the field emission characteristics of the higher 1D nanostructures are very similar to those of the equal-height 1D nanostructure array. But the field emission characteristics of the shorter 1D nanostructures are contrary to those of the higher ones. These anomalous phenomena for the shorter 1D nanostructures are induced by the electric fields enhanced due to the equal-potential lines penetrating into the higher emitters and reduced due to the equal-potential lines compressed by the higher emitters. This kind of screen effect is very different from the screen effect of the conducting emitters. [J379]

"Effect of UV irradiation during synthesis of polypyrrole by a one-step deposition/polymerization process"

Polypyrrole (PPY) nanofilms were synthesized by a one-step deposition/polymerization process in a vacuum chamber under ultraviolet photon irradiation. To realize the synthesis of PPY films, the authors measured the current through a conducting polymer connected by two electrodes. The nanofilms were characterized by atomic force microscopy and Fourier-transform infrared spectroscopy. A possible mechanism is proposed for the formation of the PPY nanostructure during the photopolymerization. [J380]

"Integration of functional epitaxial oxides into silicon: From high-K application to nanostructures"

The authors will present results for crystalline lanthanide oxides on silicon with the Ln2O3composition (Ln=Pr, Nd, and Gd) in the cubic bixbyite structure grown by solid state molecular beam epitaxy. On Si(100) oriented surfaces, crystalline Ln2O3grows as (110)-oriented domains, with two orthogonal in-plane orientations. Layers grown under best vacuum conditions often exhibit poor dielectric properties due to the formation of crystalline interfacial silicide inclusions. Additional oxygen supply during growth improves the dielectric properties significantly. Experimental results for Ln2O3-based metal-oxide-semiconductor (MOS) capacitors grown under optimized conditions show that these layers are excellent candidates for application as very thin high-Kmaterials replacing SiO2in future MOS devices. In addition, they will present a new approach for nanostructure formation which is based on solid-phase epitaxy of the Si quantum well combined with simultaneous vapor-phase epitaxy of the insulator on top of the quantum well. Ultrathin single-crystalline Si buried in a single-crystalline insulator matrix with sharp interfaces was obtained by this approach on Si(111). Finally, the incorporation of crystalline Si islands into single-crystalline oxide layers will be demonstrated. [J381]

"Hybrid metallic nanoparticles for excitation of surface plasmon resonance"

A Ag nanostructure was put forward in this paper. There are two types of Ag nanoparticles, spherical and pyramidal particles. Both of them have the same period, but different height and shapes. The hybrid nanoparticles can produce the localized surface plasmon resonance (LSPR), which couples each other and leads to an extra peak transmission. Our UV-visible-IR spectrophotometer measurement results show that some extra small and sharp peaks appear besides the normal LSPR wave peaks in the transmittance spectrum. The hybrid Ag nanoparticles being used as nanosensors will be more sensitive and selective than the conventional LSPR-based nanosensors. [J382]

"Quantum ballistic phenomena in nanostructures of paraelectric PbTe"

This article reviews recent developments in the physics of lead telluride nanostructures. PbTe is a IV-VI narrow gap paraelectric semiconductor, characterized by the huge static dielectric constant epsilon 1000at helium temperatures. Methods of gating and nanostructure fabrication of modulation doped PbTe/Pb1-xEuxTequantum wells are described. Specific properties of PbTe, make it possible to put into evidences a number of interesting effects in the quantum ballistic regime, not encountered in standard semiconductor nanostructures. It is found that conductance of narrow constrictions shows precise zero-field quantization in 2e2/hunits, despite a significant amount of charged defects in the vicinity of the conducting channel. This unusual result is a consequence of a strong suppression of Coulomb potential fluctuations in PbTe, an effect confirmed by numerical simulations. Furthermore, orbital degeneracy of electron waveguide modes can be controlled by the width of PbTe/Pb1-xEuxTequantum wells, so that unusual sequences of plateau conductance are observed. Finally, because of a rather large Zeeman splitting in PbTe, significant spin splitting of the conductance plateaus is observed already in the magnetic fields of about 0.2 T. It is shown that PbTe quantum wires act as efficient local spin-filters, in which the spin polarized current is carried by a large number of wire modes. [J383]

"Effect of hydrogen treatment on the field emission of amorphous carbon film"

The field emission characteristics of amorphous carbon (a-C)films are studied before and after H plasma treatment. It is found that H plasma treatment lowered the turn-on field and improved the field emission uniformity. Surface sp2/sp3ratio, work function, and topography of the a-Cfilms before and after H plasma

treatment are studied using Raman spectroscopy, Kelvin probe, and atomic force microscopy, respectively. The results show that the etching effect of H plasma on a-Cfilm is obvious, which is different from those of diamond and tetrahedral amorphous carbon (ta-C) films. We suggest that the surface component change and nanostructure of treated a-Cfilms cause electron injection from sp2sites to surface sp3sites which are responsible for low macroelectrical field emission. [J384]

"Periodic ordering of random surface nanostructures induced by femtosecond laser pulses on metals"

In this paper, we performed a detailed study of the formation of femtosecond laser-induced periodic surface structures (LIPSSs) on platinum and gold at near-damage threshold fluences. We find a unique type of LIPSS entirely covered with nanostructures. A distinctive feature of the nanostructure-covered LIPSS is that its period is appreciably less than that of the regular LIPSS. We show that the reduced period is caused by an increase of the real part of the effective refractive index of the air-metal interface when nanostructures develop and affect the propagation of surface plasmons. [J385]

"Role of the gold film nanostructure on the nanomechanical response of microcantilever sensors"

In this study, we have determined the relationship between the nanostructure of the gold film deposited on microcantilevers and the sensitivity and reproducibility of their static response to molecular adsorption. In order to tune the properties of the gold film, gold was deposited at different rates and thicknesses. The cantilever response to molecular adsorption was characterized by exposure of the cantilevers to mercaptohexanol in water. The morphology of the gold surface was characterized by atomic force microscopy, and the residual stress induced in the cantilevers was characterized by a profilometry technique based on the optical beam deflection method. We have found that the discontinuous morphology of the gold film for small thicknesses and low deposition rates gives rise to large values of residual tensile stress due to the formation of grain boundaries at the expense of strain energy. These cantilevers exhibit the highest sensitivity and reproducibility to molecular adsorption. However, larger thicknesses and higher deposition rates produce the coalescence of gold nanoislands via atom diffusion. This is characterized by a large relative decrease (increase) of the tensile (compressive) stress. These cantilevers exhibit small sensitivity and low reproducibility to molecular adsorption. We conclude that the control of the gold coating process is critical for the reliability of the measurements with nanomechanical sensors. [J386]

"Growth behavior of oxide nanostructures by electrical and thermal conductivities of substrate in atomic force microscope nano-oxidation"

We report the growth behavior of oxide nanostructures according to physical properties such as work function, electrical and thermal conductivities, and roughness for high resolution nanostructure fabrication. Among these factors, threshold voltages, in particular, which induced the formation of a water meniscus and driving voltage, which drive oxyanions for oxidation, decreased as the mobility of electrons increased by the increasing electrical conductivity. Oxide growth increased as the diffusion of OH radical increased by the increasing conductivity of thermal energy. The high electrical and thermal conductivities imply that the reaction of the OH radical and surface was more easily activated over a wide reaction region (in the parallel direction of substrate) by the conductivity of the generated thermal energy at a low driving voltage. On the basis of these conductivity effects, the Cr film, which is the most sensitive to electron transport and conductivities, had hill-shaped nanostructures and could be applied as a candidate for high-speed atomic force microscope lithography at the lowest driving voltage. In addition, Ta and Ti, which are less sensitive, can be used to fabricate nanostructures with a high aspect ratio (spike shape). [J387]

"Thermal properties of natural nanostructured hydroxyapatite extracted from fish bone waste"

In a previous study, natural hydroxyapatite (HAp) from the bones of Brazilian river fish was calcined at 900 °C(4-12 h), and optical characterization using the near infrared photoacoustic spectroscopy technique enabled the establishment of 8 h as the best calcination time for nanostructure stabilization when milled in a high-energy milling device [T. M. Coelho, E. S. Nogueira, W. R. Weinand, W. M. Lima, A. Steimacher, A. N. Medina, M. L. Baesso, and A. C. Bento, J. Appl. Phys. 100, 094312 (2006)]. The fish wastes used were from species such as pintado (Pseudoplatystoma corruscans), jau (Paulicea lutkeni), and cachara (Pseudoplatystoma fasciatum). In this study, the characterization of the thermal properties of the same natural HAp is discussed for samples milled from 0 to 32 h, with nanostructures from 80 to 24 nm. The powders were pressed into disks at 350 MPa and sintered for 4 h at 1000 °C. Thermophysical parameters were obtained by thermal wave interferometry and nonadiabatic relaxation calorimetry. Results for thermal diffusivity and thermal conductivity showed that the parameters increase with milling time, although they present a transition (a plateau) in the interval from 8 to 16 h.

Two different slopes were observed and this was interpreted as being due to the size of the crystallites, which fall rapidly, dropping from 80 nm to near 22 nm when milling time is increased from 0 to 16 h, and forming agglomerates up to 32 h. [J388]

"Microwave absorption of patterned arrays of nanosized magnetic stripes with different aspect ratios"

Arrays consisting of nanosized stripes of Permalloy with different length-to-width ratios have been fabricated using electron beam nanolithography, magnetron sputtering, and lift-off process. These stripes have a thickness of 100nm, a width of 300nm, and different lengths ranging from 300nmto100mcm. The stripes are separated by a distance of 1mcm. Magnetization hysteresis loops were measured using a superconducting quantum interference device susceptometer. Microwave absorption at 9.8GHzwas determined by means of ferromagnetic resonance technique. The dependence of the resonant field on the angle between the nanostructure and the in-plane dc magnetic field indicates the presence of uniaxial magnetic anisotropy associated with the aspect ratio of the stripes. A maximum change of the resonant field of 1600Oewas observed in the longest stripes, yet it was only 200Oefor square shaped stripes. The linewidth of the resonant curve varied with the angle, in the range from 120to300Oe. Most of the ferromagnetic resonance spectra exhibited multiple resonant peaks due to dimensional confinement of spin waves in the nanosized stripes. The maximum squareness of the magnetization hysteresis loop was for the field applied along the stripes, but the coercivity did not have a monotonic angular dependence as expected from the Stoner-Wohlfarth model for coherent magnetization rotation of the systems with uniaxial anisotropy. [J389]

"Microstructures of SiC nanoparticle-doped Mg B 2 /Fe tapes"

We have studied bulk MgB2synthesized by reaction of MgH2and B with and without SiC nanoparticles and at a range of reaction temperatures. All of the samples showed enhanced upper critical fields compared to most bulk MgB2, including the sample with 10at.%SiC reacted at 600°C, which showed Hc2(0K) 42T. Extensive transmission electron microscopy (TEM) and STEM observations show that using MgH2instead of pure Mg reduces the concentration of oxide second phases in the tapes, but that adding SiC reintroduces nanoscale grains of MgO, SiO2, and SiOxCy, and larger grains of Mg2Si. SiC causes some C doping of the MgB2, but electron energy loss spectroscopy and x-ray diffraction measurements show that the C concentration is similar to other bulk C-doped MgB2. In all the samples with and without SiC, the grain size is very small, 10-60nm. Electron scattering from the high density of grains and second-phase boundaries is responsible for the enhanced Hc2of these samples. However, the Hc2properties are somewhat compromised by very broad transitions that may have their origin in the local variations of nanostructure. [J390]

"Kinetic Monte Carlo simulation of vapor-liquid-solid nanostructure growth"

The vapor-liquid-solid growth of nanostructures is simulated using a two-dimensional kinetic Monte Carlo model. The model considers the deposition of reactants from the vapor, solute diffusion in the solution droplet, and the nucleation and growth of the precipitated solid phase. The extrusion of the solid from the solution into the vapor is also modeled. A morphological transition from one-dimensional to two-dimensional growth is observed in response to changes in reactant vapor pressure and to changes in the solute diffusivity at the liquid-vapor interface. The morphology is determined by the dominant growth direction of the solid and is dependent on the speed at which deposited solute species can be diffused from the surface. Such a fundamental change in morphology has been observed experimentally in the growth of silicon carbide nanostructures and insight into the cause of this transition is achieved. [J391]

"Nanographite domains in carbon nanowalls"

The nanostructure of carbon nanowalls (CNWs), composed of a stack of several graphite sheets, was investigated by transmission electron microscopy. Our detailed analysis revealed that numerous graphite regions with an average size of about 20 nm were formed in the CNWs. The formation of these regions originates from the introduction of lattice defects such as dislocations and the slight rotation of the graphite sheets. On this basis, it is concluded that the graphite regions, so-called "nanographite domains," are the constitutional units of the CNWs. [J392]

"A plausible mechanism for the evolution of helical forms in nanostructure growth"

The observation of helices and coils in nano-tube/-fiber (NT/NF) syntheses is explained on the basis of the interactions between specific catalyst particles and the growing nanostructure. In addition to rationalizing nonlinear structure, the proposed model probes the interplay between thermodynamic quantities and predicts conditions for optimal growth. Experimental results on the effect of indium catalyst on affecting the coil pitch in

NTs and NFs are presented. [J393]

"On the mechanism of hysteresis in conductance of point contacts to single ferromagnetic films"

Single nonmagnetic/ferromagnetic interfaces can exhibit magnetic excitations and hysteretic switching, provided that the current density traversing the interface is sufficiently high (108A/cm2)and the flow regime is diffusive. We measure hysteretic switching in conductance induced by nominally unpolarized electron currents in nanocontacts to thin Co films and successfully model the effect for 20nmscale point contacts using micromagnetic simulations, which take into account an out of plane stress-induced magnetic anisotropy in the point contact region. [J394]

"Superconducting MgB 2 Nanostructures Fabricated by Electron Beam Lithography"

MgB2meander lines with width ranging from 250 to 500 nm have been fabricated by electron beam lithography (EBL)-based technique. Magnesium diboride films grown by all-in-situ method have been used. A critical current density of 8 MA/cm2was measured for meander with width down to 300 nm. For sake of comparison the measurements have been performed as well on 10 mum wide strip patterned on the same sample. The results show that the nanostructuring process doesn't affect the superconducting properties of the structure. The flexibility of the EBL approach makes it interesting in view of fabrication of MgB2superconducting devices, such as photon detectors. [J395]

"Flux Pinning Properties of Multilayered MgB 2 /Ni Thin Films"

In this paper, we will show the superconducting properties of the alternately-layered MgB2/Ni thin films. MgB2/Ni multilayered thin films were prepared on silicon substrates (100) by sequentially switching an electron beam evaporation technique and a coaxial vacuum arc evaporation source. The lattice spacing of artificial pinning layers was designed to correspond to a magnetic field of 8 T (flux line lattice spacing of 15 nm). As a result, clear enhancement of Jc was observed in the multilayered thin film when the fields applied parallel to the film surface. The results suggest a great possibility of the artificial nanostructure to improve superconducting performances of MgB2. [J396]

"Photon Number-Resolved Detection With Sequentially Connected Nanowires"

Sequentially connected superconducting nanowires, such as nanopatterned meanders, are very promising candidates for single-photon detectors capable to resolve a number of photons in the pulse. In such devices, the photon number-resolved (PNR) mode is possible due to independent detection of electromagnetic quanta by different regions of the meander. Every photon creates a resistive region in the superconductive meander and the total resistance is expected to be proportional to the number of photons absorbed. While the PNR mode can be realized with available single-photon detectors based on NbN nanowires, up to now it has not been observed experimentally. Here we show that the PNR mode in NbN requires the proper impedance matching between readout circuitry and nanowire-based detector. We discuss possible design of the readout circuitry for PNR detection. Results of modeling show that a high impedance amplifier placed in close proximity to the superconducting nanostructure can provide effective readout for the NbN nanowire-based detector operating in PNR mode. [J397]

"Spectral Sensitivity and Spectral Resolution of Superconducting Single-Photon Detectors"

Single photon detectors based on meanders from 5-nm thin B1 niobium nitride nanostrips show moderate spectral resolution along with the spectral cut-off of the quantum efficiency occurring in the near-infrared spectral range. Beyond the cut-off there is a gradual decrease of the quantum efficiency. To describe the response beyond the cut-off we combine the previously developed hot-spot detection mechanism with the photon-induced unbinding of the vortex-antivortex pairs, which appear in the superconducting film below the Kosterlitz-Thouless phase transition. The detector responds to the absorption of a single photon with a voltage pulse whose amplitude depends on the photon energy. We report the observation of a photon-energy dependent statistical distribution of the pulse amplitude that defines the energy resolution of the detector. We analyzed the detector response to continuous and femtosecond-pulse radiation using broadband microwave amplifiers and a fast single-shot oscilloscope as well as integrating SQUID amplifiers. Our analysis suggests that both the amplitude and the duration of the response pulses are jointly controlled via the kinetic inductance of the meander line and the Joule power dissipated in the meander by the bias current. [J398]

"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. [J399]

"High-Precision Alignment and Bonding System for the Fabrication of 3-D Nanostructures"

We successfully developed a high-precision wafer alignment and bonding system for the fabrication of a variety of 3-D nanostructures. To control the wafer positions with high accuracy during the wafer-bonding process, we improved upon a design of the conventional mask-alignment stage. A stress sensor was incorporated to measure the load between the two wafers. In addition, the parallelism of the wafers was monitored by an optical interferometry system. To determine alignment errors in both the and directions simultaneously, we devised an alignment method consisting of crossed vernier scales. We demonstrated that the new alignment and bonding system allowed us to realize precise 3-D photonic crystals with the alignment inaccuracy of < 100 nm at most, and we show that the best experimental error achieved to date was < 25 nm. As this system has the benefit of more readily and intuitively determining the absolute positions of the two wafers, it can be applied to the fabrication of a wide variety of nanoscale multilayer devices. [J400]

"Structural and Electrical Characterization of Carbon Nanofibers for Interconnect Via Applications"

We present temperature-dependent electrical characteristics of vertically aligned carbon nanofiber (CNF) arrays for on-chip interconnect applications. The study consists of three parts. First, the electron transport mechanisms in these structures are investigated using I-V measurements over a broad temperature range (4.4 K to 350 K). The measured resistivity in CNF arrays is modeled based on known graphite two-dimensional hopping electron conduction mechanism. The model is used because of the disordered graphite structure observed during high-resolution scanning transmission electron microscopy (STEM) of the CNF and CNF-metal interface. Second, electrical reliability measurements are performed at different temperatures to demonstrate the robust nature of CNFs for interconnect applications. Finally, some guidance in catalyst material selection is presented to improve the nanostructure of CNFs, making the morphology similar to multiwall nanotubes. [J401]

"Subsecond-response SAW humidity sensor with porphyrin nanostructure deposited on bare and metallised piezoelectric substrate"

The surface acoustic wave (SAW) humidity sensor based on the Meso-tetra (4 sulfonatophenyl) porphyrin (TPPS4) nanostrip structure deposited on a bare or metallised surface of the piezoelectric YZ LiNbO3substrate has been investigated. The SAW attenuation, which greatly increases with humidity in sensors with TPPS4 layers on bare substrates, is almost humidity-independent in devices with TPPS4 layers on metallised substrates. For both types of sensors, the SAW velocity exhibits close-to-linear decrease with growing humidity. The sensor exhibited fast response and recovery times of from 0.8 to 0.5 s in both amplitude and phase of the output signal. The real-time monitoring of human breath with the help of the sensor was demonstrated. [J402]

"Design and Operation of a MEMS-Based Material Testing System for Nanomechanical Characterization"

In situ mechanical characterization of nanostructures, such as carbon nanotubes and metallic nanowires, in scanning and transmission electron microscopes is essential for the understanding of material behavior at the nanoscale. This paper describes the design, fabrication, and operation of a novel microelectromechanical-systems (MEMS)-based material testing system used for in situ tensile testing of nanostructures. The device consists of an actuator and a load sensor with a specimen in between. Two types of actuators, in-plane thermal and comb drive actuators, are used to pull the specimens in displacement control and force control modes, respectively. The load sensor works based on differential capacitive sensing, from which the sensor displacement is recorded. By determining sensor stiffness from mechanical resonance measurements, the load on the specimen is obtained. Load sensors with different stiffness were fabricated. The best resolutions were achieved with load sensors that are designed for testing nanotubes, reaching 0.05 fF in capacitance, 1 nm in displacement, and 12 nN in load. For the first time, this MEMS-based material testing scheme offers the possibility of continuous observation of the specimen deformation and fracture with subnanometer resolution, while simultaneously measuring the applied load electronically with nano-Newton resolution. The overall device performance is demonstrated by testing freestanding cofabricated polysilicon films and multiwalled carbon

nanotubes. [J403]

"Tunneling Spectroscopy of Magnetic Double Barrier Junctions"

Scanning tunneling microscopy (STM) is used to study transport in magnetic double tunnel junctions (DTJs) formed using a fixed transparency barrier of a patterned tunnel junction (TJ), and a variable tunnel barrier between the top electrode of the patterned junction and the STM tip. A sufficiently thin top electrode has been predicted to result in a rectification of charge current through a DTJ when the two barriers have different transparency. Our measurements indeed show a high current rectification ratio for 3-nm-thick, continuous film top electrodes, which is observed for junctions with asymmetric tunnel barriers [J404]

"Nanofabrication and Evanescent Light Enhancement by Surface Plasmon"

Metallic nanostructure gratings made up of GaP substrate and covered by gold thin film have been designed and fabricated in order to enhance the near-field light waves emitted from 30-nm apertures in the thin metallic film for throughput-efficiency increments, thereby utilizing the surface plasmon resonance effect with the nanofabricated metallic grating pitch. Theoretical analysis herein emphasizes 3-D simulation using the finite-difference time-domain method. It also experimentally shows that the near-field light from a 30-nm aperture encased in fine pitch corrugated gold thin film creates an enhancement of resonance intensity. The evanescent light output was enhanced up to 1.5% of the input linear polarized laser light without using any microlens-focused laser beam [J405]

"Coarsening of the Nanolamellar Structure in a Soft Magnetic Alloy"

Crystallization from a cobalt base Co65Si15B 14Fe4Ni2amorphous magnetic alloy yielded an interesting highly modulated nanolamellar structure with lamellar spacing of about 5 nm. Coarsening of this structure was investigated using X-ray diffraction (XRD), transmission electron microscopy (TEM), convergent beam electron diffraction (CBED), and X-ray electron dispersive spectrum (XEDS) techniques and was found to initiate at grain boundaries, which provided nucleation sites for equilibrium phases. Rod-shaped Co2B precipitates were observed along the nanolamellae; such precipitates also played a role in coarsening. A coarse lamellar structure subsequently developed which eventually broke up into equiaxed grains. A metastable Co3Si phase was also observed to form by an allotropic transformation. The coarsening of the nanolamellar structure was found to occur largely by discontinuous coarsening processes. The crystallographic relationship between the equilibrium and metastable phases was determined [J406]

"Nonlinearities and parametric amplification in superconducting coplanar waveguide resonators"

Experimental investigations of the nonlinear properties of superconducting niobium coplanar waveguide resonators are reported. The nonlinearity due to a current dependent kinetic inductance of the center conductor is strong enough to realize bifurcation of the nonlinear oscillator. When driven with two frequencies near the threshold for bifurcation, parametric amplification with a gain of +22.4dBis observed. [J407]

"Solution-processed organic thin-film phototransistors based on donor/acceptor dyad"

The authors report on solution-processed organic thin-film phototransistors based on donor/acceptor dyad. The drain current increases significantly and the switch-on voltage is shifted toward positive bias as the incident light intensity is raised. Photoconductivity and the photovoltaic effect are assumed to be the underlying mechanism. Maximum responsivities of 0.3 and 0.03A/Wwere obtained under irradiation at 370nmat an incident light intensity of 1.4mu W/cm2and irradiation using a tungsten halogen lamp at an incident light intensity of 0.32mW/cm2, respectively. [J408]

"Spin-Transfer Torque Switching in Magnetic Multilayers"

In this paper, we point out how the magnetization switching depends on the nanostructure geometry and on the material parameters. The micromagnetic study is carried out on multilayer nanodevices constituted by Permalloy(Py)/Cu/Py and Co/Cu/Co with different cross-sections. Results show that the switching time is strongly dependent on the magnetization of the material [J409]

"Comparison of Micro- and Nano-Pore Platinum Working Electrodes for CMOS Integrated Nondisposable Biosensor Applications"

In this paper, micro-pore and nano-pore platinum (Pt) electrodes are fabricated, characterized, and compared in order to check the effects of the pore sizes of the working electrode in the electrochemical analysis. These

electrodes are also fabricated on silicon substrate for developing nondisposable and continuous monitoring biosensors fully integrated with a CMOS read out circuit. The micro-pore Pt electrode was fabricated by using micromachining technique. The nano-pore Pt electrode was fabricated by using a nonionic surfactant C 16EO8(octaethylene glycol monohexadecyl ether) and an electrodeposition technique. The micro-pore array Pt electrode has approximately 10 mum in pore diameter and 80 mum in height, while the nano-pore array Pt electrode has approximately 2.5 nm in diameter. The measured current responses of the fabricated nano-pore, micro-pore, and plane Pt electrodes are approximately 4600 nA/mm2, 92.4 nA/mm2, and 9.9 nA/mm2in 0.1 M phosphate buffered saline solution mixed with 10 mM glucose solution, respectively [J410]

"1516nm room temperature CW operation of quantum dot InAs/InP(311)B singlemode laser"

Reported is the first demonstration of the performance and properties of a singlemode Fabry-Perot laser processed from InAs/InP(311)B quantum dot material, which gives emission at 1.516 mum under continuous-wave operation at room temperature [J411]

"Plasma-Treated Biomaterials"

Atmospheric pressure plasma spraying is currently used to fabricate relatively thick ceramic coatings for orthopedic applications such as hip joints replacements. We have recently fabricated bioactive nanostructured titanium oxide coatings that are bioactive and conducive to the growth of apatite. The materials are synthesized by nanoparticle atmospheric pressure plasma spraying followed by low-pressure plasma immersion ion implantation (PIII). Surface bioactivity can also be induced by irradiating the nanostructure TiO2coatings with ultraviolet light instead of hydrogen plasma ion implantation. PIII is a useful method to treat other types of biomaterials to enhance the surface bioactivity. Recent applications of the technology to modify orthopedic materials as well as biocompatible and antibacterial coatings are described in this invited paper [J412]

"Electrical Manipulation of Nonvolatile Spin Cell Based on Diluted Magnetic Semiconductor Quantum Dots"

In this paper, electrical manipulation of a memory cell based on a semiconductor nanostructure consisting of a diluted magnetic semiconductor (DMS) quantum dot (QD) and a reservoir of itinerant holes separated by an energy barrier is investigated theoretically. The operating principle takes advantage of the paramagnetic-ferromagnetic (PM-FM) phase transition mediated by the itinerant holes in the DMS QD that can lead to electrically controlled write/erase operations. Nonvolatility can be achieved when the structure is properly designed to reach a thermodynamic equilibrium at both the PM and FM configurations (i.e., bistability). Assuming a parabolic confining potential in the QD, the performance characteristics of the proposed nanostructure are analyzed including the scalability and the lifetime. An advantage of this memory concept is the extremely small dissipative energy for write/erase functions due to the open-circuit nature of the process. A readout scheme enabling electrical detection, with the repetition rate up to the 10-100-MHz range, is also explored by utilizing only two contacts. Finally, a potential application of the proposed memory cell is discussed as a rudimentary device for logic AND and OR operations [J413]

"Fluorescent-Magnetic Hybrid Nanostructures: Preparation, Properties, and Applications in Biology"

Research on nanocomposite materials aims at developing nanoscale composites with innovative optical, chemical, and magnetic properties, all combined in one single nanostructure. In this scenario, nanostructures which show simultaneously fluorescent and magnetic features are of particular interest for pharmaceutical and biomedical applications. In this review, we will focus our attention on magnetic-fluorescent nanocomposite based on colloidal iron oxide nanocrystals combined with different classes of fluorophores which can be either organic dyes, such as fluorescents, cyanines, porphyrins, or colloidal quantum dots. We will give an overview of the preparation methods of the magnetic-fluorescent nanocomposites that are now available and we will outline the most significant in vitro studies of such nanocomposites on living cells. Some examples of their applications in biology and medicine will also be discussed. [J414]

"Resistance switching memory device with a nanoscale confined current path"

The impact of a nanoscale confined current path is demonstrated on a resistance switching memory device. The memory element consists of a Ti layer constricted by an insulating self-assembly nanogap oxide, in which a redox reaction is anticipated for the resistance change without an aid of a forming process. The device exhibits a resistance ratio greater than 100, a data retention longer than 3.7Ч106s, an endurance of more than 2000cycles, and a switching operation temperature up to 125°Cat an operation condition of ±2.5Vwith 50-100nsduration, evidencing an essential role of the nanostructure on the device performance. [J415]

"Ultraviolet-sensitive field-effect transistor utilized amorphous thin films of organic donor/acceptor dyad"

The authors report on highly responsive ultraviolet (UV)-sensitive field-effect transistor based on amorphous thin films of organic donor/acceptor dyad. An optimal responsivity of up to 6.5A/Wcan be obtained for UV light at 370nm. High ratios of photocurrent to dark current of up to 4.3Ч103can also be obtained. The underlying mechanism can be sufficiently explained by ultrafast photoinduced intramolecular charge transfer between the acceptor and the donor. This result offers a potential application of organic semiconductors as active materials for UV detectors. [J416]

"Fast switchable electrochromic properties of tungsten oxide nanowire bundles"

The authors prepared uniformly shaped WO2.72nanowire bundles using the solvothermal synthesis method. They investigated the potential of the WO2.72nanowire bundles to be used as a cathode electrode for electrochromic devices and the effect of the Li+insertion (or extraction) kinetics and diffusion of Li+. An electrode consisting of arrays of WO2.72nanowire bundles was formed and used in an experiment using the Langmuir-Blodgett technique. The one-dimensional nanostructure of WO2.72has a high Li-ion diffusion coefficient (5.2Ч10-11cm2/s)and low charge transfer resistance (28.6Omega), which result in its having a fast electrochromic response time (coloring time 3.5s, bleaching time 1.1s), and outstanding high coloration efficiency (55cm2/C). [J417]

"Crystallinity and surface effects on Young's modulus of CuO nanowires"

The authors investigate the crystallinity and surface effects on Young's modulus of cupric oxide (CuO) nanowires by performing three-point bend test using atomic force microscopy. Young's modulus of the nanowires obtained ranges from 70to300GPaand is dependent on two factors. Firstly, it depends on whether the nanowire is mono- or polycrystalline, as indicated by the absence or presence of an amorphous surface layer. Second, the modulus increases with decreasing diameter for both types of nanowires. Combined with transmission electron microscopy and computational simulation studies, the nanostructure-mechanical property relationship of CuO nanowires is elucidated. [J418]

"Coercivity and nanostructure in magnetic spinel Mg (Mn ,Fe)2 O 4"

When Fe ions in the ferrimagnetic cubic MgFe2O4are replaced by Jahn-Teller (JT)-active Mn ions, the structure evolves with two-step processes. For example, the quenched cubic MgMn1.5Fe0.5O4becomes tetragonal and JT distorted with slow cooling. However, with further slow cooling, the clustering tendency of JT-distorted Mn ions induces the formation of a checkerboard nano-self-assembly consisting of Mn-rich (tetragonal, paramagnetic) and -poor (cubic, ferrimagnetic) rods. This morphological evolution accompanies a drastic modification of ferrimagnetic properties, e.g., the magnetic coercivity changes by 25. The nanocheckerboard assembly with ferrimagnetic nanorods with large shape anisotropy can be a platform for ultra high-density memory devices. [J419]

"Effect of substrate misorientation on the In As /In Al As /In P nanostructure morphology and lateral composition modulation in the InAlAs matrix"

The authors report the self-organized growth of InAs/InAlAsquantum wires on nominal (001) InP substrate and (001) InP substrates misoriented by 2°, 4°, and 8° towards both [-110]and [110]. The influence of substrate misorientation on the structural and optical properties of these InAs/InAlAsquantum wires is studied by transmission electron microscopy and photoluminescence measurements. Compared with that grown on nominal (001) InP substrate, the density of InAs/InAlAsquantum wires grown on misoriented InP(001) substrates is enhanced. A strong lateral composition modulation effect take place in the InAlAs buffer layers grown on misoriented InP substrates with large off-cut angles (4° and 8°), which induces a nucleation template for the first-period InAs quantum wires and greatly improve the size distribution of InAs quantum wires. InAs/InAlAsquantum wires grown on InP (001) substrate 8° off cut towards [-110]show the best size homogeneity and photoluminescence intensity. [J420]

"Preparation and thermoelectric transport properties of high-performance p -type Bi 2 Te 3 with layered nanostructure"

High performance Bi2Te3bulk materials with layered nanostructure have been prepared by combining melt spinning technique with spark plasma sintering, and their thermoelectric transport properties are investigated. The electrical conductivity increases greatly and the lattice thermal conductivity decreases significantly with the

increase of the roller's linear speed. These lead to a great improvement in the thermoelectric figure of merit (ZT). The maximum ZTvalue of 1.35 is obtained at 300Kfor the sample which is prepared by melt spinning with roller linear speed of 40m/s. Compared with the zone melting sample, it increases by 73% at the same temperature. [J421]

"Precise replication of antireflective nanostructures from biotemplates"

The authors report herein a new type of nanonipple structures on the cicada's eye and the direct structural replication of the complex micro- and nanostructures for potential functional emulation. A two-step direct molding process is developed to replicate these natural micro- and nanostructures using epoxy resin with high fidelity, which demonstrates a general way of fabricating functional nanostructures by direct replication of natural biotemplates via a suitable physicochemical process. Measurements of spectral reflectance showed that this kind of replicated nanostructure has remarkable antireflective property, suggestive of its potential applications to optical devices. [J422]

"Self-assembled periodic nanoporous network in multifunctional Zr O 2 -Ce O 2 -(La 0.8 Sr 0.2)Mn O 3 composites"

This letter reports the structural characteristics of the self-assembled surface nanostructure in the 0.75wt%(Zr0.88Ce0.12)O2-0.25wt%(La0.8Sr0.2)MnO3ceramics. The surface consists of periodic porous network with islandlike structures occurring at the triple boundary junctions. The pores were found to have the diameter in the range of 150-200nmwith the thickness of the porous surface layer of the order of 100nm. The pore distribution was quasiperiodic with the spacing in the range of 50-150nm. The formation of the nanoporous network is correlated to the structural transformation occurring in ZrO2system. [J423]

"Anisotropic electric conduction derived from self-organized nanogroove array on Li-doped NiO epitaxial film"

The self-assembly formation of straight and periodic nanogroove arrays was carried out on the surface of Li-doped NiO thin films by use of atomic steps on the substrate. The nanostructure was formed by annealing Li-doped NiO (111) epitaxial thin film prepared on an atomically stepped alpha -Al2O3(0001) substrate via pulsed laser deposition at room temperature. V-shaped nanogrooves, with a depth of 20nmand an open-end width of 50nm, were observed over the entire substrate and characterized by cross-sectional transmission-electron microscopy. The separation of the aligned nanogrooves was from 80to100nm, comparable to the size of the atomic steps on the substrate. Anisotropic electric conduction was definitely attained for the Li-doped NiO thin film with the nanogroove array. A resistance ratio up to about 100 was obtained for both directions parallel and perpendicular to the nanogrooves. The resultant anisotropy was considered to be mainly caused by anisotropic grain growth due to self-organized reconstruction of the NiO film during annealing. [J424]

"Fabrication and characterization of Ni /P (VDF -TrFE) nanoscaled coaxial cables"

The authors have prepared poly(vinylidenefluoride-trifluoroethylene) Ni/P(VDF-TrFE)nanoscaled coaxial cables with Ni nanowires as the cores and P(VDF-TrFE) nanotubes as the shells by a two-step process. Scanning electron microscope and x-ray diffraction measurements revealed the microstructure and crystallinity of the nanocables. Electrical measurements indicated that the nanocables possessed a large specific capacitance (10.84pC/mm2)and ferroelectric remnant polarization (10mu C/cm2)due to the composite structure. The distribution of electrical field in the nanostructure was also analyzed. [J425]

"Light enhancement by the formation of an Al oxide honeycomb nanostructure on the n -GaN surface of thin-GaN light-emitting diodes"

By using a micron polystyrene ball array as a template, an Al oxide honeycomb structure was produced on the n-GaN surface of a thin-GaN light-emitting diode (LED). The Al oxide honeycomb structure consists of the networking hexagonal Al oxide nanowall. With the Al oxide honeycomb nanostructure, the total lighting output of thin-GaN LED was enhanced by 35%. The authors believe that the networking nanowall of the Al oxide honeycomb structure acted as a waveguide to extract the light emitted to the outer medium effectively. [J426]

"Finite-Difference Time-Domain Study of Guided Modes in Nano-Plasmonic Waveguides"

A conformal dispersive finite-difference time-domain (FDTD) method is developed for the study of one-dimensional (1-D) plasmonic waveguides formed by an array of periodic infinite-long silver cylinders at optical frequencies. The curved surfaces of circular and elliptical inclusions are modelled in orthogonal FDTD grid using effective permittivities (EPs) and the material frequency dispersion is taken into account using an auxiliary

differential equation (ADE) method. The proposed FDTD method does not introduce numerical instability but it requires a fourth-order discretisation procedure. To the authors' knowledge, it is the first time that the modelling of curved structures using a conformal scheme is combined with the dispersive FDTD method. The dispersion diagrams obtained using EPs and staircase approximations are compared with those from the frequency domain embedding method. It is shown that the dispersion diagram can be modified by adding additional elements or changing geometry of inclusions. Numerical simulations of plasmonic waveguides formed by seven elements show that row(s) of silver nanoscale cylinders can guide the propagation of light due to the coupling of surface plasmons. [J427]

"Studies on electromagnetic interference shielding characteristics of metal nanoparticle- and carbon nanostructure-filled polymer composites in the Ku-band frequency"

The dispersion behaviour and electromagnetic interference (EMI) shielding properties were investigated for metal nanoparticle- and carbon nanostructure-filled polymer composites. It was observed that carbon nanostructure-polymer composites exhibited a much higher shielding performance than Ag nanoparticle-polymer composites at the same filler loading. The results also showed that Ag nanoparticle-polymer composites could exhibit an ideal shielding performance only with a very high Ag loading (> 30 wt%). The experimental data exhibited that the shielding effectiveness of the polymer composite containing 5 wt% carbon nanotubes could reach more than 20 dB in the measured frequency region, indicating such composites can be applied to the practical EMI shielding materials. In addition, some possible approaches to further improve the shielding performance of carbon nanotube-polymer composites were proposed and discussed. [J428]

"Characterization of pattern transfer in the fabrication of magnetic nanostructure arrays by block copolymer lithography"

The authors report the fabrication of large-area antidot arrays using cylinder-forming polystyrene-polyisoprene-polylactide triblock terpolymer templates. 30nmantidots were generated after removal of the minority polymer component by aqueous degradation, oxygen reactive ion etching, and subsequent Ar ion beam milling to transfer the pattern to an underlying Ni80Fe20film. Emphasis was placed on characterization of the pattern transfer, which was tracked using a combination of atomic force microscopy, magnetometry, and magnetotransport. It is demonstrated that variable temperature magnetometry and transport measurements are excellent probes of the progress of the ion milling into underlying magnetic layers. [J429]

"Nanoimprint mold fabrication and replication by room-temperature conformal chemical vapor deposition"

The authors present a technique for the replication of molds for nanoimprint lithography (NIL) without solvents or etching. A thin hard amorphous silicon film is deposited onto imprinted or self-assembled polymer nanostructures by room-temperature conformal plasma-enhanced chemical vapor deposition. After attachment to another substrate and separation from the polymer original, the thin hard film forms a NIL mold that is the inverse of the polymer original. Using this technology, the authors demonstrate the replication of a 200nmpitch grating mold and sub-50-nmfeatures over wafer-scale areas without introducing additional line edge roughness associated with conventional replication methods. [J430]

"Effect of arsenic species on the formation of (Ga)InAs nanostructures after partial capping and regrowth"

Surface morphologies of self-assembled (Ga)InAs nanostructures grown by partial-capping-and-regrowth technique using gas-source molecular beam epitaxy (GSMBE) and solid-source molecular beam epitaxy (SSMBE) are compared. With SSMBE under an As4ambient, as-grown quantum dots (QDs) change to a camel-like nanostructure after being partially overgrown with GaAs. When additional InAs is deposited, quantum-dot molecules are created. In comparison, with GSMBE under As2overpressure, as-grown QDs are transformed into quantum rings after partial capping with GaAs and then, after regrowth, become double QDs. At higher regrowth temperature, QD rings are formed. [J431]

"Nanostructure transition: From solid solution Ti(N,C) to nanocomposite nc -Ti (N ,C)/a-(C ,C N x)"

A nanostructure transition from solid solution (SS) Ti(N,C) to two-phase nanocrystalline (nc)-Ti(N,C)/amorphous (a)-(C,CNx)thin films was investigated using a combination of high-resolution transmission electron microscopy, x-ray diffraction, and x-ray photoelectron spectroscopy. The finding of the authors is that such a nanostructure transition was strongly controlled by the relative atomic ratio x[x≡(C+N)/Ti]. The results indicated that SS Ti(N,C) and uncompleted and completed segregated two-phase nanocomposite nc-Ti(N,C)/a-(C,CNx)were successively

formed at x≤1.0, 1.0 x 1.2, and x≥1.2, respectively. Increase of the xvalues not only decreased the grain size and promoted the formation of more [200]-oriented nanocrystallites but also produced more disorders and defects in thin films. A maximum hardness was achieved for a SS Ti(N,C) structure at x=1.0. The corresponding nanostructure transition mechanism is also discussed. [J432]

"Raman scattering by thin film nanomosaic rutile Ti O 2"

Thin TiO2films with rutile short-range atomic order grown at room temperature have a nanostructure of rectangular domains based on a faulted rutile structure. Raman scattering by nanomosaic rutile in single layer TiO2and TiO2-Al2O3nanolaminate films is reported here. In all architectures, the Egphonon mode frequency is similar to bulk but the A1gmode frequency is significantly blueshifted. These results are different from published Raman scattering spectra of other nanocrystalline rutile TiO2. A model for nanomosaic rutile is presented in which TiO6octahedra in the faulted regions are severely distorted with a lengthened equatorial Ti-O bond and a shortened apical Ti-O bond. The observed A1gmode blueshift is a consequence of the shortened apical bond. [J433]

"Enhanced photoluminescence of Zn O /Er 2 O 3 core-shell structure nanorods synthesized by pulsed laser deposition"

A narrow size distribution of ZnO nanorod array has been synthesized on silicon substrate by pulsed laser deposition (PLD) in argon ambient. ZnO/Er2O3core-shell nanostructures were then formed through PLD of a thin Er2O3layer onto the fabricated ZnO nanorod surface. Transmission electron microscopy analysis shows that both the ZnO core and Er2O3shell are polycrystalline. Photoluminescence measurement was carried out to characterize the optical properties of the core-shell nanostructures. The band diagram of the core-shell structure shows that a type-II nanostructure may have formed, which explains the ultraviolet emission enhancement of the core-shell structure over pure ZnO nanorods. [J434]

"Observation of oxide precipitates in InN nanostructures"

We observed the formation of oxide precipitates (bcc-In2O3)in InN nanostructures formed during metal-organic chemical vapor deposition (MOCVD) and/or subsequent postgrowth procedures in H2ambient. It was found that InN is extremely unstable in H2ambient and the activation energy of N2desorption of InN is measured to be 0.28eV, which is one order of magnitude smaller than that of reported value of InN in vacuum. Instability of InN nanostructures under H2ambient together with residual oxidant in the reactor facilitates the formation of indium oxide precipitates in the nanostructure matrix during MOCVD or the oxidation of residual indium at the surface, resulting in indium oxide dots. [J435]

"Temperature-dependent interfacial chemical bonding states and band alignment of Hf O x N y /Si O 2 /Si gate stacks"

Temperature-dependent interfacial chemical bonding states and band alignment of HfOxNy/SiO2/Sigate stacks have been investigated by X-ray photoemission spectroscopy (XPS) and spectroscopic ellipsometry (SE). By means of the chemical shifts of Hf 4f, Si 2p, O 1s, and N 1score-level spectra, it has been found that the chemical stability of the HfOxNy/SiO2/Sistacks strongly depends on the annealing temperature. Analysis of temperature-dependent band alignment of HfOxNy/SiO2/Sistacks suggests that the valence band offset Delta Evincreases slowly from 1.82eVfor as-grown film to 2.55eVfor annealed film at 700°C; however, the values of conduction band offset Delta Econly demonstrates a slight change in the vicinity of 1.50eV. From the band offset viewpoint, HfOxNy/SiO2/Sigate stack could be a promising candidate for high-kgate dielectrics. [J436]

"Step formation, faceting, and bunching in atomically flat Sr Ti O 3 (110) surfaces"

We demonstrate that single-terminated atomically flat surfaces of polar SrTiO3(110) can be obtained by annealing in air at temperatures above 1000°C. We show that a morphological transition occurs from disordered step edges to faceted step edges in the range of 1000-1100°Cwith appropriate annealing conditions. The influence of miscut angles (polar and azimuthal) on the surface nanostructure, i.e., step bunching and faceting of step edges, is described. We show how the azimuthal angle has a critical role for the step-edge faceting and the step-bunching formation. [J437]

"Scanning x-ray microdiffraction of optically manipulated liposomes"

We show optical tweezers manipulation of individual micron-sized samples investigating at the same time their inner nanostructure by synchrotron diffraction experiments. The validity of this technique is demonstrated for clusters of multilamellar liposomes trapped in single and multiple positions in the optical path of a microfocused

x-ray beam and analyzed in a microscanning mode. The signal to background ratio of the first order peak shows that single liposome measurements are feasible. Multiple trapping by means of diffractive optical elements is demonstrated as an effective manipulation tool for future x-ray diffraction studies of the interaction between different sample entities. [J438]

"Ultrahigh photocurrent gain in m -axial GaN nanowires"

An ultrahigh photocurrent gain has been found in the ultraviolet-absorbed GaN nanowires with m-directional long axis grown by chemical vapor deposition. The quantitative results have shown the gain values at 5.0Ч104-1.9Ч105of the GaN nanowires with diameters from 40to135nmare near three orders of magnitude higher than the values of 5.2Ч101-1.6Ч102estimated from the thin film counterparts. The intensity-dependent gain study has shown that the gain value is very sensitive to the excitation intensity following an inverse power law and no gain saturation observed in this investigated intensity range from 0.75to250W/m2. This behavior has strongly suggested a surface-dominant rather than trap-dominant high gain mechanism in this one-dimensional nanostructure. The strong carrier localization effect induced by the surface electric field in the GaN nanowires is also discussed. [J439]

"Enhanced photoluminescence excitation in surface plasmon coupling with an In Ga N /Ga N quantum well"

The authors report the observation of the enhancement of photoluminescence excitation through the couplings of an InGaN/GaNquantum well (QW) with localized surface plasmons (LSPs) and surface plasmon polaritons (SPPs), which are generated on a Ag nanostructure deposited on the SiN-coated QW epitaxial sample. At the wavelengths corresponding to the LSP modes, the excitation light is first absorbed by the LSPs. The LSP energy is then transferred into the QW such that the effective QW absorption is enhanced. Meanwhile, the application of the LSP local field to the QW may increase its absorption coefficient. Then, the coupling of the relaxed carriers with the SPPs enhances light emission that becomes stronger as temperature increases because of the increased carrier momentum. [J440]

"X-ray photoelectron spectroscopy study of Zr O 2 /Ti O 2 /Si stack"

A ZrO2/TiO2/Sigate stack has been prepared by using solid phase reaction between sputtered ZrO2/Tistack and underlying SiO2/Sisubstrate through in situ vacuum annealing. X-ray photoelectron spectroscopy was used to analyze interfacial properties of the ZrO2/TiO2/Sistack after annealing at high temperatures. The interfacial silicate is composed of Ti silicate and ZrO2layer does not take part in the interfacial reaction to form Zr silicate. Such a stack has the advantage of combining high dielectric constant of ZrO2and excellent interfacial property of Ti silicate/Si interface, and will have potential applications in the advanced metal-oxide-semiconductor devices. [J441]

"Giant thermoelectric effect in graphene"

The paper predicts a giant thermoelectric coefficient in a nanostructure consisting of metallic electrodes periodically patterned over graphene, which is deposited on a silicon dioxide substrate. The Seebeck coefficient in this device attains 30mV/K, this value being among the largest reported ever. The calculations are based on a transfer matrix approach that takes a particular form for graphene-based devices. The results are important for future nanogenerators with applications in the area of sensors, energy harvesting, and scavenging. [J442]

"Reactive nanojets: Nanostructure-enhanced chemical reactions in a defected energetic crystal"

Nanofluidics of chemically reactive species has enormous technological potential and computational challenge arising from coupling quantum-mechanical accuracy with largescale fluid phenomena. Here, we report a million-atom reactive force field molecular dynamics simulation of shock initiation of an energetic crystal with a nanometer-scale void. The simulation reveals the formation of a nanojet which focuses into a narrow beam at the void. This, combined with the excitation of vibrational modes through enhanced intermolecular collisions by the free volume of the void, catalyzes chemical reactions that do not occur otherwise. We also observe a pinning-depinning transition of the shock wave front at the void at increased particle velocity and the resulting localization-delocalization transition of the vibrational energy. [J443]

"Exchange bias in self-organized Nd 0.5 Sr 0.5 Mn O 3 bilayer film"

The self-organized Nd0.5Sr0.5MnO3bilayer film with a homogeneous chemical composition and different microstructures has been prepared by rf-magnetron sputtering. The top layer of the film has a columnlike nanostructure while the bottom one forms an epitaxial crystal structure. The magnetic properties of the film mimic

the behavior of superparamagnetic particles grown onto the ferromagnetic layer. An exchange-bias effect was observed at a temperature below the blocking one, even in the present ferromagnetic hybrid system. [J444]

"Enhanced luminescence of organic/metal nanostructure for grating coupler active long-range surface plasmonic device"

This letter is intended to demonstrate the effect of coupled active long-range surface plasmon polaritons (SPPs) on the plasmonics response of a lamellar grating nanostructure with organic material on the surface. The phenomenon of nano-optics gives rise to a selective spectral response and a local field enhancement. The authors' fabricated device consists of coupled organic/metal nanostructure with specific width and symmetric dielectric structure. The interaction between organic/metal interface SPPs can allow specific directional emission rather than isotropic emission. The authors present recent experimental results and discuss potential applications of such an active plasmonic biosensor with enhanced resonance energy emission due to interactions on the organic/metal nanograting. [J445]

"Broadband all-optical ultrasound transducers"

A broadband all-optical ultrasound transducer has been designed, fabricated, and tested for high-resolution ultrasound imaging. It consists of a two-dimensional gold nanostructure on a glass substrate, followed by a 3mcmpolydimethylsiloxane layer and a 30nmgold layer. The signal to noise ratio of a pulse-echo signal is over 10dBin the far field of the transducer, where the center frequency is 40MHzwith -6dBbandwidth of 57MHz. The potential for high-frequency ultrasound arrays using this technology is demonstrated using multiple measurements from the transducer to image a 25mcmdiameter wire. [J446]

"Achieving ambipolar vertical organic transistors via nanoscale interface modification"

Organic field-effect transistors have been the subject of much recent inquiry due to their unique properties. Here, the authors report an ambipolar vertical organic field-effect transistor, which consists of a capacitor cell vertically stacked with an organic active cell, separated by a thin source electrode. By inserting a nanoscale transition-metal-oxide layer at the source/organic interface, the authors fabricated the organic ambipolar transistors with low working voltage and high current output. The thin transition-metal oxide and partial oxidization metal grains form a unique nanostructure that balances the injection barrier height of two types of carriers at the source/organic contact. [J447]

"Spinodally synthesized magnetoelectric"

Lead zirconium titanate/nickel ferrite (PZT/NFO) composites have been produced by crystallizing and spinodally decomposing a gel in a magnetic field below the Curie temperature of NFO. The gel had been formed by spinning a sol onto a silicon substrate. The ensuing microstructure, characterized by atomic force microscopy, magnetic force microscopy, (Lorentz) transmission electron microscopy, and scanning electron microscopy, is nanoscopically periodic and, determined by the direction of magnetic annealing field, anisotropic. The wavelength of the PZT/NFO alternation, 25nm, agrees within a factor of 2 with the theoretically estimated value. The macroscopic ferromagnetic and magnetoelectric responses correspond qualitatively and semiquantitatively to the features of the nanostructure. The maximum of the field dependent magnetoelectric susceptibility equals 1.8V/cmOe. [J448]

"Quenching of surface-exciton emission from ZnO nanocombs by plasma immersion ion implantation"

Surface modification of ZnO nanocombs was performed through a Ti plasma immersion ion implantation (PIII) with low bias voltages ranging from 0to5kVto quench surface-originated exciton emission. The ion energy dependent surface modification on ZnO was investigated using transmission electron microscopy and temperature-dependent photoluminescence (PL). The surface exciton (SX) was clearly identified for the as-grown sample at 4.5K, and complete quenching was observed for sample treated with 5kVPIII due to surface state passivation. The SX related surface states were located within 5nmin depth from the surface corresponding to the implantation depth of 5kVPIII. Room-temperature PL enhancement of these surface-modified ZnO nanocombs was observed and discussed. The results show that PIII can become a viable technique for nanostructure surface passivation. [J449]

"High strength ultrafine/nanostructured aluminum produced by back pressure equal channel angular processing"

High strength ultrafine/nanograined aluminum materials with ultimate strength up to 740MPaand Vickers

microhardness up to 2285MPawere produced using back pressure equal channel angular processing of ultrafine-sized aluminum powder at 400°C. Microstructure analyses revealed that the attained high strength and microhardness were derived from the presence of nanosized aluminum and gamma -alumina grains (5-10nm)as well as residual amorphous alumina. The interaction between the severe shear deformation and the preexisting amorphous alumina, concurrent oxidation, and amorphous to gamma -alumina transition was considered to be responsible for the formation of such a refined and complex nanostructure. [J450]

"Confocal microscope photoluminescence and electrical characteristics of single poly(3-hexylthiophene) nanowire strand"

The photoluminescence (PL) spectra and images of a single strand of poly(3-hexylthiophene) (P3HT) nanowires with different doping states were compared by means of a laser confocal microscope with a high spatial resolution. The P3HT nanowires were electrochemically synthesized by using an ionic liquid as a dopant. From the ultraviolet and visible absorption spectra, the doping and dedoping effects of the P3HT nanowires through the treatment of organic solvent were investigated. The electrical conductivity of the single strand of the lightly doped P3HT nanowires was estimated to be 3.5Ч10-3S/cm, which was higher than that (5.4Ч10-5S/cm)of the dedoped one. From the laser confocal microscope PL experiments, we quantitatively observed more homogeneous and three to eight times brighter light emission from the single strand of the dedoped P3HT nanowires. [J451]

"Strain on wrinkled bilayer thin film"

The authors report strain measurement on bilayer wrinkling silicon-germanium (SiGe) thin film. In combination of atomic force microscopy and ultraviolet micro-Raman measurement, the relationship between the spatial profile and strain distribution is established. Theoretical analysis on the mechanism of strain relaxation shows that, in contrast to self-rolling nanotube, both bending and shearing force play an important role in determining the morphology. The behavior demonstrated in the SiGe system should also exist in a wide range of material systems under various strain situations. This study advances the understanding of nanostructure engineered by strain and has significant implications on the performance of nanodevices. [J452]

"Nanostructural origin of the ac conductance in dielectric granular metals: The case study of Co 20 (Zr O 2)80"

The authors show which is the nanostructure required in granular Co20(ZrO2)80thin films to produce an ac response such as the one that is universally observed in a very wide variety of dielectric materials. A bimodal size distribution of Co particles yields randomly competing conductance channels which allow both the thermally assisted tunneling through small particles and capacitive conductance among larger particles that are further apart. A model consisting on a simple cubic random resistance-capacitor network describes quantitatively the experimental results as functions of temperature and frequency, and enables the determination of the microscopic parameters controlling the ac response of the samples. [J453]

"Arrays of magnetic nanoindentations with perpendicular anisotropy"

The authors report an approach to the fabrication of periodic magnetic patterns using spherical indentations. These troughs are shaped by an imprint technique, employing a self-assembled monolayer of particles. Well-defined structures with perpendicular magnetic anisotropy are obtained by deposition of Co/Pdmultilayer films onto the topographic array. The structures formed in the indentations can be magnetically exchange decoupled from their neighbors depending critically on their specific shape. The presented concept leads to a realization of a magnetic nanostructure medium, which offers advances in achieving high pattern densities combining a low cost nanoimprint approach with material functionalization. [J454]

"Growth competition during glancing angle deposition of nanorod honeycomb arrays"

Arrays of Ta nanorods were grown by glancing angle deposition (GLAD) onto honeycomb Cr nanodot patterns that were evaporated onto Si substrates through a self-assembled monolayer of SiO2nanospheres. Statistical size analyses from arrays of rods with variable average length land width w, with 210nm≤l≤650nmand 109nm≤w≤304nm, show that the distribution in wbroadens with increasing land decreasing w, but remains approximately constant with a fixed l/wratio. This is attributed to an intercolumnar growth competition that exacerbates nanorod size fluctuations but scales with rod size. These results suggest that the overall nanostructure shapes during low-temperature GLAD are independent of material-specific length scales and are, therefore, completely controlled by the geometric shadowing. [J455]

"Preparation and photoinduced wettability conversion of superhydrophobic beta -Ga 2 O 3 nanowire film"

High-yield uniform beta -Ga2O3nanowire films with mesh structure on GaP substrate have been synthesized via heat treating porous GaP preevaporated Au under low vacuum. The single-crystalline beta -Ga2O3nanowires have uniform diameters of about 100nmand a preferential [001] growth direction along the axis. The as-prepared beta -Ga2O3nanowire film reveals a superhydrophobic property. The remarkable photoinduced surface wettability conversion at beta -Ga2O3nanowire film was found, which can be explained by the cooperation of the surface photosensitivity and the special nanostructure. [J456]

"Suppression of electron-phonon scattering in double-quantum-dot based-quantum gates"

The authors propose a nanostructure design which can significantly suppress longitudinal-acoustic-phonon-lectron scattering in double-quantum-dot based quantum gates for quantum computing. The calculated relaxation rates versus voltage exhibit a double-peak feature with a minimum approaching 105s-1. In this matter, the energy conservation law prohibits scattering contributions from phonons with large momenta; furthermore, increasing the barrier height between the double quantum dots reduces coupling strength between the dots. Hence, the joint action of the energy conservation law and the decoupling greatly reduces the scattering rates. [J457]

"Remnant magnetoresistance in ferromagnetic (Ga,Mn)As nanostructures"

The authors show a magnetoresistive effect that appears in a lithographically shaped, three-arm nanostructure fabricated from ferromagnetic (Ga,Mn)As layers. The effect, related to a rearrangement of magnetic domain walls between different pairs of arms in the structure, is revealed as a dependence of zero-field resistance on the direction of the previously applied magnetic field. This effect could allow designing devices with unique switching and memory properties. [J458]

"Large area 50 nm period grating by multiple nanoimprint lithography and spatial frequency doubling"

The authors have developed an approach to fabricate large area 50nmperiod gratings (22nmlinewidth) with low cost. The method used a fabrication cycle twice, each combining nanoimprint lithography with a spatial frequency doubling based on electroless plating, lift-off, and reactive ion etching. Hence by frequency doubling twice, we started with a 200nmperiod grating mold and finished with a 50nmperiod grating with a uniform area of 3cm2-the largest achieved today. This method is scalable for the fabrication of even smaller period gratings over a large area, and is a viable low-cost technique for making nanoimprint lithography molds for high-throughput fabrication of 50nmperiod grating or grid devices. [J459]

"Nanostructure evolution in hydrogenated amorphous silicon during hydrogen effusion and crystallization"

The authors report a study by small-angle x-ray scattering (SAXS) and tilting SAXS of nanovoids in amorphous silicon films undergoing solid phase crystallization (SPC) by annealing. SPC causes nanovoids in hot-wire chemical vapor deposited (HWCVD) amorphous Si films to decrease in total void fraction but increase in individual void volume. During annealing, the voids also change shape from prolate spheroids to more spherical geometries. Preexisting, large H clusters in as-deposited HWCVD films may provide favorable sites for void expansion driven by H2pressure, while energy minimization and strain relaxation drive geometric changes. [J460]

"Micro-Raman spectroscopy of a single freestanding GaN nanorod grown by molecular beam epitaxy"

Micro-Raman spectra were measured on a single freestanding GaN nanorod, which was grown by molecular beam epitaxy. A sharp linewidth of E2(high)mode of 2.1cm-1measured in the x(y,y)xconfiguration indicates the high crystalline quality of the nanorod. The angle-dependent Raman spectroscopy shows that the integrated intensities of these first-order Raman modes follow the theoretical sinusoidal functions. The forbidden E1(LO)mode that appeared in the x(z,z)xscattering configurations is assigned to the quasi-LO phonon mode. Power-dependent Raman spectroscopy shows redshift with increasing laser power density due to sample heating which is confirmed by Stokes and anti-Stokes measurements. The broadband centered at 708.5cm-1is ascribed to the surface mode of the nanostructure. [J461]

"Ultrabroad stimulated emission from quantum-dash laser"

The authors demonstrate the generation of ultrabroadband stimulated emission in the quasi-zero-dimensional InAs/InAlGaAsquantum-dash laser grown on InP substrate. The laser exhibits lasing wavelength coverage of up to 76nmat 1.64mcmfrom simultaneous multiple confined states lasing at room temperature. Unlike the conventional interband diode laser, the rule changing broadband lasing signature is achieved from the quasicontinuous interband transition formed by the inhomogeneous quantum-dash nanostructure. [J462]

"Synthesis and superconducting properties of niobium nitride nanowires and nanoribbons"

Superconducting niobium nitride wires and ribbons with transverse dimensions down to tens of nanometers were synthesized by annealing NbSe3nanostructure precursors in flowing ammonia gas at temperatures up to 1000°C. Their critical temperatures increase with increasing annealing temperatures and reach 9-11.2Kwhen sintered at 950°Cor above. X-ray diffraction analyses identified Nb4N5and Nb5N6phases, dominating at annealing temperatures below and above 950°C, respectively. Transport measurements show magnetoresistance oscillations at temperatures near the superconducting transition due to vortex-row confinement effects and voltage jumps in current-voltage characteristics at low temperatures attributed to hot-spot behavior. [J463]

"Fullerene nanostructure-induced excellent mechanical properties in hydrogenated amorphous carbon"

Hydrogenated amorphous carbon films were deposited by dc-pulse plasma chemical vapor deposition. The structure of as-prepared films, characterized by transmission electron microscopy, Raman spectra, and x-ray photoelectron spectra, is considered as nanocomposite thin films with C60and fullerene crystalline nanoparticles embedded in amorphous sp2and sp3carbon matrices. The high hardness and high elastic recovery of as-prepared films are attributed to the unique structure that C60and fullerene nanocrystalline grains (soft) dispersed in amorphous carbon phase (hard) to form a network structure, which restrains the dislocation migration, assists the stress relaxation, and hence, enhances the mechanical properties of the films. [J464]

"Nanopillar ferromagnetic nanostructure as highly efficient spin injector into semiconductor"

We report the prediction of a high spin injection ratio gamma into a semiconductor (SC) contact, by using a ferromagnetic (FM), small-sized, and cylindrical nanopillar as the spin injector (SI). The increase in spin scattering within the FM nanopillar injects spin current into the SC, effectually mitigates the blockage of SI due to conductance mismatch. To minimize the spreading resistance (SR) which arises due to areal discontinuity at FM-SC interface, a thin low resistance metal is inserted at the interface such that SR is contained within it. With the insertion, we obtained gamma of as high as 40%, compared to just 3% without insertion, and an even lower value of 0.5% without the nanopillar patterning. [J465]

"Highly parallel mix-and-match fabrication of nanopillar arrays integrated in microfluidic channels for long DNA molecule separation"

We report on a mix-and-match method based on a combination of soft UV nanoimprint lithography, contact optical lithography, and reactive-ion-etch techniques, which is applicable for high throughput manufacturing of nanostructure integrated microfluidic devices. We demonstrate the integration of high density and high aspect ratio nanopillars into microfluidic channels as electrophoresis sieving matrices. As a result, lambda DNA and T4 DNA can be separated within a few minutes. By changing the pattern design, the device could be used for separation of other types of molecules. [J466]

"Crystalline structure's influence on the near-field optical properties of single plasmonic nanowires"

The finite difference time domain method is employed to study the crystalline structure's influence on the propagation of a local excitation along metallic nanowires of subwavelength cross section. The metallic nanowires are elongated cylinders deposited on a transparent substrate. A tightly focused gaussian beam illuminates one end of the nanowires. According to recent experimental studies, the authors show that the propagation length of the localized surface plasmon excitations depends on the crystalline structure of the nanowire. Thus, they are able to determine the effective permittivity of metals in such a nanostructure versus its crystalline properties. The authors also demonstrate that the field of optical information transport could greatly benefit from the care of the subwavelength optical waveguide's crystallinity. [J467]

"Cluster scale composition determination in a boron-rich compound"

Composition metrology is an important issue for compound nanostructure and devices. By imaging the internal structure of boron clusters in a boron-rich material using the high angle annular dark field technique in an aberration-corrected scanning transmission electron microscope, the authors have been able to determine

quantitatively the local composition to be B6O1-x(x=0.30±0.04)through a relative image contrast analysis with the aid of a dynamical electron scattering simulation. Fluctuation of the oxygen occupancy is spatially resolved. This high precision and efficient measurement allows the study of the nonstoichiometry effect on an atomic scale for boron-rich materials. [J468]

"Nanoscale ablation on patterned diamondlike carbon film with femtosecond laser pulses"

The authors have studied the origin of nanostructure formation on diamondlike carbon film in femtosecond laser ablation at low fluence. Using the thin film target patterned with submicrometer-size stripes, they have observed that the nanostructure starts to be formed on the crest of stripes along the direction perpendicular to the laser polarization. The experimental results have shown that nanoscale ablation for the nanostructuring would preferentially be initiated by the enhancement of localized electric field on the stripe surface with high curvature. [J469]

"Nanostructure of chemically phase separated La-Ce-Mn-O thin films"

The perovskite compound La0.67Ce0.33MnO3(LCeMO) is a candidate for electron doping rather than the hole doping common in manganites. However, it is not clear whether Ce, which has a smaller ionic radius than other dopants, can be incorporated into the crystal lattice. Thin LCeMO films were prepared by two different deposition techniques. In both cases, a chemical phase separation is observed, which in one case leads to a self-organized columnar nanostructure with no indication for n-type doping. In the other case, we find hole doping induced by La vacancies. [J470]

"Nanoscale carrier transport in Ti /Al /Ni /Au Ohmic contacts on AlGaN epilayers grown on Si(111)"

In this letter, a correlation between nanostructure and current flow in Ti/Al/Ni/AuOhmic contacts on AlGaN films grown on Si(111) is reported. A cross correlation between conductive-atomic force microscopy and structural analyses (x-ray diffraction, transmission electron microscopy) demonstrates that the structure and the electrical properties of the different phases formed inside the reacted layer upon annealing are crucial for the nanoscale current transport. The experimental measurement of the resistivity of the main phases formed upon annealing (AlNi, AlAu4, and Al2Au) indicated that the low resistivity Al2Auphase provides preferential conductive paths for the current flow through the contact. [J471]

"Ultrafast dynamics of periodic nanostructure formation on diamondlike carbon films irradiated with femtosecond laser pulses"

Using a pump-probe technique the authors have measured reflectivity of diamondlike carbon (DLC) film irradiated with femtosecond laser pulses to understand dynamic processes responsible for periodic nanostructure formation. The results have shown that characteristic reflectivity change observed as a function of superimposed laser shots is closely associated with the nanostructure formation and the bonding structure change to induce surface swelling, leading to a conclusion that the nanostructure formation on the DLC surface is certainly preceded by the bonding structure change. The nanoscale ablation to produce the nanostructure is discussed based on the local field generation on the surface. [J472]

"Compound nanostructures formed by metal nanoparticles dispersed on nanodendrites grown on insulator substrates"

A composite nanostructure consisting of Pt nanoparticle/W nanodendrite was fabricated on an insulator Al2O3substrate using an electron-beam-induced deposition process combined with an ion sputtering method. W nanodendrites with the tips of 3nmwere grown self-standing at the edge of the Al2O3substrate. The observed morphology is attributed to a growth mechanism involving an electrical charge-up on the substrate surface, movement of charges, and their accumulation on the convex surface of the substrate as well as at the tips of the deposits. Pt nanoparticles with an equilibrium face-centered-cubic structure were uniformly distributed on the W nanodendrites. These composite nanostructures have potential for application in the fields of catalysis and nanodevices. [J473]

"Anisotropic broadening of Cu nanorods during glancing angle deposition"

Regular arrays of freestanding Cu nanostructures were grown on patterned Si substrates using glancing angle deposition (GLAD) from two oppositely positioned sputtering sources. Continuous azimuthal substrate rotation during deposition leads to the formation of vertical 430-nm-wide rods, which broaden anisotropically during subsequent growth with a stationary substrate. Statistical analyses of plan-view micrographs combined with numerical simulations indicate a linear increase in the width aspect ratio with deposition time that is attributed to

a change in the growth front direction. This technique, termed simultaneous opposite GLAD, provides a unique approach for nanostructure shaping. [J474]

"III-VI compound semiconductor indium selenide (In 2 Se 3) nanowires: Synthesis and characterization"

The authors report the synthesis of one-dimensional indium selenide nanowire, a III-VI group compound semiconductor nanostructure with potential applications in data storage, solar cells, and optoelectronics. Nanoscale gold particles were used as catalysts and growth was also demonstrated using indium as self-catalyst. The growth mechanism is confirmed to be vapor-liquid-solid process by in situ heating experiments in which In and Se were found to diffuse back into the gold catalyst bead forming a Au-In-Se alloy that was molten at elevated temperatures. The morphology, composition, and crystal structure of the In2Se3nanowires (NWs) were analyzed by scanning electron microscopy, energy dispersive x-ray spectroscopy, and high-resolution transmission electron microscopy. [J475]

"Effect of layer stacking and p -type doping on the performance of In As /In P quantum-dash-in-a-well lasers emitting at 1.55 mcm"

The authors report the growth of 6-, 9-, and 12-layer InAs/InPquantum-dash-in-a-well (DWELL) laser structures using gas source molecular beam epitaxy. Broad area laser performance has been investigated as a function of number of layers. The highest modal gain at 48cm-1is achieved for an optimized nine-DWELL layer structure. The effect of layer stacking and p-type doping on the characteristic temperature is also reported. Nine-DWELL layer single mode ridge waveguide lasers showed high slope efficiency (0.2W/Aper facet) and output power (Pout=20mW), close to those of conventional quantum well devices. [J476]

"Catalyst-seeded synthesis and field emission properties of flowerlike Si-doped AlN nanoneedle array"

Flowerlike Si-doped AlN nanoneedle array is grown from cobalt particles seeded on Si substrate by evaporating AlCl4and SiCl4in NH3atmosphere. The nanoneedles are several microns in length, and their base and tip diameters are in the range of 50-150 and 5-30nm, respectively. Field emission (FE) measurements show that the Si-doped AlN nanoneedle array has a low turn-on field (1.8V/mcm)and a high field enhancement factor (3271), indicating that it is a promising candidate for FE applications. In addition, this catalyst-seeded and Si-doped method may facilitate the development of efficient AlN nanostructure FE devices. [J477]

"How surface-enhanced chemiluminescence depends on the distance from a corrugated metal film"

Peroxidase labeled streptavidin was immobilized onto the surface of bulk and clusterlike metal films at a distance controlled by a peptide chain with a length between 1.3 and 7.8nm. Luminol chemiluminescence which occurred at peroxidase vicinity depends on the metal nanostructure. When peroxidase is attached on a bulklike film, chemiluminescence increases monotonously with the distance because of a decrease of the light emission quenching by metal. When peroxidase is attached on a clusterlike film, chemiluminescence undergoes a complex variation with the metal/catalyst distance evidencing a competition between the already mentioned quenching process and a nanostructure-induced catalysis enhancement. [J478]

"Preparation, microstructure, and magnetic properties of bulk nanocrystalline Gd metal"

Bulk nanocrystalline gadolinium metal was prepared using spark plasma sintering (SPS) and subsequent annealing process. The SPS Gd metal had a single phase with a mean grain size of about 10nm. A pressure-induced C-axis crystal texture was found in the SPS Gd sample. With the decrease of Gd grains from micrometer to nanometer range, the Curie temperature TCdecreased by 10.7Kand the magnetic moment per Gd atom at 5Kdropped noticeably from 7.81mu Bto 6.31mu B. These results indicate the remarkable influence of the nanostructure on the magnetism of Gd due to the finite size effect. [J479]

"Solid state self-assembly of nanocheckerboards"

The authors introduce an emergent method to fabricate a few-nanometer-size columnar superlattice with a checkerboard pattern in inorganic spinels by harnessing the Jahn-Teller structural distortion. Transmission electron microscope images reveal that the fundamental building blocks are two types of long nanorods with the 4Ч4Ч70nm3size, which are alternatively stacked in a way that the cross sectional and side views show checkerboard and herringbone patterns, respectively. The authors discuss that the strain induced by the Jahn-Teller distortion causes this peculiar self-assembled nanostructure in the coherent mixture of two spinel phases. This pure solid state self-assembly can be implemented to fabricate heterogeneous nanostructures with practical

functionalities. [J480]

"Simultaneous formation of surface ripples and metallic nanodots induced by phase decomposition and focused ion beam patterning"

We report the simultaneous formation of self-assembled surface ripples in Cd2Nb2O7pyrochlore caused by focused ion beam (FIB) patterning and uniformly distributed metallic nanodots induced by phase decomposition under ion bombardment. The characteristic wavelength of the surface ripples is controllable from the nm to the sub-mcmscale. High-density Cd metallic nanoparticles, 5nm, formed and the distribution of nanoparticles is consistent with the morphological characteristics of the ripple pattern. This approach provides a means of fabricating surface nanostructure with various patterns and a controllable particle size and distribution by combining ion beam-induced phase decomposition with high-precision FIB patterning. [J481]

"Angular distribution control of extreme ultraviolet radiation from laser-produced plasma by manipulating the nanostructure of low-density Sn O 2 targets"

We have found that the divergence of a relatively monochromatic extreme ultraviolet (EUV) emission from a laser-produced plasma can be manipulated by changing the target morphology which is a porous low-density tin oxide (SnO2)structure. The fundamental light of a Nd-YAG laser was irradiated on the target with laser intensity of 1011W/cm2and pulse duration of 10ns. The nanostructure and density of the targets were tuned by a combination of colloidal polymer template and sol-gel processes [Gu, Nagai, Norimatsu, Fujioka, Nishimura, Nishihara, Miyanaga, and Izawa, Chem. Mater. 17, 1115 (2005)], which has a merit in large-scale preparation. When the target has an open cell nanostructure, the EUV emission directed predominantly along target normal, while a closed cell target exhibited divergent emission. The angular distribution may be affected by the orientation of the microstructured initial target, and this phenomenon can be applied to wavefront control of EUV emission. [J482]

"Hollow cadmium selenide semiconductor tetrapods"

Hollow cadmium selenide (CdSe) tetrapods were synthesized on a large scale. The directional growth of twins led the tetrapod nanostructure to be formed. The silicon powder was responsible for the growth of the hollow tetrapods. The UV-visible absorption spectra of the hollow CdSe tetrapods display an absorption edge at about 765nm. There is a redshift of 53nmof the absorption edge, in comparison with that of bulk CdSe at 712nm. In the Raman spectra, two new anomalous modes at 250.91 and 493.42cm-1are observed. This might originate from the enhanced internal stress of hollow structures. [J483]

"Carrier-to-noise ratio enhancement of super-resolution near-field structure disks by Ag nanostructure"

The recording and retrieval characteristics of super-resolution near-field structure disks have been evaluated before and after the fabrication of a Ag-nanostructured film on the top dielectric layer, using a 405nmwavelength laser and a 0.65 numerical aperture lens system. The carrier-to-noise ratio for 100nmmark signals is significantly improved by applying the Ag-nanostructured film. The underlying mechanism for the enhancement depends on the top dielectric layer thickness. A simulation based on Mie theory shows good agreement with the measured reflectance spectrum for the Ag-nanostructured film. [J484]

"Shape and spatial correlation control of InAs-InAlAs-InP (001) nanostructure superlattices"

The control of shape and spatial correlation of InAs-InAlAs-InP(001) nanostructure superlattices has been realized by changing the As overpressure during the molecular-beam epitaxy (MBE) growth of InAs layers. InAs quantum wires (QWRs) are obtained under higher As overpressure (1Ч10-5Torr), while elongated InAs quantum dots (QDs) are formed under lower As overpressure (5Ч10-6or 2.5Ч10-6Torr). Correspondingly, spatial correlation changes from vertical anti-correlation in QWR superlattices to vertical correlation in QD superlattices, which is well explained by the different alloy phase separation in InAlAs spacer layers triggered by the InAs nanostrcutures. It was observed that the alloy phase separation in QD superlattices could extend a long distance along the growth direction, indicating the vertical correlation of QD superlattices can be kept in a wide range of spacer layer thickness. [J485]

"Expanded conformation of macromolecular chain in polyaniline with one-dimensional nanostructure prepared by interfacial polymerization"

In this letter, the authors report the formation mechanism of one-dimensional nanostructural polyaniline prepared

by an interfacial polymerization. The transmission electron microscopy image of the conducting polymer exhibits a diameter of 80nmand a length of 1mcm. The resistivity of the polymer at room temperature is 3.03±0.05Omega cm. The measurement of in situ UV-visible spectra showed an "expanded and partly doped" stage in the interfacial polymerization. It is hypothesized that the expanded molecular conformation performs a molecular template function on the formation of one-dimensional structure in the synthesis process. [J486]

"Emerging nanoscale silicon devices taking advantage of nanostructure physics"

This paper describes the present status of research on emerging nanoscale silicon devices that take full advantage of new physical phenomena which appear in silicon nanostructures. This new physics includes quantum effects that enhance the performance of MOS transistors and single-electron charging effects that add new function to conventional CMOS circuits. These physical phenomena may be used to extend the scaling and performance limits of conventional CMOS. [J487]

"Optical and magnetic properties of Ni nanoparticles in rutile formed by Ni ion implantation"

Crystalline Ni nanoparticles in the near surface of TiO2(rutile) have been synthesized by Ni ion beam implantation at room temperature to a fluence of 1Ч1017/cm2. Transmission electron microscopy, optical absorption spectroscopy, and a superconducting quantum interference device magnetometer have been utilized to characterize the nanostructure, optical and magnetic properties of Ni particles in TiO2. Crystalline Ni nanoparticles with dimensions ranging 3-20 nm formed in the near surface of rutile, which caused a broad absorption band from 700 nm in the optical absorption spectrum. Magnetic measurement indicated that the coercive force of Ni nanoparticles was about 210 Oe at 10 K. The superparamagnetism of the nanoparticles was observed above blocking temperature T=85K. [J488]

"Periodic chains of gold nanoparticles and the role of oxygen during the growth of silicon nanowires"

The introduction of oxygen during silicon monoxide-vapor liquid solid growth of silicon nanowires causes a shift in silicon suboxide stoichiometry resulting in an increased formation of silicon dioxide at the nanowire surface. This leads to instabilities of the usual cylindrical nanowire core-shell structure, where the liquid gold/silicon alloy droplet at the nanowire tip is incorporated inside a silicon dioxide nanowire to form a periodic array of nanoparticles. The structure and the composition of the resulting nanostructure are investigated using transmission electron microscopy. The influence of the oxygen is investigated experimentally and supports the authors' model of the formation mechanism. [J489]

"Fast three-dimensional nanostructure fabrication by laser-assisted nanotransfer printing"

The authors present a laser-assisted nanotransfer printing technique for transferring metal nanopatterns onto prepatterned substrates. A fused quartz mold covered with an array of chromium nanodots is pressed against the surface of a photolithographically patterned substrate, while a single laser pulse from a quadrupled-frequency solid state Nd:YAG laser is used to melt the thin metal structures. By controlling the laser fluence, selective metal pattern transfer can be realized only on the protruded area of the substrate upon separation of the quartz support. The transferred chromium nanodots are then used as an etch mask to pattern three-dimensional structures. [J490]

"Common features of nanostructure formation induced by the surface undulation on the Stranski-Krastanow systems"

The nanostructure formation effected by the surface undulation on the Stranski-Krastanow (SK) systems during the annealing process is investigated by simulating the morphological evolution of the systems driven by surface diffusion. The results reveal three common features in the formation process. First, the essence of the nanostructure formation is the transformation of the film material above the wetting layer into faceted islands. Second, the wetting layer thickness is given by the first critical thickness for the SK transition. Third, the width of the nanostructures measured at the average film height is close to a constant during the formation process. [J491]

"Organic heterostructure field-effect transistors using C 60 and amorphous spirolinked compound"

The authors fabricated organic heterostructure field-effect transistors using C60and amorphous compound 2,2',7,7'-tetra-(m-tolyl-phenylamino)-9,9'-spirobifluorene. The corresponding transistor characteristics show ambipolar charge transport behaviors. The measured hole and electron mobilities of 5.53Ч10-4and 2.23Ч10-3cm2/Vswere obtained. Large hysteresis in the transfer curve was observed after the transfer characteristics

were measured from the on state to the off-off state and vice versa. In this case, the switch-on voltage shifted by 40V. [J492]

"Nanochemistry, nanostructure, and electrical properties of Ta 2 O 5 film deposited by atomic layer deposition and plasma-enhanced atomic layer deposition"

Ta2O5films were deposited by plasma-enhanced atomic layer deposition (PEALD) and thermal ALD on native oxide surface (SiOx/Si). The properties of as-deposited and forming gas annealed films were examined and qualitatively compared with respect to nanostructural, nanochemical, capacitance-voltage and leakage-current-voltage (JL-V), and oxide breakdown characteristics. Although high-resolution transmission electron microscopy showed structurally sharp Ta2O5/SiOxinterfaces in forming gas annealed PEALD Ta2O5/SiOx/Sistacks, electron energy loss spectroscopy revealed interdiffusion of Ta and Si across this interface, the indiffusion length of Ta being higher than the outdiffusion length of Si. The consequent formation and enhancement of Ta-O-Si bond linkages in thicker Ta2O5films were clearly reflected in the JL-Vdata. Moreover, the fixed charge density (Qf=5Ч1011qC/cm-2)was thickness invariant in PEALD Ta2O5. For similar PEALD and ALD Ta2O5thickness in Ta2O5/SiOx/Sistacks, the latter showed a lower Ditand higher defect density,-- results attributed to protons and hydroxyl groups, respectively, which stem from water used as an oxidant for the thermal ALD process. [J493]

"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. [J494]

"Nanostructure evolution of Y Ba 2 Cu 3 O x thin films grown by pulsed-laser glancing-angle deposition"

Nanostructured thin films of amorphous YBa2Cu3Oxwere prepared using pulsed-laser glancing-angle deposition. Ambient oxygen pressure and laser fluence have a strong effect on the microstructure of the films. The films exhibit a structural evolution from isolated directional nanorods, through a network of vertical nanocolumns, to nanoparticles fractal with increasing ambient oxygen pressures from below 1 to above 180mtorr. The shadowing effect, surface diffusion, and flux scattering by ambient gas play main roles in determining the structural evolution. [J495]

"Simulation study of junction effect on field emission from one-dimensional nanostructure grown on silicon substrate"

In this article, the field-emission properties of the one-dimensional nanostructure grown on doped silicon substrate have been studied via computer simulation. The classical transport equation is used to describe the carrier transport in the material and solved together with Poisson's equation. The field emission at the emitter-vacuum interface is modeled by the Fowler-Nordheim equation. Our simulation results agree with the experimental results qualitatively. For narrow-band-gap material, the p-type Si substrate will limit the field-emission current in the high applied voltage region. This result can be ascribed to the formation of reverse-biased p-njunction. For wide-band-gap material, however, the p-type Si substrate will enhance the field-emission current, which is attributable to the lower carrier injection barrier height and the stronger driving force offered by the p-type substrate. [J496]

"Carbon nanostructure field emission devices"

The microwave plasma chemical vapor deposition (MPCVD) method is capable of synthesizing various forms of carbon allotropes such as diamond, carbon nanotubes (CNTs), and diamondlike carbon (DLC) while varying the growth parameters or utilizing substrate coated with catalytic thin film. In this article, needlelike carbon nanostructures (CNs) were synthesized utilizing high power (5kW)and high working pressure (120Torr)MPCVD on a thin catalytic film of nickel with a diffusion barrier layer of titanium on a micropatterned silicon substrate. The effects of in situ doping by trimethylboron (TMB) on the morphologies and field emission properties of the CNs were also investigated. Straight, needlelike CNs with random orientation were obtained for 15mingrowth time with or without TMB doping. However, the CNs appear to transform into diamondlike nanocrystals after prolonged growth of 30minwith TMB doping. Unlike MPCVD grown CNTs, it was found that the CNs have strong

adhesion to the substrate and could withstand postgrowth processing such as ultrasonic agitation cleaning in solvents. Field emission tests performed show that in situ TMB doping of the patterned needlelike CNs lowers the turn-on field of the cathode. A vacuum field emission triode with self-aligned gate utilizing CNs as the field emitter is also fabricated. [J497]

"Analysis of a microelectromechanical system testing stage for tensile loading of nanostructures"

A new analytical model is developed for interpreting tensile loading data on "templated carbon nanotubes" (T-CNTs, amorphous carbon nanotubes made by pyrolysis with the channels of nanopores in anodized alumina nanopore arrays) obtained with a microelectromechanical-system (MEMS)-based mechanical testing stage. It is found that the force output from the actuation unit of the testing stage depends on the stiffness of the force sensing beam and the nanostructure being loaded, as well as the power input. A superposition method is used to treat the mechanics of the device structure in the linear elasticity response regime. To our knowledge this is a new approach for solving the mechanical response of MEMS structures with variable force output and of the configuration described herein. An in situ mechanical testing of individual T-CNTs was undertaken in a scanning electron microscope (LEO1525) using a new device fabricated with integrated electrodes for controlled deposition of T-CNTs by electric-field guided assembly in a liquid. The T-CNT was subsequently tensile loaded to the point of fracture. The calculated modulus of the T-CNT using the new model based on the experimentally measured displacement of the moving platform with and without the T-CNT attached falls within the range expected for amorphous carbon. The new model corrects the treatment in a previously presented model [S. Lu etal, Rev. Sci. Instrum. 75, 2154 (2004)]. [J498]

"In situ mechanical testing of templated carbon nanotubes"

A new microelectromechanical system (MEMS)-based tensile testing stage (with integrated actuator, direct load sensing beam, and electrodes for controlled assembly of an individual nanostructure) was developed and used for in situ tensile loading of a templated carbon nanotube (T-CNT) inside a scanning electron microscope (SEM). Specifically, an increasing tensile load was applied to the T-CNT by actuating the device and high-resolution scanning electron microscopy images were acquired at different loads. The load (from the bending of the direct force-sensing beam), the elongation of the specimen during loading, and the specimen geometry were all obtained from analysis of SEM images. The stress versus strain curve and Young's modulus were thus obtained. A model is presented for the tensile loading experiment, and the fit value of Young's modulus from this model is compared to values obtained by an independent method. The results of this experiment on a T-CNT suggest the use of this device for loading other nanostructures and also for designing other MEMS-based systems, such as a compressive testing stage. [J499]

"Reproduction of the Morpho blue by nanocasting lithography"

The Morpho butterfly's blue, which is a specific color produced by nanostructures, is expected to serve to various industrial applications such as posters, displays, cosmetics, etc. The natural Morpho blue has recently been emulated successfully by an artificial stepped nanostructure, but the fabrication of the nanostructure is too expensive using conventional lithography method. To solve the problem, nanocasting lithography (NCL) is newly applied using UV curable polymer to replicate the stepped nanostructure and improve heat resistance for the following deposition process. After fabrication of the stepped polymer structure by NCL, TiO2and SiO2layers are deposited using the vacuum electron beam deposition and the Morpho blue structure is efficiently reproduced at low cost. The reflective characteristic of the reproduced structure is almost same as the natural Morpho blue. [J500]

"Submicron three-dimensional structures fabricated by reverse contact UV nanoimprint lithography"

The fabrication of a three-dimensional multilayered nanostructure is demonstrated with a newly developed nanofabrication technique, namely, reverse contact ultraviolet nanoimprint lithography. This technique is a combination of reverse nanoimprint lithography and contact ultraviolet lithography. In this process, a UV cross-linkable polymer and a thermoplastic polymer are spin coated onto a patterned hybrid metal-quartz stamp. These thin polymer films are then transferred from the stamp to the substrate by contact at a suitable temperature and pressure. The whole assembly is then exposed to UV light. After separation of the stamp and the substrate, the unexposed polymer areas are rinsed away with acetone leaving behind the negative features of the original stamp with no residual layer. [J501]

"Micromachined piezoresistive proximal probe with integrated bimorph actuator for aligned single ion implantation"

The authors report a microfabrication procedure of self-actuated piezoresistive scanning probes (SAPSPs). They

are designed for a SAPSP instrument that is integrated with an ion beam for aligned single ion implantation in ultrahigh vacuum. The novelty of the design is an integrated hollow pyramid, instead of a previously mechanically hand mounted pyramid [J. Vac. Sci. Technol. B 23, 2798 (2005)]. The pyramid has dual purpose. First it collimates the ion beam and suppresses secondary particles from the back side of the cantilever, so that secondary particles from the target material can be used for single ion detection. Second the pyramid also provides an atomic force microscope tip for the scanning probe. A crucial step in the fabrication is the back side opening via etching for the hollow pyramid. The fabrication procedure will be discussed in detail. [J502]

"Fabrication of hybrid bilayer nanostructure by duo-mold imprinting"

A bilayer scaffold consisting of a thermoplastic and thermoset has been fabricated via duo-mold imprinting method. The molds used in this fabrication are with comparable surface energy. The preferential demolding between the two molds was achieved by utilizing the adhesion difference between the molds and the two polymers while the transfer of the polymers from the mold to the substrate was guided by the large contrast of surface energy between the mold and the substrate. The use of thermoset polymer imparts the thermal and mechanical stabilities into the imprinted structures so that a higher imprinting temperature is feasible. A higher imprinting temperature is found to facilitate the transfer of the imprinted polymer from the mold to the substrate by enhancing the wetting between the polymer and the substrate. [J503]

"In situ real time monitoring of nanosecond imprint process"

Using a real time imprint monitoring system (RIMS), the authors measured the process time for laser assisted nanoimprint lithography to be about 200ns. They found that during this short period of time, the mold had been fully pressed into the resist, resulting in a full pattern transfer with high fidelity. Their results also demonstrated the capability of RIMS for monitoring an ultrafast imprint process. [J504]

"Fe adatoms along Bi nanolines on H /Si (001)"

The stability and electronic and magnetic properties of Fe atoms adsorbed on the self-assembled Bi-line nanostructure on the H/Si(001)surface are addressed by spin-density functional calculations. Our results show that Fe adatoms are much more stable on sites closer to the Bi nanolines suggesting that they form one-dimensional atomic arrays. The most stable structure occurs on a missing dimer line beside the Bi dimers, which corresponds to an array with distances between Fe adatoms of about 8E. In this array the irons are coupled antiferromagnetically with spin magnetic moment of about 1.5mu Bper Fe atom, whereas the coupling exchange interactions is found to be of about 14.4meV. We also estimate a large magnetic anisotropy energy of 3meV/at.originated on the structural anisotropy of the Fe-adatom site. In addition, the electronic band structure of the Fe array at the most stable structure shows a magnetic half-metal behavior. [J505]

"Indium oxide "rods in dots" nanostructures"

The authors have demonstrated a special indium oxide (In2O3)"rods in dots" nanostructure with high nanorod sheet density of over 1012cm-2. The approach has been realized through depositing controllable individual In2O3nanorods in both number and shape within a single porous alumina membrane (PAM) nanochannel under radio frequency magnetron sputtering. The authors further discussed in detail effects of the PAM configurations (pore diameter and thickness) and sputtering conditions (substrate temperature and argon pressure) on the formation of the In2O3nanostructure. [J506]

"Subpicosecond time-resolved Raman studies of field-induced transient transport in an In x Ga 1-x As -based p-i-n semiconductor nanostructure"

Electron transient transport in an InxGa1-xAs-based (x=0.53)p-i-nnanostructure under the application of an electric field has been studied by time-resolved Raman spectroscopy on a subpicosecond time scale and at T=300K. The experimental results reveal the time evolution of the electron distribution function and electron drift velocity with subpicosecond time resolution. These experimental results are compared with those of both InP-based and GaAs-based p-i-nnanostructures and provide a consistent understanding and better insight of electron transient transport phenomena in semiconductors. [J507]

"Ultrafast-laser-induced parallel phase-change nanolithography"

A phase-change nanolithography technique is developed to fabricate up to millions of two-/three-dimensional nanostructures (50nm)over a large area at a high speed by combining femtosecond laser, microlens array, and wet etching process. Near-field scanning optical microscopy, electrical force microscopy, and atomic force microscopy were used to characterize optical and electrical properties of crystalline and amorphous states,

respectively. Different reactions of both amorphous and crystalline areas in phase-change film to alkaline solution are demonstrated. Multiphoton absorption and ultrashort pulse contribute to nanostructure generation. This method opens up a route for nanodevice fabrication with phase-change material. [J508]

"Effects of silicon nanostructure evolution on Er 3+ luminescence in silicon-rich silicon oxide/Er-doped silica multilayers"

The effect of silicon nanostructure evolution on Er3+luminescence is investigated by using multilayers of 2.5nmthin SiOx(x 2)and 10nmthin Er-doped silica (SiO2:Er). By separating excess Si and Er atoms into separate, nanometer-thin layers, the effect of silicon nanostructure evolution on np-Si sensitized Er3+luminescence could be investigated while keeping the microscopic Er3+environment the same. The authors find that while the presence of np-Si is necessary for efficient sensitization, the overall quality of np-Si layer has little effect on the Er3+luminescence. On the other hand, intrusion of np-Si into Er-doped silica layers leads to deactivation of np-Si/Er3+interaction, suggesting that there is a limit to excess Si and Er contents that can be used. [J509]

"Nanoscopy of near-field distribution on plasmonic nanostructures"

The nanoscopy of the spatial distribution due to the interference of surface-plasmon polaritons (SPPs) on metallic nanostructures has been studied. The results show that the wavelength of plasmon wave becomes short when the thickness of the metallic film decreases because of SPPs coupling on both sides of the metallic structure. The interference of SPPs on the exit side of metallic nanostructures can redistribute the illumination light into nanoscale spatial distribution with high intensity, which beats the Rayleigh diffraction limit. The spatial resolution of sub-50-nm pattern on a metallic nanostructure with a thickness of 60nmwas experimentally measured by using a traditional photoresist with an illumination wavelength of 436nm, which verifies the theoretical predictions. The information of the near-field distribution from corrugated metallic nanostructures is important for understanding the underlying physics, as well as for optimizing metallic nanostructures for possible applications. [J510]

"Optical generation of high frequency ultrasound using two-dimensional gold nanostructure"

A two-dimensional (2D) gold nanostructure is used to optically generate high frequency ultrasound. The structure consists of 2D arrangements of gold nanoparticles, sandwiched between a transparent substrate and a 4.5mcmthick polydimethylsiloxane (PDMS) layer. The acoustic signal displays significant improvements compared to a bulk black PDMS films (the current state of the art) at frequencies from 50to100MHz. The high optical extinction ratio of the gold nanostructure provides a convenient method to construct an integrated transmit/receive optoacoustic array. These results show that a 2D gold nanostructure can be used to produce high frequency arrays for ultrasound imaging. [J511]

"Field emission from honeycomblike network of vertically aligned AlN nanoplatelets"

Honeycomblike network of vertically aligned AlN nanoplatelets was synthesized on etched Si substrate via a simple vapor phase method without catalyst. The nanoplatelets are hexagonal wurtzite AlN and their thickness is 10-100nm. Field emission (FE) measurements showed that this nanostructure has a low turn-on field of 3.2-5.0V/mcmand a threshold field of 7.8-12.1V/mcmat sample-anode distances of 50-100mcm. The fluctuation of FE current with density of 10mA/cm2over 5his lower than 3%. The low turn-on and threshold fields and the small fluctuation of current demonstrate that this two-dimensional AlN nanostructure is a promising FE material. [J512]

"Anisotropic x-ray absorption effects in the optical luminescence yield of ZnO nanostructures"

The authors have found that the directionality of the orbital populated following core-level x-ray absorption of a hexagonal nanostructure has a strong influence on the resulting optical luminescence yield spectra. For ZnO, there is an enhancement of the band gap exciton luminescence following O 1sto 2pzrelative to 2px,yexcitation. The defect luminescence O 1sexcitation spectrum also shows sensitivity to the nature of the defect (surface or bulk). [J513]

"Piezoresistive pressure sensing by porous silicon membrane"

In this paper, the piezoresistive pressure-sensing property of porous silicon has been reported. The pressure sensitivity of a porous silicon membrane of 63% porosity and 20-μm thickness has been observed to be about three times more than that of a conventional bulk silicon membrane of the same dimensions. The increased sensitivity is attributed to the improvement in piezoresistance due to quantum confinement in the porous silicon

nanostructure. The piezoresistive coefficient of porous silicon is estimated for the first time and is observed to be about 50% larger than that of monocrystalline silicon for a 63% porosity porous silicon membrane. The response time has also been studied and observed to be significantly shorter. Power dissipation of the porous silicon pressure sensor is also much less compared to that of commercial bulk silicon piezoresistive pressure sensors. [J514]

"Dielectrophoretic integration of nanodevices with CMOS VLSI circuitry"

We present a novel platform for the development and deployment of nanosensors in integrated systems. The nanosensor technology is based on cylindrical structures grown using porous membranes as templates. These nanostructures are manipulated using dielectrophoretic forces, thus allowing their individual assembly and characterization. This assembly also enables the development of "mixed-mode" integrated circuits that include readout, signal processing, and communications circuitry, as well as the requisite layout for the post-integrated-circuit assembly of the nanostructures. We report the results of assembly experiments performed on complementary metal-oxide-semiconductor (CMOS) circuitry designed using Freescale semiconductor's HiP6W low-voltage 0.18-mum Si/SiGe BiCMOS process [J515]

"Regular MgO nanoflowers and their enhanced dielectric responses"

Regular MgO nanoflowers were synthesized via a simple chemical route. The as-synthesized nanoflowers are single crystalline and consist of MgO nanofibers which have lengths up to several micrometers and diameters in the range of 20-80nm, with an average of 50nm. The frequency spectra of the relative dielectric constant and the dielectric loss were measured in the frequency range of 50Hzto5MHz. Temperature spectra of the relative dielectric constant were also measured and the experimental results showed that MgO nanoflowers have a much higher relative dielectric constant as compared with MgO micropowders, especially at low frequencies at room temperature. [J516]

"Effects of cellular fine structure on scattered light pattern"

Biological cells are complex in both morphological and biochemical structure. The effects of cellular fine structure on light scattered from cells are studied by employing a three-dimensional code named AETHER which solves the full set of Maxwell equations by using the finite-difference time-domain method. It is shown that changes in cellular fine structure can cause significant changes in the scattered light pattern over particular scattering angles. These changes potentially provide the possibility for distinguishability of cellular intrastructures. The effects that features of different intrastructure have on scattered light are discussed from the viewpoint of diagnosing cellular fine structure. Finally, we discuss scattered light patterns for lymphocyte-like cells and basophil-like cells. [J517]

"Effect of Annealing on Extraordinary Hall Effects in Sputtered Granular Cu Co Thin Films"

This work explores the nanostructure dependence of extraordinary Hall effect (EHE) in Cu80Co20granular thin films. Upon annealing, an unusual nanostructure evolution in Cu-Co into two Co particles-size distribution affects the magnetotransport properties, most evidently in the EHE. It was concluded that the EHE in annealed films primarily depends on the population of smaller sized particles. Upon annealing, the EHE field sensitivity was gradually reduced from 0.78 nOmega-cm/Oe for the as-deposited film to 0.04 nOmega-cm/Oe for 400degC annealed one [J518]

"Mosaic nanostructure of Ti O 2 with rutile short-range atomic order"

A nanolaminate film of six 36nmTiO2-7nmAl2O3bilayers is sputter deposited at room temperature and examined by high resolution transmission electron microscopy (HRTEM). Neither the TiO2nor the Al2O3layers have long-range crystallographic order. Previous Raman spectroscopy of the nanolaminate showed that short-range atomic order in the TiO2component is characteristic of bulk rutile. The HRTEM images of the Al2O3layers consist entirely of random contrast speckle characteristic of a material with no atomic ordering beyond the nearest-neighbor level. However, the predominant feature in the images of the TiO2layers is a mosaic structure, with fewer regions of random contrast speckle. The mosaic consists of four repetitive elements: (1) domains of {110} planes terminating along directions, (2) planar faults along directions, (3) {110} facets in steps along the [001] direction, and (4) a herringbone structure of short strands of (110) and (-110)planes on either side of a midrib. We show how two combined growth operations can generate this nanostructure: These operations are the preferential three-dimensional growth of a rutile nucleus with a {110} habit and the formation of growth faults with 12{011}and 12{121}displacement vectors. The results explicitly show that TiO2with rutile short-range atomic order self-assembles into units beyond the nearest-neighbor level. This behavior is different from oxides that are continuous random network formers, such as SiO2and Al3O3, in which the metal-oxygen bonds are

predominantly covalent. [J519]

"CAD-guided automated nanoassembly using atomic force microscopy-based nonrobotics"

Nanoassembly using atomic force microscopy (AFM) is a promising technique for nanomanufacturing. Most AFM-based nanoassembly schemes are implemented either manually using haptic devices or in an interactive way between the users and the atomic force microscope images. These schemes are time consuming and inefficient. Therefore, the computer-aided design (CAD)-guided automated nanoassembly using AFM is desirable for nanomanufacturing. In this paper, a general framework for CAD-guided automated nanoassembly using AFM is developed. Based on the CAD model of a nanostructure, the manipulation paths for both nanoparticles and nanorods are generated automatically. A local scanning method is developed to compensate for the random drift that may cause the failure of the nanoassembly. The experimental results demonstrate that the developed general framework can be employed to manufacture nanostructures efficiently. The research work opens a door to the CAD-guided automated nanomanufacturing using AFM. Note to Practitioners-Atomic force microscope (AFM)-based nanoassembly will lead to potential breakthroughs in manufacturing new revolutionary industrial products because many potential nanostructures and nanodevices are asymmetric, which cannot be manufactured using self-assembly only. In order to increase the efficiency and accuracy of AFM-based nanoassembly, automated computer-aided-design (CAD)-guided nanoassembly is desirable to manufacture nanostructures and nanodevices. Based on the CAD model, the environment model and the model of the nanoobjects, collision-free paths are generated to control the AFM tip to manipulate nanoobjects. A local scanning method is developed to obtain the actual position of each nanoobject to compensate for the random drift. Since the building materials of nanostructures and nanodevices may include nanoparticles, nanorods, nanowires, nanotubes, etc., automated path planning algorithms are developed for both nanoparticles and nanorods. The experimental results show that the developed general framework can be used to manufacture nanostructures more efficiently. [J520]

"Monolithic, high surface area, three-dimensional GeO 2 nanostructures"

We report a sol-gel synthesis of monolithic three-dimensional GeO2nanostructures (aerogels). Transmission electron microscopy shows that these ultralow-density (99.2%porous) nanostructures are formed by a continuous network of elongated amorphous GeO2nanoligaments, 15-20nmin diameter and 50-200nmin length. As a result, monoliths exhibit a high surface area of 60m2g-1. A comparison of soft x-ray absorption spectra at GeL3and OKedges with theoretical densities of states reveals that the electronic structure of aerogels is similar to that of hexagonal GeO2, indicating a (distorted) tetrahedral environment of Ge atoms in the amorphous nanostructure. [J521]

"Diode effect in asymmetric double-tunnel barriers with single-metal nanoclusters"

Asymmetric double-tunnel barriers with the center electrode being a metal cluster in the quantum regime are studied. The zero dimensionality of the clusters used and the associated quantized energy spectra are manifest in well-defined steps in the current-voltage characteristic. Record high current rectification ratios of 104for tunneling through such clusters are demonstrated at room temperature. We are able to account for all of the experimentally observed features by modeling our double-barrier structures using a combination of discrete states and charging effects for tunneling through quantum dots. [J522]

"Mapping the local nanostructure inside a specimen by tomographic small-angle x-ray scattering"

Small-angle x-ray scattering is combined with scanning microtomography to reconstruct the small-angle diffraction pattern in the direction of the tomographic rotation axis at each location on a virtual section through a specimen. These data yield information about the local nanoscale structure of the sample. With rotational symmetry present in the diffraction patterns, e.g., for isotropic or fiber-textured scatterers, the full reciprocal space information in the small-angle scattering regime can be reconstructed at each location inside the specimen. The method is illustrated investigating a polymer rod made by injection molding. [J523]

"Effect of post deposition annealing on the optical properties of Hf O x N y films"

We report in this letter that Hafnium oxynitride (HfOxNy)gate dielectrics were prepared by radio frequency (RF) reactive magnetron sputtering and optical properties of the HfOxNythin films were investigated by spectroscopic ellipsometry with photon energy of 0.75-6.5eVat room temperature. The investigations showed that the annealing temperatures have a strong effect on the optical properties of HfOxNythin films. With increased annealing temperature, the refractive index nis observed to increase, while the extinction coefficient kdecreases, respectively. The changes of the complex dielectric functions and the optical band gap Egwith the annealing temperature are also discussed. [J524]

"Cooperative solid-vapor-phase epitaxy: An approach for fabrication of single-crystalline insulator/Si/insulator nanostructures"

We study the growth of insulator/Si/insulator nanostructures on Si(111) using molecular beam epitaxy. Based on different investigations, we develop an approach for the fabrication of a nanostructure with a continuous ultrathin single-crystalline silicon buried in a single-crystalline insulator matrix with sharp interfaces. This approach is based on an epitaxial encapsulated solid-phase epitaxy, in which the solid-phase epitaxy of silicon is accompanied by a vapor-phase epitaxy of the second insulator layer. We call this approach as cooperative solid-vapor-phase epitaxy. As an example we demonstrate the growth of buried epitaxial silicon in epitaxial Gd2O3. [J525]

"Nanoscale magnet for semiconductor spintronics"

A hybrid nanostructure of diluted magnetic semiconductor quantum well (DMS-QW) has been fabricated by using a ferromagnetic Co/Pt-multilayered film with perpendicular magnetization. The nanoscale disk of DMS-QW with a diameter of 80nmwas embedded in the magnetic film generating magnetic fields perpendicular to the DMS-QW plane. As a result, exciton photoluminescence with circular-polarization properties arises in a zero external field, due to the giant Zeeman effects of excitons. It indicates that the perpendicular magnetic fields applied from the Co/Ptfilm align the exciton spins in the DMS nanoscale disk, acting as a nanoscale magnet for semiconductor spintronics. [J526]

"Fabrication of In P /In As /In P core-multishell heterostructure nanowires by selective area metalorganic vapor phase epitaxy"

We report the growth of InP/InAs/InPcore-multishell nanowire arrays by selective area metalorganic vapor phase epitaxy. The core-multishell nanowires were designed to accommodate a strained InAs quantum well layer in a higher band gap InP nanowire. The precise control over nanowire growth direction and heterojunction formation enabled the successful fabrication of the nanostructure in which all three layers were epitaxially grown without the assistance of any catalyst. The grown nanowires were highly uniform, vertically oriented, and periodically aligned with controllable dimensions. 4Kphotoluminescence measurements confirmed the formation of strained InAs quantum well on InP (110) sidewalls and the well widths corresponding to the photoluminescence peaks were in good agreement with calculated values. [J527]

"Zn Ga 2 O 4 nanotubes with sharp cathodoluminescence peak"

Single-crystal ZnGa2O4nanotubes were grown using well-aligned ZnO nanorods as templates by a vapor transport method. Ga and O vapors were reacted with ZnO to form ZnO/ZnGa2O4core-shell nanostructure, and single-crystal ZnGa2O4nanotubes were obtained by the removal of ZnO cores with a dilute HCl solution. The cathodoluminescence spectra indicate that the ZnGa2O4nanotubes emit near ultraviolet (UV) and blue lights (380 and 464nm). The sharp near UV peak shall be beneficial for optical applications. [J528]

"Anisotropy of Carrier Transport in the Active Region of Lasers With Self-Assembled InAs Quantum Dashes"

Ambipolar carrier migration is investigated for the first time by probing with submicrometer spatial resolution the photoluminescence emitted from the active region of an InAs quantum-dash laser grown on InP. Pumping the nanostructure with two wavelengths, 880 and 940 nm, helps to better understand the transport patterns and the role of the InP substrate. The migration parallel with the dash layer is studied in two directions: along the dash elongation and perpendicular to (across) the elongation. Besides an overall quenching in the presence of dashes, a 20% reduction in migration is observed for the along direction when compared to the across one [J529]

"Nanoscale patterning of (La ,Pr ,Ca)Mn O 3 thin film using atomic force microscopy lithography and their electrical properties"

We have applied the atomic force microscopy (AFM) lithography technique to electrically phase-separated (La,Pr,Ca)MnO3(LPCMO) thin films. It was found that the maximum pattern height of 10.5nmfor the as-deposited film was much higher than that of 5.3nmfor the annealed film, suggesting that AFM lithography of LPCMO thin film was highly influenced by oxygen nonstoichiometry that enhances ion migration. The nanochannel with 150nmwidth was fabricated using this technique. The nanostructure shows insulating behavior under H=0Tand large hysteretic behavior accompanied with metal-insulator transition temperature Tp=140and 170Kupon cooling and warming under 5T. In contrast, the unpatterned film has Tp=170K(H=0T)and 240K(H=5T)without large

hysteretic behavior. The difference between the nanochannel and the unpatterned film can be related to the electronic phase separation. [J530]

"Thermal influence on passing of polarized light through the Sn O 2 :In 2 O 3 layers"

Thermal dependent changes of light depolarization degree were observed in the SnO2:In2O3(ITO) layers deposited onto the flat glass substrates which are used usually as electrodes for optoelectronic devices. The observed effect is reversible. It can be attributed to the changes of nanostructure geometry in the bulk of the ITO layer as well as on its surface. Such geometric changes involve dispersion of polarized light. The investigated effect should be taken into consideration when developing optoelectronic devices because it can provoke distortion of the optical information field. [J531]

"Diamond cone arrays with controlled morphologies formed by self-organized selective ions sputtering"

Controlled preparation of nanoscale materials and the underlying mechanisms are essential issues nowadays. Here, we report a significant subtractive formation process of large-area diamond conical nanostructure arrays using a hot filament chemical vapor deposition (HFCVD) system with negative biasing of the substrates, and the etching effect of energetic ions on the formation of diamond cone arrays with controlled morphology has been studied in detail. It shows that methylic ions dominantly contribute to diamond cone formation based on a neutral-ion charge exchange collision model. The self-organized selective sputtering process of as-formed hillock bottoms on a roughened surface by low energetic ions plays a key role for the formation and development of diamond cones. The cone morphologies under various experimental parameters are systematically studied, and they nicely confirm and supplement the as-established cone formation mechanism. [J532]

"Structural and thermoelectric properties of epitaxially grown Bi 2 Te 3 thin films and superlattices"

Multi-quantum-well structures of Bi2Te3are predicted to have a high thermoelectric figure of merit ZT. Bi2Te3thin films and Bi2Te3/Bi2(Te0.88Se0.12)3superlattices (SLs) were grown epitaxially by molecular beam epitaxy on BaF2substrates with periods of 12 and 6 nm, respectively. Reflection high-energy electron diffraction confirmed a layer-by-layer growth, x-ray diffraction yielded the lattice parameters and SL periods and proved epitaxial growth. The in-plane transport coefficients were measured and the thin films and SL had power factors between 28 and 35 mu W/cm K2. The lattice thermal conductivity varied between 1.60 W/mKfor Bi2Te3thin films and 1.01 W/mKfor a 10 nmSL. The best figures of merit ZTwere achieved for the SL; however, the values are slightly smaller than those in bulk materials. Thin films and superlattices were investigated in plan view and cross section by transmission electron microscopy. In the Bi2Te3thin film and SL the dislocation density was found to be 2Ч1010 cm-2. Bending of the SL with amplitudes of 30 nm(12 nmSL) and 15 nm(6 nmSL) and a wavelength of 400 nmwas determined. Threading dislocations were found with a density greater than 2Ч109 cm-2. The superlattice interfaces are strongly bent in the region of the threading dislocations, undisturbed regions have a maximum lateral sie of 500 nm. Thin films and SL showed a structural modulation [natural nanostructure (nns)] with a wavelength of 10 nmand a wave vector parallel to (1,0,10). This nns was also observed in Bi2Te3bulk materials and turned out to be of general character for Bi2Te3. The effect of the microstructure on the thermoelectric properties is discussed. The microstructure is governed by the superlattice, the nns, and the dislocations that are present in the films. Our results indicate that the microstructure directly affects the lattice thermal conductivity. Thermopower and electrical conductivity were found to be negatively correlated and no clear dependence of the two quantities on the microstructure could be found. [J533]

"Structural and compositional analyses of a strained Al Ga N /Ga N superlattice"

We investigated the nanostructure of AlGaN/GaNstrained-layer superlattice (SLS) cladding in a GaN-based violet laser diode (LD) using a scanning-transmission electron microscope (STEM). Metal-organic vapor-phase epitaxy was used to grow 200 pairs of n-Al0.14Ga0.86N/n-GaNlayers directly on the n-GaN:Sicontact layer that was deposited on a (0001) sapphire substrate. The Al0.14Ga0.86Nand GaN layers were distinguished as dark and bright bands in the high-angle annular dark-field (HAADF) images taken in the [1210]zone axis. The widths of the Al0.14Ga0.86Nand GaN layers were determined to be 2.24±0.09and 2.34±0.15nm, respectively. The lattice parameters of the Al0.14Ga0.86Nwere measured to be a=0.32±0.01nmand c=0.50±0.02nm, and those of the GaN, a=0.32±0.02nmand c=0.52±0.03nm. This is a direct illustration of the SLSs, where a good lattice matching in the basal plane caused by shrinkage of the Al0.14Ga0.86Nlattice normal to the basal plane suppresses the generation of misfit dislocations. Dislocations, appearing as dark contours i- n bright-field STEM images and as bright contours in HAADF images, run either parallel or perpendicular to the cdirection. Another mechanism of the SLS to suppress lattice defects in the LDs has also been disclosed. [J534]

"Bright contrast imaging of carbon nanofiber-substrate interface"

We present the contrast mechanisms of scanning electron microscopy (SEM) for visualizing the interface between carbon nanofibers (CNFs) and the underlying substrate. SEM imaging with electron beam energies higher than a certain threshold provides different image contrasts depending on whether CNFs are in contact with the substrate or suspended above the substrate. CNFs with diameters ranging from 25to250nmare examined with various electron beam energies. It is found that the threshold energy corresponds to the energy required to penetrate the CNF and its dependence on CNF diameter can be understood using the theory of electron range. This knowledge will be quite useful for interface imaging of all nanostructure devices. [J535]

"Quantum decoherence of nanodevices under convective and radiative boundary conditions"

Low dimensional nanostructures under thermal transport conditions have been traditionally treated as closed quantum systems. Many emerging operational nanodevices, however, will interact with their environment through convection and radiation processes. The realistic treatment of boundary conditions apart from internal conduction must now be quantified. Starting with a nanostructure operating in the ballistic or quasiballistic transport regime, the behavior of coherent carrier transport is investigated with the onset of convection and radiation interactions. Quantum decoherence is found to occur due to nanostructure heat carrier correlations to the fluid molecules or photons. Diagonalization of the quantum density matrix follows and serves as a mechanism to induce classicality on the heat carrier transport regime. Numerical experimentation has been performed with a silicon nanowire modeled under convective and radiative boundary conditions. Decoherence time scales of the nanowire are characterized for varying gaseous flow speeds, temperatures, and radiation environments. The magnitude of environmental coupling is also investigated to determine the decoherence behavior. Decoherence time scales are found to range from 300nsto7mswith gaseous convection producing the shortest temporal evolution. The loss of coherence has been found in every case analyzed, thus suggesting the transport regime to lie in classical phase space for this type of open quantum system. The transformation of heat carrier coherent quantum transport to the classical structure of phase space with the onset of environmental thermal interactions such as gas/liquid molecules or photons represents the major result of this work. The predictable outcome of preferred pointer states is discussed with the possibility of fabricating nanostructures that exhibit predetermined engineered thermal transport behavio- r under a specific set of boundary conditions. [J536]

"Transition radiation in metal-metal multilayer nanostructures as a medical source of hard x-ray radiation"

We show that a periodic metal-metal multilayer nanostructure can serve as an efficient source of hard x-ray transition radiation. Our research effort is aimed at developing an x-ray source for medical applications, which is based on using low-energy relativistic electrons. The approach toward choosing radiator-spacer couples for the generation of hard x-ray resonant transition radiation by few-MeV electrons traversing solid multilayer structures for the energies of interest to medicine (30-50keV)changes dramatically compared with that for soft x-ray radiation. We show that one of the main factors in achieving the required resonant line is the absence of the contrast of the refractive indices between the spacer and the radiator at the far wings of the radiation line; for that purpose, the optimal spacer, as a rule, should have a higher atomic number than the radiator. Having experimental goals in mind, we have considered also the unwanted effects due to bremsstrahlung radiation, absorption and scattering of radiated photons, detector-related issues, and inhibited coherence of transition radiation due to random deviation of spacing between the layers. Choosing as a model example a Mo-Ag radiator-spacer pair of materials, we demonstrate that the x-ray transition radiation line can be well resolved with the use of spatial and frequency filtering. [J537]

"Overlapping Double-Hole Nanostructure in a Metal Film for Localized Field Enhancement"

We propose a nanostructure consisting of an array of overlapping circular holes in a metal film that allows for eight orders of magnitude increased energy density with respect to the conventional diffraction limit. The field enhancement is achieved by combining two effects: focusing in the double-hole structure and the resonance of the array configuration. We study the dependence of the field enhancement on the nanostructure design by using a finite-difference time-domain method and finite-difference mode analysis. The proposed nanostructure design is amenable to focused ion beam milling fabrication, and preliminary structures are shown [J538]

"Recent Progresses and Future Prospects of Two- and Three-Dimensional Photonic Crystals"

Photonic crystals, in which the refractive index changes periodically, provide an exciting new tool for the manipulation of photons and have received keen interest from a variety of fields. This paper reviews the recent progress and future prospects of photonic crystals and their applications to photonic-nanostructure devices

[J539]

"Overlapping Double-Hole Nanostructure in a Metal Film for Localized Field Enhancement"

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"Characterization of natural nanostructured hydroxyapatite obtained from the bones of Brazilian river fish"

In this study, the characterization of the optical properties of natural hydroxyapatite (HAp) [Ca10(PO4)6(OH)2]is discussed. In the first stage of the experiment, natural HAp was processed from the bones of Brazilian river fish such as pintado (Pseudoplatystoma corruscans), jau (Paulicea lutkeni), and cachara (Pseudoplatystoma fasciatum). The bones were calcined at 900°Cfor different amounts of time (4-12h)and reduced to powder using two different milling times (2 and 4h) in a high-energy ball mill, in order to determine the best procedure for obtaining natural nanostructured HAp powder for the study. In the second stage, material calcined for 8hwas milled for 2, 4, 8, and 16h. The techniques of photoacoustic spectroscopy, scanning electron microscopy, and flame atomic absorption spectrometry were applied to characterize these samples. The O-H stretching shown by photoacoustic spectroscopy was correlated to the HAp nanostructure. Structural analysis indicated a Ca/Pratio close to 1.67 (1.64±0.04)and the presence of morphology and particle phase structure in the nanostructured HAp powder. [J541]

"Impact response by a foamlike forest of coiled carbon nanotubes"

We studied the dynamic response of a foamlike forest of coiled carbon nanotubes under high strain rate deformation using a simple drop-ball test. The method is based on measuring the dynamic force between the ball and the foam on the substrate during the stages of penetration and restitution. The analysis of the forest's morphology after impact has shown no trace of plastic deformation and a full recovery of the foamlike layer of coiled carbon nanotubes under various impact velocities. The contact force exhibits a strongly nonlinear dependence on displacement and appears fundamentally different from the response of a forest of straight carbon nanotubes, and from the Hertzian type of plane-sphere interaction. "Brittle" fracture of the foamlike layer is observed after repeated high velocity impacts. Such layers of coiled nanotubes may be used as a strongly nonlinear spring in discrete systems for monitoring their dynamic behavior and as a nanostructure for localized microimpact protection. [J542]

"Nanostructure and temperature-dependent photoluminescence of Er-doped Y 2 O 3 thin films for micro-optoelectronic integrated circuits"

The nanostructure and photoluminescence of polycrystalline Er-doped Y2O3thin films, deposited by radical-enhanced atomic layer deposition (ALD), were investigated in this study. The controlled distribution of erbium separated by layers of Y2O3, with erbium concentrations varied from 6to14at.%, was confirmed by elemental electron energy loss spectroscopy (EELS) mapping of Er M4and M5. This unique feature is characteristic of the alternating radical-enhanced ALD of Y2O3and Er2O3. The results are also consistent with the extended x-ray absorption fine structure (EXAFS) modeling of the Er distribution in the Y2O3thin films, where the EXAFS data were best fitted to a layer-like structure. X-ray diffraction (XRD) and selected-area electron diffraction (SAED) patterns revealed a preferential film growth in the [111] direction, showing a lattice contraction with increasing Er doping concentration, likely due to Er3+of a smaller ionic radius replacing the slightly larger Y3+. Room-temperature photoluminescence characteristic of the Er3+intra-4ftransition at 1.54mcmwas observed for the 500E, 8at.%Er-doped Y2O3thin film, showing various well-resolved Stark features due to different spectroscopic transitions from the 4I13/2→4I15/2energy manifold. The result indicates the proper substitution of Y3+by Er3+in the Y2O3lattice, consistent with the EXAFS and XRD analyses. Thus, by using radical-enhanced ALD, a high concentration of optically active Er3+ions can be incorporated in Y2O3with controlled distribution at a low temperature, 350°C, making it possible to observe room-temperature photoluminescence for fairly thin films (500-900E)without a high temperature annealing. [J543]

"Silicate layer formation at HfO2 /SiO2 /Si interface determined by x-ray photoelectron spectroscopy and infrared spectroscopy"

A high-k Hf-silicate interfacial layer grown by the solid phase reaction between sputtered metallic Hf films and an underlying SiO2/Si substrate through in situ vacuum annealing and subsequent thermal oxidation has been investigated. By means of the chemical shifts of Si 2p, Hf 4f, and O 1s core-level spectra determined by x-ray photoelectron spectroscopy (XPS), the formation of an interfacial Si-O-Si bond as the dominant reaction during in situ thermal oxidation of the Hf/SiO2/Si gate stack has been confirmed. In situ vacuum anneals without air exposure at 700 °C accelerates the interface reaction and results in the formation of Si-rich Hf-silicate interfacial layer. Analysis by Fourier transform infrared spectroscopy (FTIR) has indicated that vacuum annealed samples containing the silicate interface layer effectively suppresses the growth of the interfacial SiOxlayer compared to unannealed samples during postdeposition annealing. [J544]

"Transmission electron microscopy investigation of self-assembly ZnO twinning nanostructures"

Self-assembly ZnO twinning nanostructures are studied by transmission electron microscopy systematically. Selected area electron diffraction and high-resolution transmission electron microscopy observations indicate two types of twin boundaries (0111)and (0113)appeared in the same nanostructure and the twinning relationships are well defined. Convergent-beam electron diffraction techniques determine the polarities of the building blocks are all Zn terminated with the help of theoretical simulations, which is further confirmed by electron energy loss spectroscopy under (0002) and (0002)Bragg conditions. [J545]

"Structure and magnetic properties of FePt and FePt-Ag nanostructured magnets by cyclic cold rolling"

This paper reports phase components, nanostructure, coercivity mechanism, and hard magnetic properties of FePt and FePt-Ag bulk nanostructured magnets prepared by cyclic cold rolling and subsequent annealing. Annealing temperature of 500 °C or higher and annealing time of 120 min or longer are necessary for the as-rolled nanolaminate foils to complete the diffusion and ordering phase transformation. The addition of a small amount of Ag to the as-rolled Fe/Ptfoils results in an increase of both the ordering temperature and relative volume fractions of Fe3Ptand FePt3phases. The diffusion and phase formation mechanism linked to the specific nanostructures of the cold-rolled foils are discussed. The coercivity mechanism of FePt and FePt-Ag nanostructured magnets is analyzed by Gaunt's domain-wall pinning model. [J546]

"Nanostructured Mn-Al permanent magnets produced by mechanical milling"

Prealloyed powders of Mn54Al46were mechanically milled, and the as-milled powders subsequently annealed at temperatures from 350to600°Cto produce the ferromagnetic L10-structured tau phase. It was found that the magnetic properties are strongly dependent on both the fraction of tau phase and the grain size. Due to the nanostructure, a large coercivity, up to 4.8kOe, was obtained for Mn54Al46powders annealed at 400°Cfor 10min. Both remanence curves and delta Mplots showed no exchange coupling between the tau -phase nanograins. The mechanism for the magnetization process was determined to be domain-wall pinning type. [J547]

"Size-dependent transition from shape to exchange dominated magnetic nanostructure"

In order to quantitatively investigate the interplay between shape anisotropy (magnetostatics) and exchange, patterned zigzag structures were prepared with sizes varying over two orders of magnitude. The magnetic state is a balance between shape anisotropy, which causes the magnetization to follow the serrated edge of the structure, and exchange, which prefers uniform magnetization. In intermediate-sized structures, we find that the magnetization along the center of the zigzag oscillates between approximately ±32°and is relatively independent of the device size. As the dimensions are reduced to less than a critical length lambda cr, the oscillation magnitude drops rapidly. On the other hand, the largest structures develop extended film properties such as multiple vortices and ripple. [J548]

"Structure and magnetism of nanocrystalline exchange-coupled (Ni 0.67 Co 0.25 Fe 0.08)89-x Zr 7 B 4 Cu x (x=0,1) films"

Structural and magnetic characterizations of nanocrystalline films of (Ni0.67Co0.25Fe0.08)89-xZr7B4Cux(x=0,1)alloys are reported. The films were grown on quartz substrates using pulsed laser deposition from homogeneous targets of the above compositions at substrate temperatures ranging from ambient to 600°C. Structural properties were measured by x-ray diffraction, atomic force microscopy, and transmission electron microscopy, whereas the magnetic properties were measured by vibrating sample magnetometry and ferromagnetic resonance. The resulting films exist as a two phase alloy with face-centered-cubic metallic grains suspended in an amorphous matrix. For both the x=1and x=0alloys, the softest magnetic properties (coercivity Hc 0.5Oe, 4pi Ms 7000G) coincided to a deposition at 300°Cin which the fcc grain size (D)was 6-

8nmseparated by an amorphous phase of 1nm. At higher substrate temperatures (Ts)grain size follow a Ts2dependence, while at lower temperatures the grain size is comparable but the volume of the amorphous matrix is larger and hence the exchange coupling is comparatively weak. A power law relationship is observed between the coercivity and grain size with Hcalpha D3. These results are consistent with the results of Suzuki etal [J. Mag- n. Magn. Mater. 177-181, 949 (1998)] for the nanostructure being dominated by a uniaxial anisotropy. [J549]

"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. [J550]

"Temperature induced differences in the nanostructure of hot-wire deposited silicon-germanium alloys analyzed by anomalous small-angle x-ray scattering"

The nanostructure of hydrogenated amorphous silicon-germanium alloys, a-Si1-xGex:H(x=0.62-0.70), prepared by the hot-wire deposition technique applying different substrate and filament temperatures was analyzed by anomalous small-angle x-ray scattering experiments. The pure-resonant scattering contribution, which is related to the structural distribution of the Ge component in the alloy, was separated from the total small-angle scattering for one sample series. For all alloys the Ge component was found to be inhomogeneously distributed. The shape of the pure-resonant and the mixed-resonant scattering curves reveal significant differences indicating the presence of a third phase, probably hydrogen clusters and/or voids. The thin films showed improved microstructure when lowering the filament temperature to 1800°C. Additional improvement was achieved by optimizing the substrate temperature (between 260 and 305°C) resulting in suggested mass fractal structures of Ge with the fractal dimension p 1.6and a size of about 40nm. The nature of the microstructural changes induced by changes in filament temperature compared to those induced by the changes in substrate temperature were clearly different. The improved microstructure of the alloys could be correlated with improved optoelectronic properties of the material. [J551]

"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. [J552]

"Nanostructure and giant Hall effect in TM x (Si O 2)1-x (TM =Co ,Fe ,Ni) granular system"

Granular TMx(SiO2)1-x(TM=Co,Fe,Ni)thin films were thermally treated at different temperatures and their magnetotransport and structural properties were studied. Hall resistivity decreases with thermal annealing. Structure was analyzed based on small angle x-ray scattering results. A model of polydisperse system of hard spheres was used for obtaining structural parameters. Analysis reveals that a volume fraction of transition-metal atoms (less than 29%) are forming nanospheres. Changes in giant Hall effect upon annealing can depend on a particular combination of nanoparticle diameter, interparticle distance, and size distribution. [J553]

"Dependence of device performance on carrier escape sequence in multi-quantum-well p-i-n solar cells"

This work is a study relating device performance and carrier escape sequence in a large set of InAsP/InPp-i-nmulti-quantum-well solar cells. The devices encompass nearly identical i-region thickness and built-in electric field and present similar absorption threshold energies. The escape sequence of the first confined electron-to-conduction band continuum and heavy/light holes-to-valence band continuum is extracted from the photoluminescence versus temperature analysis and by comparing the measured activation energies to

calculated hole/electron well depths and thermionic escape times. Light holes, as expected for most III-V nanostructure systems, are found to be the fastest escaping carriers in all samples. The escape of electrons prior to heavy holes is shown to be a prerequisite to prevent severe open circuit voltage degradation. A possible explanation of the origin of this effect is offered. InP/InAsPmulti-quantum-well solar cells with high built-in electric field and fast electronic escape time display better open circuit voltage and performance. [J554]

"Spin-torque driven excitations and hysteresis in magnetic point contacts"

Magnetic multilayers are known to exhibit magnetization excitations, which are due to exchange fields produced by densely distributed spin-polarized electron currents. We report an observation of such excitations as well as hysteretic spin states produced by unpolarized currents in point contacts to single ferromagnetic layers. By measuring diffusive and ballistic contacts for various material combinations, we investigate the microscopic mechanism of the single interface spin-torque effect and discuss the possible origin of the observed hysteresis. [J555]

"Pattern storage and recognition using ferrofluids"

An implementation of an associative memory based on a ferromagnetic nanocolloid is proposed. The design contains inductive input and output units for training the ferrofluid as well as sensors incorporated into the output units for performing recall. Using Monte Carlo simulations of the system we demonstrate the possibility of creating nanoparticle configurations that can serve to associate input/output pattern pairs. [J556]

"Strain and magnetic anisotropy of epitaxial Ni /Cu (001) nanostructures"

The magnetic anisotropy of isolated epitaxial Ni/Cu(001)nanostructure on Si(001)has been studied together with structural characterization. The strain of the Ni nanostructure is released such that the perpendicular strain of nanostructure with tNi=10nmdecreases to -0.48%from -1.17%of film with the same thickness. Because of this, strain becomes the main factor in determining magnetic anisotropy of Ni/Cunanostructure in the investigated Ni thickness range (tNi=4.5-10nm). [J557]

"Nanowire based quantum interference sensors for electromagnetic radiation"

We present a proposal for the use of a nanostructure for electromagnetic radiation sensing, which is based on quantum interference. One sensor format that is discussed is comprised of symmetric hexagonal nanowire loops or parallel nanowires. The relevant quantum interference properties are analyzed, showing that the influence phase functional for the current density depends on the final relative velocity of electrons in these nanostructures. [J558]

"Thermoelectrical study of ferromagnetic nanowire structures"

The mixed effects of heat and charge transports have been studied at room temperature for Ni/Cuand Co/Cumultilayers with currents perpendicular to the interfaces as well as Ni and Co homogeneous nanowires. In order to carry out this analysis, magnetothermogalvanic voltage (MTGV) measurements have been performed. The method consists in monitoring an alternating voltage response that arises when an oscillation of the temperature of the nanostructure is applied and a steady current crosses the nanostructure. Different responses were observed for thicknesses of the ferromagnetic layer larger or shorter than the spin diffusion length. Qualitatively different MTGV profiles were also observed for Ni and Co homogeneous nanowires. These results demonstrate the importance of spin relaxation processes produced in ferromagnetic/nonferromagnetic (FM/NF) interfaces as well as in FM layers for the MTGV response. [J559]

"Molecular rheology of perfluoropolyether lubricant via nonequilibrium molecular dynamics simulation"

Molecular rheology of perfluoropolyether (PFPE) systems is particularly important in designing effective lubricants that control the friction and wear in tribological applications. Using the coarse-grained, bead-spring model, equilibrium molecular dynamics based on the Langevin equation in a quiescent flow was first employed to examine the nanostructure of PFPE. Further, by integrating the modified Langevin equation and imposing the Lees-Edwards boundary condition, nonequilibrium molecular dynamics of steady shear was investigated. We observe that the shear viscosity of PFPE system depends strongly on molecular architecture (e.g., molecular weight and endgroup functionality) and external conditions (e.g., temperature and shear rate). Our study of the flow activation energy/entropy and their correlations with nanostructure visualization showed that the PFPE structure was substantially modified. [J560]

"Nanostructure and magnetic properties of highly (001) oriented L10 (Fe 49 Pt 51)1-x Cu x films"

We report on nonepitaxially grown L10Cu-alloyed FePt thin films with strong (001) texture. The FePt films with different Cu contents were deposited directly on Si wafers with a Fe49Pt51/Cumultilayer structure. The Cu content was varied from 0to13at.%. All films were annealed at 600°Cfor 5min. X-ray-diffraction characterization showed that only one set of L10diffraction peaks appeared and no elemental Cu diffraction peaks were visible. This result, along with a varying c/alattice-parameter ratio, suggests that Cu substitutes Fe or Pt in the L10lattice and ternary FePtCu alloy films are formed. (001) texture was enhanced with the increase of Cu content. Transmission electron microscope images showed that the grain size of FePtCu was about 10nm. For FePt film with 11at.%Cu substitution, coercivity was about 5kOe, which is suitable for writing in a practical perpendicular-recording film. [J561]

"Nanostructure calculation of CoAg core-shell clusters"

Detailed studies of the structure of magnetic nanoclusters are crucial for understanding their magnetic properties. We have investigated the structure of CoxAg1-xnanoparticles by means of molecular dynamics simulations utilizing the embedded atom method. Starting from a completely random distribution of Co and Ag atoms, the clusters were heated up to 1300Kand subsequently cooled down. The size of the resulting particles was 2.8nm(864 atoms). A clear segregation of the Ag atoms on the surface of the Co core was obtained. [J562]

"Enhanced spin accumulation in a superconductor"

A lateral array of ferromagnetic tunnel junctions is used to inject and detect nonequilibrium quasiparticle spin distribution in a superconducting strip made of Al. The strip width and thickness are kept below the quasiparticle spin diffusion length in Al. Nonlocal measurements in multiple parallel and antiparallel magnetic states of the detectors are used to in situ determine the quasiparticle spin diffusion length. A very large increase in the spin accumulation in the superconducting state compared to that in the normal state is observed and is attributed to a diminishing of the quasiparticle population by the opening of the gap below the transition temperature. [J563]

"Spin-flip scattering at Al surfaces"

Nonlocal measurements are performed on a multiterminal device to in situ determine the spin-diffusion length and in combination with resistivity measurements also the spin-relaxation time in Al films. By varying the thickness of Al we determine the contribution to spin relaxation from surface scattering. From the temperature dependence of the spin-diffusion length it is established that the spin relaxation is impurity dominated at low temperature. A comparison of the spin- and momentum-relaxation lengths for different thicknesses reveals that the spin-flip scattering at the surfaces is weak compared to that within the bulk of the Al films. [J564]

"Comparison of nanostructure characteristics of ZnO grown on GaN and sapphire"

The immature developments of p-type ZnO and ZnO-related ternary or quaternary compound and the small lattice mismatch between ZnO and GaN stimulate interest in the hybrid growth of ZnO and GaN. In this research, we compared the nanostructures and optical properties of two ZnO thin-film samples grown under the same conditions but on different underlying materials (sapphire and GaN). With the high growth temperature of 450°C, both samples show domain structures. However, in contrast to the sample of ZnO on sapphire, the sample of ZnO on GaN starts with smaller domains (a few tens of nanometers in width) of almost vertical boundaries at the interface and evolves into larger domains (around 100nmin width). The 30° twist of the basal plane in ZnO with respect to its underlying sapphire does not occur in the sample of ZnO on GaN. Within a domain of ZnO on sapphire, misfit and threading dislocations can be periodically observed along the interface with the separation of about 8nm. The transition of the lattice structure across the interface between ZnO and GaN was quite smooth, indicating the high heterojunction quality in this sample. The x-ray diffraction results showed that the crystalline quality of ZnO on GaN is slightly better than that of ZnO on sapphire. However, based on the thermal quenching behavior of integrated photoluminescence intensity, we estimated that the optical quality of the two samples is about the same. [J565]

"Self-assembly of antimony nanowires on graphite"

One-dimensional (1D) semimetals (e.g., antimony and bismuth) are excellent thermoelectric materials. We demonstrate the self-assembly of 1D Sb nanowires on highly oriented pyrolytic graphite, along with structures of other dimensionality. Comparing with an Sb crystal in ambient condition, our scanning tunneling microscopy analysis indicates that these Sb nanowires have a compressed lattice structure, which is likely formed under the Laplace pressure that can be quite large in a nanostructure. The conditions for growing aligned semimetal nanowires exclusively are discussed. [J566]

"Thermal stability and energy-band alignment of nitrogen-incorporated Zr O 2 films on Si(100)"

Thermal stability and energy-band alignment of ZrOxNyfilms on Si are investigated using x-ray photoelectron spectroscopy and spectroscopy elliposometry (SE). The results show that the Zr-N bonds in as-oxidized ZrOxNyfilms are thermally unstable, while the N-O bonds in ZrOxNymatrix are stable even at high annealing temperature of 900°C. Optical properties are also analyzed based on the SE fitting results. The slight blueshift in the absorption edge indicates the increased band gap from 3.9to5.1eVafter the additional annealing. Based on the valence-band spectrum results, zero-field energy-band alignments for ZrOxNy/Siand ZrOxNy/SiO2/Sistacks are extracted. [J567]

"Patterning 20 nm half-pitch lines on silicon using a self-assembled organosilicate etch mask"

Lines of 20nmhalf-pitch were generated on silicon surface using a self-assembled organosilicate nanostructure. A mixture of a poly(styrene-b-ethylene oxide) (PS-b-PEO) with an organosilicate precursor that is selectively miscible with PEO was used to create lamellar phase whose orientation was controlled perpendicular to the surface by tuning the surface energy of substrates. Thermal cross-linking of the organosilicate precursor followed by thermal decomposition of the PS-b-PEO leaves a robust organosilicate line pattern of sublithographic length scales on the surface. Line patterns on silicon substrate were created by transferring this self-assembled pattern into the underlying silicon substrate using anisotropic plasma etching. [J568]

"Modeling heterostructures of nanophononic crystals by continuum model with microstructures"

The application of nanophononic heterogeneous materials requires efficient and accurate modeling and analysis tools. For nanostructured materials, the use of atomistic simulation may be a potential solution. However, it is well known that this approach is beset with prohibitive computing time and an astronomical amount of data generated. In this letter, a microstructure continuum theory is employed to describe wave propagation in these materials. The key step in this approach is the establishment of a relationship between the local kinematics and the global continuum variables so that the characteristics of the nanostructure are captured. Propagation of longitudinal harmonic waves in nanophononic media is considered and the resulting dispersion curves are used to evaluate the accuracy of the microstructure continuum model. [J569]

"Plasma dynamics of water breakdown at a water surface induced by femtosecond laser pulses"

Femtosecond laser pulse induced ultrafast plasma dynamics studies of water breakdown in the range up to 250psare reported. We combine transient imaging techniques together with spectrally resolved reflection spectroscopy to monitor the early breakdown dynamics at the water surface with a laser intensity being 1.5 above threshold. We observe a 20psdelay before the plasma expands with an initial velocity of 5900m/s. The transient electron density after formation of the plasma is 1.2Ч1021/cm3. A recombination on a picosecond time scale with a rate of (1.6Ч10-9±0.3Ч10-9)cm3/sis found. [J570]

"Magnetic and transport properties of multilayer nanoscale antidot arrays"

The magnetic and transport properties of multilayer antidot nanostructure have been systematically investigated. The structures consisting of Co (30nm)/Cu(tCunm)/Ni80Fe20(30nm)were fabricated using deep ultraviolet lithography followed by lift-off process. We observed that the magnetization reversal processes are markedly dependent on tCudue to the interplay of different interlayer coupling mechanisms. The transport properties of the antidot arrays typically show a superposition of anisotropic and giant magnetoresistance effects, and the relative magnitude of the two effects is strongly sensitive to tCu. This is completely different from the observations in the corresponding continuous films. [J571]

"Porous InP array-directed assembly of InAs nanostructure"

Fascinating features of porous InP array-directed assembly of InAs nanostructures are presented. Strained InAs nanostructures are grown by molecular-beam epitaxy on electrochemical etched porous InP substrate. Identical porous substrate with different pore depths defines different growth modes. Shallow pores direct the formation of closely spaced InAs dots at the bottom. Deep pores lead to progressive covering of the internal surface of pores by epitaxial material followed by pore mouth shrinking. For any depth an obvious dot depletion feature occurs on top of the pore framework. This growth method presages a pathway to engineer quantum-dot molecules and other nanoelements for fancy physical phenomena. [J572]

"Fabrication of tunable nanostructure arrays using ion-polishing-assisted nanosphere lithography"

A simple technique has been developed for fabricating tunable nanostructure arrays, combining ion polishing and nanosphere lithography. Nanohole arrays with the controllable shape and in-plane dimensions are demonstrated. The combination of ion polishing and nanosphere lithography yields tunable masks and provides an easy way for flexible nanofabrication. [J573]

"Direct femtosecond laser nanopatterning of glass substrate by particle-assisted near-field enhancement"

Direct femtosecond laser nanopatterning of glass substrate by particle-assisted near-field enhancement was demonstrated in this letter. The nanostructure was characterized by field-emission scanning electron microscopy and atomic force microscopy. No cracks were found on the glass surface. The hole size were measured from 200 300nm. When laser fluence is close to the damage threshold, a trihole structure was observed. Nonlinear multiphoton absorption and near-field enhancement were the mechanisms of the nanofeature formation. Calculations based on particle-on-surface theory were carried out. The suggested method has potential applications in the nanolithography of a transparent glass substrate for nanostructure device fabrication. [J574]

"Low-temperature high-pressure preparation of transparent nanocrystalline Mg Al 2 O 4 ceramics"

Transparent MgAl2O4spinel nanoceramics have been sintered at relatively low-temperature (500-700°C) under high pressure (2-5GPa)using a hydrostatic press with high-temperature-calcined nanopowders. The morphology, nanostructure, optical property, and density of ceramics were analyzed by scanning electron microscopy, transmission electron microscopy, UV-VIS-IR transmission spectrum, and Archimedes draining method. The average grain size (100nmfor all samples sintered) depends on the sintering pressure and temperature. The nanoceramics are highly transparent even though their relative densities are all less than 99%, due to the low or negligible light scattering from the nanosized grains and pores. [J575]

"High strength hexagonal structured dendritic phase reinforced Zr-Ti-Ni bulk alloy with enhanced ductility"

A Zr74.9Ti10.5Ni14.6nanostructure-dendrite composite was prepared by copper mold casting. X-ray diffraction, and scanning and transmission electron microscopies, reveal a microstructure comprising ultrafine-scale dendrites with hexagonal structure and a two-phase interdendritic matrix, consisting of nanocrystalline hexagonal and tetragonal phases. Room temperature compression tests show evident yielding and 6% plastic strain together with work hardening up to 1622MPa. These results indicate that composite materials based on hexagonal phases might be an alternative to composites containing body-centered cubic phase reinforcements. [J576]

"RF plasma conditions for growth of carbon nanostructures"

As the physical limits of silicon-based microelectronics are reached, a need for new materials is required in order to continually improve processor speed. Carbon nanotubes have been suggested as a material to fill in where silicon technology leaves off, due to their small dimensions and unique metallic and semiconductor properties. In order to better understand the conditions in which carbon nanostructures are formed, a detailed plasma analysis has been performed on a gaseous electronics conference (GEC) plasma chamber. This analysis includes plasma composition, rotational temperatures, and spatially resolved hydrogen actinometry during carbon nanostructure growth. [J577]

"High-anisotropy nanocluster films for high-density perpendicular recording"

This paper reports results on the synthesis and magnetic properties of L10:X nanocomposite films, where L10=FePt, CoPt, and X=C, Ag, etc. Two fabrication methods are discussed: nonepitaxial growth of oriented perpendicular media, and monodispersed nanoparticle-assembled films grown with a gas-aggregation source. The magnetic properties are controllable through variations in the nanocluster properties and nanostructure. The films show promise for development as recording media at extremely high areal densities. [J578]

"Cellular nonlinear network based on semiconductor tunneling nanostructure"

We propose and analyze a cellular nonlinear network (CNN) based on a semiconductor nanostructure consisting of multiple layers of two semiconductors along with an incorporated quantum dot layer. An elementary logic cell of the proposed CNN consists of two resonant tunneling diodes connected in series through a quantum dot. The cell may be realized with multiple layers of two semiconductor materials with an embedded dot layer in between. The local interconnections of nanocells are achieved via tunneling between the neighboring quantum dots. Cells may be biased by the common column contacts, and only edge cells have individual I/O ports. Using

approximate tunneling characteristics, we simulated network dynamics and found procedures leading to useful logic functionality. In order to illustrate network capabilities for image processing, we present examples of filtering, erosion, dilation, and edge detection carried out on a test image on a 400Ч269 cell template. The realization of a number of logic functions in one module is possible due to the incorporation of nonlinear (tunneling) elements for cell interconnections. The proposed CNN architecture for nanostructures demonstrates powerful computing potential that will be beneficial for many practical applications. [J579]

"Innovative high-performance nanowire-grid polarizers and integrated isolators"

We developed a new type of wire-grid polarizer, the so-called nanowire-grid polarizer, which has achieved commercial quality optical performance and reliability. The nanowire-grid polarizer has cores composed of silicon dioxide nanowalls with metal coating on one side. These cores are surrounded by multilayer thin films for antireflection. The core nanowire grid utilizes nano-sized high-aspect ratio dielectric walls as a support for forming a high aspect ratio metal nanowire grid, which significantly reduces energy loss due to metal absorption for the transmitted beam while achieving high extinction ratio for the blocked beam. For all design simulations, we utilized a rigorous coupled-wave analysis and modal method. The nanowire-grid structure was fabricated by a wafer-based nanoreplication lithography and pattern-transfer techniques, which are capable of producing a large-area high aspect ratio nanostructure with high throughput and low cost. The optical performance of the nanowire-grid polarizer was characterized thoroughly. Furthermore, the nanowire-grid polarizer has been integrated monolithically with a Faraday magnetooptic garnet, which results in an integrated semi-isolator. Full free-space isolators based on the integrated semi-isolators have been also developed, which achieved excellent performance, good enough for commercial applications. [J580]

"Heat-resistant epoxy-silicon hybrid materials for printed wiring boards"

An epoxy-silicon hybrid resin based on a new concept has been developed. This resin has a structure in which epoxy-silicon oligomers by sol-gel reaction are incorporated into the epoxy resin matrix at the nanometer level. The nanostructure was confirmed by 29Si NMR spectrum and a time-resolved energy filtering-transmission electron microscopy technique. This epoxy-silicon hybrid resin shows excellent mechanical properties at high temperatures. The elastic modulus at 260°C was 0.6 GPa, much higher than the 0.08 GPa of conventional epoxy resins; and the thermal expansion coefficient above the glass transition temperature was two-thirds of the conventional one. It was confirmed that conventional fabrication process for FR-5 was applicable to copper clad laminates for the epoxy-silicon hybrid resin. [J581]

"Space charge phenomenology in polymeric insulating materials"

Topics related to space charge phenomenology, particularly the origin of space charge and its interaction with the host insulating polymer, have been widely discussed in recent years. Due to the development of reliable techniques for direct observation of space charge it is now possible to obtain, besides obvious indications on space charge and electric field magnitude and location, quantities that provide additional information on space charge accumulation and depletion rate, apparent mobility and trap depth distribution. Therefore, commonly debated topics such as the nature of charge carriers, the conduction mechanism, the charge dynamics at interfaces and the relation with nanostructure can be re-examined on the basis of space charge observation and this is, indeed, the purpose of this paper. [J582]

"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. [J583]

"In situ catalyzation of carbon nanostructures growth in low-frequency inductively coupled plasmas"

A low-frequency inductively coupled plasma source has been employed for in situ catalyzed growth of carbon nanostructures. The catalyzing process depends strongly on the plasma parameters and controls the shape and alignment of nanostructures. [J584]

"Structure and magnetic properties of chemically prepared mixtures of crystalline and amorphous Fe(B) nanoparticles"

A fine dispersion of crystalline and amorphous Fe(B) nanoparticles has been chemically prepared and its structural and magnetic properties compared to those of the corresponding single phase nanoparticles. The coercivity of the as-prepared dispersion was intermediate between that of the single phase crystalline and amorphous nanoparticles but less than expected from a simple rule of mixtures. Moreover, after annealing at temperatures below the crystallization temperature of the amorphous phase, the coercivity of the dispersion was reduced significantly below that of the single phase amorphous nanoparticles suggesting a modified interparticle interaction arising from the characteristic nanostructure of the dispersion. [J585]

"Magnetization reversal and nanostructure refinement in magnetically annealed Nd 2 Fe 14 B /alpha -Fe -type nanocomposites"

Nanostructure refinement, magnetic anisotropy and hard magnetic property enhancement have been observed in melt-spun Nd2.4Pr5.6Dy1Fe84Mo1B6nanocomposites annealed in an in-plane or out-of-plane field of 1.2T. The magnetic annealing results in an enhancement of an out-of-plane (110) crystal texture of alpha -Feand an in-plane uniaxial magnetic anisotropy of the 2:14:1 phase. Magnetic annealing also introduces finer, less angular and more homogeneously distributed soft and hard nanograins. Field dependent torque measurement indicates a complex magnetization reversal mechanism in these nanocomposites. Compared with the sample annealed without a field, there is a noticeable improvement in the hard magnetic properties for the magnetically annealed samples. Especially, the energy product (BH)maxwas enhanced by 26.6% (from 94to119kJ/m3). The improvement in the magnetic properties is a result of the enhanced crystallographic texture, nanostructure refinement, and in-plane uniaxial magnetic anisotropy enhancement. [J586]

"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. [J587]

"Physical models for coupled electromechanical analysis of silicon nanoelectromechanical systems"

Nanoelectromechanical systems (NEMS) can be designed and characterized by understanding the interaction and coupling between the mechanical, electrical, and the van der Waals energy domains. In this paper, we present physical models and their numerical simulation for coupled electrical and mechanical analysis of silicon NEMS. A nonlinear continuum elastic model is employed for mechanical analysis. The material properties required in the continuum model are extracted from molecular-dynamics simulations. We present three electrostatic models-namely, the classical conductor model, the semiclassical model, and the quantum-mechanical model, for electrostatic analysis of NEMS at various length scales. The electrostatic models also account for the corrections to the energy gap and the effective mass due to the strain in the silicon nanostructure. A continuum layer approach is introduced to compute the van der Waals forces. The coupling between the mechanical, electrical, and the van der Waals energy domains as well as their numerical implementation is described. Numerical results are presented for several silicon NEM switches to understand the

static electromechanical pull-in behavior. [J588]

"Nanostructure formation during ion-assisted growth of GaN by molecular beam epitaxy"

Ion-beam-assisted molecular beam epitaxy was used to grow GaN on sapphire by reacting Ga from an effusion cell with ammonia. With the ion beam at low glancing angle and energy between 60-500eV, periodic, nanoscale ripple and dots were observed both with and without growth. By changing the growth parameters, the dimensions could be tuned from 40to800nm. The ripple wavelength was analyzed in terms of continuum models. However, the time constant for pattern formation was several orders of magnitude less than that predicted by linear or nonlinear theories. The mobile adatom concentration was calculated and found to be quantitatively reasonable, increasing with increasing net growth rate. The ripple wavelength was observed to be well developed for nitrogen ion beams, but not with Ar ions within our energy and flux range. Adding growth reduced the measured wavelength rather than increasing it. [J589]

"In situ synthesis of Mn-doped ZnO multileg nanostructures and Mn-related Raman vibration"

Mn-doped ZnO multileg nanostructures were synthesized via in situ thermal oxidation of Zn and MnO2powder. Spectroscopic measurements show that Mn ions have been doped into the lattice positions of Zn ions, which strongly induce growth of the observed ZnO multileg nanostructure. It is revealed that the growth mechanism of this kind of multileg ZnO:Mn nanostructure is different from the traditional vapor-solid or vapor-liquid-solid nucleation model of ZnO nanostructures. A possible mechanism is discussed on the basis of the growth process of a tetrapod ZnO nanostructure. Furthermore, we report the observation of an additional Raman peak. This peak is considered to have an origin related to Mn dopant in the ZnO nanostructure. This Raman feature can be regarded as an indicator for the incorporation of Mn ions into the lattice positions of the multileg ZnO nanostructure. [J590]

"Effective magnetic permeability of Ni and Co micro- and nanoparticles embedded in a ZnO matrix"

Current trends in the miniaturization of microwave devices have prompted considerable interest in studying electromagnetic transport in nanoscale systems. Understanding the effect of physical structure and the role of interfaces is critical for gaining insight into the electromagnetic and magnetic properties of nanostructures and their behavior in microwave devices such as circulators and isolators. Previously, we have described the electromagnetic characteristics at microwave frequencies and the static magnetic properties of gamma -Fe2O3/ZnOmicro- and nanocomposites fabricated via powder processing. Here we present systematic effective permeability measurements of magnetically structured granular systems composed of magnetic grains embedded in a nonmagnetic matrix using broadband microwave spectroscopy. Using the transmission/reflection waveguide method, the effective complex permeability was measured in the frequency range of 0.01-10GHz. The results were compared for composites consisting of micrometer-sized (type-M) and nanometer-sized (type-N) Co and Ni particles embedded in a ZnO matrix. Results show that the type-Ncomposite samples display a prominent gyromagnetic resonance in the gigahertz region of frequency which can have a complex structure. In contrast, this resonance is not observable for the type-Mcomposite samples. These results are in agreement with the previous observations for the gamma -Fe2O3/ZnOcomposites. Interestingly, the Ni/gamma -Fe2O3type-Ncomposites exhibit a composition dependen- ce of the effective permeability which is quite different from the Co/ZnOand Ni/ZnOtype-Ncomposites. From the microwave data collected, it is found that a mean-field approach (effective-medium approximation) is appropriate for understanding the permeability of composite materials characterized by submicrometer inclusion length scales. The relevance of the Bruggeman and McLachlan models are tested against experimental data over a large range of composition. From these comparisons, although there are some systematic discrepancies to a certain extent, we conclude that the overall agreement of the spectral dependence of the complex permeability of Ni nanocomposites with the Landau-Lifshitz-Gilbert prediction is fairly good in view of the simple assumption. It seems that this phenomenology is also applicable to Co nanocomposites by assuming a double Lorentzian form for the gyromagnetic resonance. Analysis of the gyrorcsonance linewidths strongly suggests a large dispersion in the local field which presumably reflects the disordered physical nanostructure. [J591]

"One-dimensional zigzag gallium nitride nanostructures"

Two one-dimensional (1D) single-crystalline gallium nitride (GaN) nanostructures with periodic zigzag (type I) and diameter-modulated (type II) shapes have been synthesized by passing through ammonia over a mixture of gallium and gallium oxide (Ga2O3)powders held at elevated temperature. The process was catalyzed by the dispersion of thio-capped Au nanoparticles on the substrate onto which GaN nanostructures were condensed. The transformation between these two nanostructure morphologies was also observed. A possible growth model for the zigzag-shaped nanostructures is proposed, in which the formation of the zigzag nanostructures results

from the construction of two different nanoscale unit cells. This work provides an avenue to a group of 1D nanostructures with a zigzag shape. The possibility to form 1D nanostructures yet to be discovered by changing the stacking direction of the (0001) plane will facilitate the fabrication of nanoscale functional devices as well as our understanding of the growth behavior of nanoscale crystallites. [J592]

"The impact of energy band diagram and inhomogeneous broadening on the optical differential gain in nanostructure lasers"

We present a general theoretical model for the optical differential gain in semiconductor lasers. The model describes self assembly quantum dots (QDs), self assembly quantum wires (QWRs) and single quantum-well lasers. We have introduced the inhomogeneous broadening due to size fluctuations in the assembly cases. At each dimensionality, we have considered the carrier populations in the excited states and in the reservoirs, where conduction and valence bands are treated separately. We show that for room temperature operation the differential gain reduction due to increased size inhomogeneity is more pronounced in QDs than in QWRs. We show this reduction to be smaller than the one-order reduction attributed to state filling in conventional dot and wire assemblies operating at room temperature. The integration prefactor coefficient of the differential gain in zero-dimensional cases exceed one- and two-dimensional coefficients only for low temperatures where the homogenous broadening is considerably smaller than the thermal energy. The differential gain of QDs, QWRs, and compressively strained single quantum-well lasers operating at room temperature and close to equilibrium is nearly the same. [J593]

"Effect of crystal orientation on self-assembled silicon nanostructures formed by electron-beam annealing"

This paper discusses the growth of silicon nanostructures on silicon (100), (110), and (111) substrates by electron-beam annealing. The nanofabrication procedure involves annealing of the untreated Sisubstrates at 1100°Cfor 15susing a raster scanned 20-keVelectron beam. Nanostructuring occurs as a result of kinetic amplification of the surface disorder induced by thermal decomposition of the native oxide. Pyramidal and truncated pyramidal nanocrystals were observed on Si(100)surfaces. The nanostructures are randomly distributed over the entire surface and square based, reflecting the twofold symmetry of the substrate surface. Similar square-based pyramidal structures with four equivalent facets are observed following the nanostructuring of Si(110). With Si(111), nanostructure growth occurs preferentially along step edges formed on the vicinal surfaces. Significant differences in the shapes of nanostructures formed on step edges and terraces are related to the different growth mechanisms on the unreconstructed and 7Ч7reconstructed domains, respectively. [J594]

"Low-temperature catalyst adding for tin-oxide nanostructure gas sensors"

Thick-film gas sensors are successfully fabricated using the nanostructure tin-oxide powder. In order to suppress the coarsening of the nanostructure tin-oxide particles during the adding process, the low-temperature catalyst adding (LTCA) method is proposed in this paper. LTCA is an adding method of noble Pd catalyst onto the nanostructure tin-oxide particles under the lower temperature below 300°C by excluding chloride. It turned out that the adding without particle coarsening is successfully carried out by means of LTCA. Applying LTCA to the fabrication of the thick film using nanostructure tin-oxide powder having a size smaller than 5 nm leads to an excellent performance with respect to the methane gas sensing. After aging at 400°C, a good sensitivity (R3500/R1000) of 0.66 is obtained for the sensor doped with 5 wt% of Pd catalyst. Also, the sensitivity of the sensor is so stable that the deviation of the electrical resistance is within 3% after 400 h of aging. [J595]

"Cd1-x Mnx Te semimagnetic semiconductors for ultrafast spintronics and magnetooptics"

We present ultrafast optical characterization of Cd1-xMnxTe single crystals with high (x>0.5-Mn) concentration, studied by magnetooptical sampling and time-resolved magnetization modulation spectroscopy. We have demonstrated that the dynamics of both Mn spins and carrier spins in Cd1-xMnxTe is extremely fast (in the subpicosecond range), making the nanostructures based on this material very promising for applications in spintronics and magnetooptics. [J596]

"The effects of ion irradiation on porous silicon photoluminescence"

The effects of ion irradiation on porous Si (po-Si) photoluminescence (PL) are investigated to gain insight into the emission mechanism. Po-Si was obtained by standard electrochemical etching of p-doped Si(100) and the samples were aged for several weeks to achieve stability of the PL intensity. Specimens were progressively irradiated with H+, He+, or Ne++ions followed by PL measurements. PL spectra were obtained as a function of the displacement per atom (DPA) parameter up to a DPA level of 10-2, which was sufficient to nearly

extinguish PL. The quenching behavior showed a strong dependence on the chemical nature of the implanted species. Within experimental error, the quenching efficiency was equivalent for He+and Ne++irradiations, but was considerably higher for H+irradiation. Channeling spectrometry showed the efficiency to be correlated with the self-recovery of defects generated during irradiation. The observed PL quenching is associated with the creation of nonradiative recombination sites within the band gap, but not with Si nanostructure amorphization and/or surface oxygen removal. Significant recovery of quenched PL occurs over a period of 120daysfor specimens that are stored in air, but not for samples that are stored in vacuum. These results demonstrate the importance and complexity of surface oxidation on the po-Si luminescence mechanism. [J597]

"Effects of heat generation during electron-beam-induced deposition of nanostructures"

To elucidate the effects of beam heating in electron-beam-induced deposition (EBID), a Monte Carlo electron-solid interaction model has been employed to calculate the energy deposition profiles in bulk and nanostructured SiO2. Using these profiles, a finite element model was used to predict the nanostructure tip temperatures for standard experimental EBID conditions. Depending on the beam energy, beam current, and nanostructure geometry, the heat generated can be substantial. This heat source can subsequently limit the EBID growth by thermally reducing the mean stay time of the precursor gas. Temperature-dependent EBID growth experiments qualitatively verified the results of the electron-beam-heating model. Additionally, experimental trends for the growth rate as a function of deposition time supported the conclusion that electron-beam-induced heating can play a major role in limiting the EBID growth rate of SiO2nanostructures. [J598]

"Silica-supported silver nanoparticles: Tailoring of structure-property relationships"

Silica-supported silver nanoparticles were obtained by rf sputtering from Ar plasmas under soft synthesis conditions, with particular attention to the combined influence of rf power and total pressure on the system composition, nanostructure, morphology, and optical properties. In order to attain a thorough insight into the nucleation and growth phenomena of Ag nanoparticles on the silica substrate, several in situ and ex situ characterization techniques were used. In particular, a laser reflection interferometry system was employed for a real-time monitoring of the deposition process, providing useful and complementary information with respect to the other ex situ techniques (x-ray photoelectron spectroscopy and x-ray excited Auger electron spectroscopy, glancing incidence x-ray diffraction, atomic force microscopy, optical-absorption spectroscopy, and transmission electron microscopy). The above investigations evidenced the formation of silver-based nanosystems (average crystallite size ≤10nm), whose features (metal content, Ag particle size and shape, structure and optical properties) could be carefully tailored by moderate and controlled variations of the synthesis parameters. [J599]

"Coherent precipitation in the TbCu 7 -type GdCo -based ribbons prepared by simple processing"

Isotropic Gd(Co0.88-xCuxFe0.09Zr0.03)7(x=0.10-0.20)ribbons with TbCu7structure have been prepared by melt-spinning technique. A uniform and fine cellular microstructure consisting of 2:17 cell with 1:5 cell-boundary phase is developed by simply slow cooling the ribbons from 850to 400°Cwithout the standard solid solution and isothermal aging treatments. It is interesting to note that the original grain boundary of 1:7 phase still exists in the precipitation-hardened ribbons and the crystallographic texture is formed in each 1:7 granular region after the treatment. This gives a way to fabricate the textured magnets with nanostructure. Positive temperature coefficients of remanence and coercivity are observed in the ribbons. The coercivity mechanism of the precipitation-hardened ribbons is discussed at the temperature ranging from room temperature to 600°C. It is proposed that the residual 1:7 phase boundaries act as effective pinning sites at high temperatures. [J600]

"Influence of eddy current on magnetization processes in submicrometer permalloy structures"

In this paper, we determine the critical particle size and conductivity range that leads to pronounced eddy current effects on magnetization reversal of magnetic nanostructures. An extended finite-element micromagnetic solver which includes eddy currents is used to calculate the magnetization behavior of a permalloy nanocube of 27 nm side under the influence of an applied field. It is shown that for high-conductivity σ>106(Ω m)-1in the intermediate state of reversal it takes the magnetization longer to fully align in the direction of the applied field. [J601]

"Ex situ ellipsometric investigation of nanocolumns inclination angle of obliquely evaporated silicon thin films"

We propose an application of spectroscopic ellipsometry pertinent to the characterization of nanostructure inclination of oblique thin films. This technique is employed ex situ in the measurement of silicon thin films fabricated at oblique incidence and modeled as aggregate microstructures formed from amorphous silicon, silicon oxide, and void in the effective medium model. The technique may also be utilized in situ as a powerful probe

for the characterization of oblique thin films during their fabrication and processing. [J602]

"Ultraslow light (200 m /s) propagation in a semiconductor nanostructure"

We report time-domain measurements of ultraslow light propagation in a semiconductor quantum-well structure using coherent population oscillation. Delays greater than 1 ns are achieved for an amplitude-modulated optical beam propagating through a 195-nm-long active region, corresponding to group velocities less than 200m/s. Delays can be easily varied by adjusting the intensity of the control laser. The bandwidth is suitable to delay sub-GHz modulated optical signals. [J603]

"Patterning lyotropic liquid crystals as precursors for carbon nanotube arrays"

We report on a simple patterning technique using lyotropic liquid-crystal solutions to fabricate organized arrays of high aspect ratio carbon nanostructures. An automated pen writing system is used in conjunction with nanochannel alumina templates to produce ordered arrays of nanotubes and nanofibers in a variety of shapes, widths, and carbon crystal structures set by surface anchoring phenomena. The nanostructure arrays are characterized with optical and electron microscopy and Raman spectroscopy to establish the morphology and crystal structures of the carbon nanoform arrays. [J604]

"Epitaxial nanostructure and defects effective for pinning in Y (RE)Ba 2 Cu 3 O 7-x coated conductors"

This paper describes the microstructure to improve the magnetic field dependence of the critical current density, Jc, of Y(RE)Ba2Cu3O7-x[Y(RE)123, RE: Gd and Sm] coated conductors. A columnar microstructure 10nmin diameter has been obtained by using Y123 targets including yttrium-stabilized zirconium for the pulsed-laser deposition. This columnar structure, composed of BaZrO3and Y123, continued from the substrate to the surface of the film 0.25mcmin thickness. We have named it "the bamboo structure" from its morphology. The bamboo structure was effective for increasing Jcin a magnetic field especially parallel to the c-axis. We have also found stacking faults in RE123 effective to improve Jc. [J605]

"Superconducting NbSe 2 nanowires and nanoribbons converted from NbSe 3 nanostructures"

We describe the synthesis of superconducting NbSe2nanowires and nanoribbons by the nondestructive removal of Se from one-dimensional NbSe3nanostructure precursors. We report scanning electron microscopy imaging, x-ray diffraction, and transmission electron microscopy analyses of the morphology, composition, and crystallinity of the converted NbSe2nanostructures. Transport measurements on individual nanowires/ribbons confirm their superconductivity with Tc 7.2K, and the appearance of current-induced resistance steps is attributed to localized phase slip centers, akin to those reported in other superconducting nanostructures. [J606]

"Effect of B content on nanostructure evolution and twinning deformation of nanocrystallite in nc -Ti (N ,B)/a-(Ti B 2 ,B N) nanocomposite thin films"

Nanostructure evolution and deformation of nanocrystallites in nanocrystalline (nc-) Ti(N,B)/amorphous (a-) (TiB2,BN)thin films were investigated by high resolution transmission electron microscopy. The results indicated that the incorporation of B into TiN led to the formation of the nanocomposite that consists of nc-Ti(N,B) grains embedded in an amorphous matrix. Increasing B content accelerated not only the formation of more [200]-oriented grains but also the twining deformation in nanocrystallites. The deformation was enhanced with increasing B content, which was attributed to the decrease of grain size with increasing B content and the formation of nc-Ti(N,B) solid solution by dissolving B into the TiN lattice. [J607]

"ZnO symmetric nanosheets integrated with nanowalls"

Diverse ZnO integrated nanostructures, constructed by epitaxial nanowalls and symmetric single-crystalline nanosheets, were successfully synthesized via a strain-assisted self-catalyzed process at a low temperature of 500°C. The nanostructures started with the growth of ZnO nanowires, nucleated on a rugged ZnO single-crystalline film via a strain-assisted self-catalyzed growth mechanism. The nanowalls were then formed by the interconnection of the nanowires. Finally, the nanosheets were grown from the edges of the nanowalls. The growth mechanisms were supported by direct experimental evidence. Room-temperature cathodoluminance spectra show a relatively strong and sharp ultraviolet emission as well as a weak and broad green emission. The integrated nanostructure may be applied to develop self-inclusive nanoelectronics. [J608]

"Nanoscale dislocation patterning by ultralow load indentation"

The use of nanoindentation as a dislocation patterning technique for self-assembled nanostructures is investigated. In this context we have studied the behavior of GaAs under ultralow load indentation conditions. It is shown that periodic dislocation arrays are formed and can be well controlled by nanoindentation. Transmission electron microscopy (TEM) reveals that the crystal deforms solely by dislocation activity with no evidence of stacking faults, twinning, fracture, or phase transformation. The resulting strain field is highly localized, indicating that ultralow load nanoindentation may provide an excellent means to mechanically bias nanostructure nucleation and patterning during subsequent crystal growth. [J609]

"Self-organization of polyaniline nanorods: Towards achieving a higher conductivity"

We present a scanning tunnelling microscopy and spectroscopy study of polyaniline nanostructure. Our results show the possibility of achieving a high degree of self-organization in polyaniline nanorods in the undoped as well as the doped states. The spectroscopy results clearly establish a direct correlation between the extent of ordering and the density of states at the Fermi energy of the doped samples. Small angle x-ray scattering experiment helps to understand the formation of such self-organized structures. [J610]

"Efficient field emission from alpha -Fe 2 O 3 nanoflakes on an atomic force microscope tip"

Aligned arrays of flake-shaped hematite (alpha -Fe2O3)nanostructure have been fabricated on an atomic force microscope (AFM) tip. They are created by simply heating an iron-coated AFM tip in ambience on a hot plate. These nanoflakes are characterized as alpha -Fe2O3single crystalline structures with tip radii as small as several nanometers and are highly effective as electron field emitters. With a vacuum gap of about 150mcm, field emission measurements of alpha -Fe2O3nanoflakes on AFM tips show a low turn-on voltage of about 400-600Vand a high current density of 1.6Acm-2under 900V. Such high emission current density is attributed to the nanoscale sharp tips of the as-grown nanoflakes. Based on the Fowler-Nordheim theory, it is demonstrated the enhancement factor of alpha -Fe2O3nanoflakes on AFM tips is comparable to that of carbon nanotubes. Our findings suggest that alpha -Fe2O3nanoflakes are potentially useful as candidates for future electron field emission devices. [J611]

"Intraband magnetoabsorption as a probing tool for the quantum dot charge"

A method of characterizing the quantum dot charge buildup in a magnetic field is proposed based on the far-infrared magneto-optical response properties. The inherent topological symmetry of the nanostructure and several optical configurations are analyzed as key factors determining the appropriate use of intraband transitions as a probing tool for the quantum dot charge buildup. [J612]

"Local density of states mapping of a field-induced quantum dot by near-field photoluminescence microscopy"

We have described near-field photoluminescence microscopy of a field-induced quantum-dot structure based on a Be-delta -doped GaAs-Al1-xGaxAssingle heterojunction with a surface square mesh gate. The local density of states in the field-induced quantum dot was mapped by measuring the spatial distribution of the near-field photoluminescence intensity, because the photoluminescence spectrum owing to the recombination of holes bound to Be accepters with electrons in an electron gas contains information on the electronic density of states. Experimentally, we observed that the electrons confined in lower energy states spatially localize in a field-induced quantum dot. [J613]

"Synthesis and magnetic characterization of ZnFe2 O4 nanostructure in AAO template"

One-dimensional-magnetic nanostructures have recently attracted much attention because of their intriguing properties that are not displayed by their bulk or particle counterparts. One of the commonly used methods for generating ID-nanostructures is based on the electrodeposition of various materials in porous membranes. This technique has been applied to fabricate metallic nanowires as arrays of wires perpendicular to the substrate. They display unique magnetic properties (e.g., anisotropic magnetization). Electrodeposition is, however, of limited use for oxide-based magnetic materials, due to the difficulty involved in the formation of oxides through electrochemical deposition. We obtained zinc ferrite nanowires inside an anodic aluminum oxide (AAO) template using a novel technology fundamentally different from electrodeposition. First, fabricated zinc ferrite nanoparticles were injected in the AAO template and then annealed in air. The process of embedding particles into the pores was assisted by the magnetic field of a permanent magnet placed under the substrate. The physical and chemical properties of these zinc ferrite nanowires have been investigated by thermogravimetric analysis, infrared, X-ray diffraction, scanning electron microscope, and superconducting quantum interference device. The nanoparticles embedded into the pores exhibited superparamagnetic behavior with the blocking temperature of 15 K. After annealing, the particles formed nanowires and the hysteresis of the annealed samples increased

significantly. [J614]

"Rotation and wall propagation in multidomain Co/Pd islands"

Patterned magnetic structures with sizes ranging from 30 nm to 5 μm have been fabricated to investigate the magnetization reversal of Co/Pd islands with perpendicular anisotropy. The nucleation field for reversal in islands capable of supporting a multidomain ground state (size ranging from 200 nm to 5 μm) is higher than the domain wall propagation field and is characterized by a Stoner-Wohlfarth-like angle dependence. Pre-reversed nucleation sites in the islands leads to the 1/cos(θ) switching behavior indicative of domain wall motion. [J615]

"High-sensitivity InSb thin-film micro-Hall sensor arrays for simultaneous multiple detection of magnetic beads for biomedical applications"

An InSb thin-film linear micro-Hall sensor array of eight sensors, each with a sensitivity of 10 nT/Hz12/ was developed for biomedical applications. The individual Hall sensors had an active area of 5 μmЧ5 μm and were separated by a distance of 5 μm. A combination of these Hall devices and a magnetization system incorporating both dc and ac bias magnetic fields, enabled the simultaneous detection of multiple 2.8 μm diameter superparamagnetic beads. [J616]

"Reversible magnetization variations in large field ranges associated to periodic arrays of antidots"

The remanence configurations and magnetization reversal processes of square arrays of circular antidots lithographed in thin Fe films are analyzed on the framework of a micromagnetic model as a function of the antidot diameter and interantidot distance. From our simulation results, we conclude that the remanence and the global reversal process are determined by inhomogeneous moment structures surrounding the antidots and originated from the magnetostatic energy minimization. [J617]

"Nanostructure and magnetic properties of As-quenched Fe-based ribbons"

Nanocrystalline ribbons Fe-Cu-Nb-Si-B and Fe-Zr-B-Cu with high effective permeability μe, high saturation magnetic induction Bs, and low saturation magnetostriction λscan be fabricated by melt-spinning technique without additional annealing processes. We obtained magnetic properties of Bs=1.23 T, μe(at 1 kHz)=74300,λs=2Ч10-6for as-quenched nanocrystalline ribbon Fe72Cu2.5Nb3Si13.5B9, and properties of Bs=1.55 T, μe(at 1 kHz)=27100,λs=-1Ч10-6for as-quenched nanocrystalline ribbon Fe87Zr7B3Cu3, respectively. [J618]

"Control of magnetic behavior in Fe3 O4 nanostructures"

Hexagonally well-ordered nanoporous anodized aluminum oxide (AAO) templates were synthesized by electrochemical method. Then, magnetite (Fe3O4) nanoparticles of 8-15-nm diameter were filled in the pores of the AAO template, and then the morphology and magnetic properties were characterized. Vibrating sample magnetometer measurement indicated that the nanoparticles inside AAO showed superparamagnetic behavior at as-filled state. But after annealing at 600°C for 2 hr, the nanostructure (i.e., an assembly of nanoparticles) exhibited coercivity of 80 Oe. Superconducting quantum interference measurement device data showed that after annealing the blocking temperature was above 300 K. Thus, the annealed magnetite nanostructures possessed ferrimagnetism. [J619]

"Tunable multiferroic properties in nanocomposite PbTiO 3 -CoFe 2 O 4 epitaxial thin films"

We report on the synthesis of PbTiO3-CoFe2O4multiferroic nanocomposites and continuous tuning of their ferroelectric and magnetic properties as a function of the average composition on thin-film composition spreads. The highest dielectric constant and nonlinear dielectric signal was observed at (PbTiO3)85-(CoFe2O4)15, where robust magnetism was also observed. Transmission electron microscopy revealed a pancake-shaped epitaxial nanostructure of PbTiO3on the order of 30 nm embedded in the matrix of CoFe2O4at this composition. Composition dependent ferroics properties observed here indicate that there is considerable interdiffusion of cations into each other. [J620]

"Architecture and engineering of a supramolecular functional material by manipulating the nanostructure of fiber network"

Three-dimensional fiber networks were created from an organogel system consisting mainly of elongated fibrils by using a nonionic surfactant as an additive. The presence of the surfactant molecules manipulates the network structure by enhancing the mismatch nucleation on the growing fiber tips. Both the fiber network structure and

the rheological properties of the material can be finely tuned by changing the surfactant concentration, which provides a robust approach to the engineering of supramolecular soft functional materials. [J621]

"Filling a spectral hole via self-phase modulation"

The effect of spectral amplitude modulation on self-phase modulation is studied. To that end we remove a small interval of frequency components from the broad spectrum of a femtosecond laser pulse. We investigate the regeneration of these missing frequency components via self-phase modulation. A water jet serves as a transparent sample. A physical model is given which explains the observation that the removed frequency components are not only replenished by self-phase modulation but can even overshoot their adjacent frequencies in power spectral density. In addition, we suggest possible applications in the field of nonlinear microscopy. [J622]

"High coercivity Co-ferrite thin films on SiO2 (100) substrate prepared by sputtering and PLD"

Co-ferrite thin films with high coercivity were deposited on SiO2single crystal substrates by sputtering and pulsed laser deposition (PLD). All the films were subsequently annealed at a temperature from 500°C to 1200°C. Magnetic properties were found to be strongly related to annealing temperature, substrate, thickness and thin film deposition methods. A coercivity as high as 9.3 kOe was achieved in the 50 nm film after annealing at 900°C for 15 min deposited on (100)-SiO2substrate using sputtering. The high coercivity was associated with the nano-structure, relatively large micro-strain, and a high density of defects. [J623]

"Recent progress in exact and reduced-order modeling of light-scattering properties of complex structures"

An emerging research area in biophotonics with potentially near-term clinical applications in early stage cancer detection involves the investigation of possible correlations of the elastic light scattering properties of tissues with alterations in their cellular composition and nanostructure. Until recently, exploring these correlations has been impeded by a lack of robust and accurate mathematical models of the light scattering properties of complex structures. In this paper, we review recent progress in this area. Topics include: 1) development of accurate reduced-order expressions for the total scattering cross section spectra of a wide range of nonspherical and inhomogeneous particles; 2) rigorous finite-difference time-domain modeling results showing how the backscattering of light can be sensitive to nanometer scale features embedded within micrometer-scale particles; and 3) development of accurate reduced-order expressions for the backscattering depolarization properties of a wide range of inhomogeneous particles. These advances provide an improved science base for cellular level biophotonics, and have promise to accelerate the development of novel corresponding clinical technologies. [J624]

"GaN nanostructure fabrication by focused-ion-beam-assisted chemical vapor deposition"

Gallium nitride (GaN) nanostructures were fabricated by focused-ion-beam-assisted chemical vapor deposition. Gallium precursor gas and atomic nitrogen radicals were irradiated onto the surface simultaneously during the irradiation of a Ga ion beam of 25keVat 600°C. Scanning electron microscopy observations revealed three-dimensional structures formed periodically on the substrates. Although near-band-edge emission from GaN was observed using this method, other luminescence attributed to defects and/or impurities was also observed. Surface damage caused by the ion beam was also observed. To improve the structural shape and optical properties, a two-step growth method is proposed. First, structure formation was performed at 300°C. Second, nitridation was performed at 600°Cto make the GaN nanostructures stoichiometric and to activate the nitrogen in the structures. GaN nanostructures of a 200nmЧ100nmblock of height 50nmwere fabricated and strong near-band-edge emission at 3.37eVfrom GaN was observed. [J625]

"Near-field optical spectroscopy and microscopy of self-assembled Ga N /Al N nanostructures"

The spatial distribution and emission properties of small clusters of GaN quantum dots in an AlN matrix are studied using high-resolution electron and optical microscopy. High-resolution transmission electron microscopy reveals near vertical correlation among the GaN dots due to a sufficiently thin AlN spacer layer thickness, which allows strain induced stacking. Scanning electron and atomic force microscopy show lateral coupling due to a surface roughness of 50-60nm. Near-field photoluminescence in the illumination mode (both spatially and spectrally resolved) at 10Krevealed emission from individual dots, which exhibits size distribution of GaN dots from localized sites in the stacked nanostructure. Strong spatial localization of the excitons is observed in GaN quantum dots formed at the tip of self-assembled hexagonal pyramid shapes with six [1011]facets. [J626]

"Self-aligned Co nanoparticle chains supported by single-crystalline Al 2 O 3 /Ni Al (100) template"

We present Co nanoparticle chains grown by vapor deposition over a single-crystalline Al2O3layers on NiAl(100) with such features as self-limiting size distribution with the average size of 2.7nm, well-ordered alignment, and high thermal stability. We attribute these features to peculiar one-dimensional long stripes with 4nminterdistance on the surface of the ultrathin Al2O3template. This nanostructure may open the door to numerous applications, such as catalysis and nanostorage, where large area well-ordered nanodots are desired. [J627]

"Investigation of the nanostructure and wear properties of physical vapor deposited CrCuN nanocomposite coatings"

This article presents results on CrCuN nanocomposite coatings grown by physical vapor deposition. The immiscibility of Cr (containing a supersaturation of nitrogen) and Cu offers the potential of depositing a predominantly metallic (and therefore tough) nanocomposite, composed of small Cr(N) metallic and/or beta -Cr2Nceramic grains interdispersed in a (minority) Cu matrix. A range of CrCuN compositions have been deposited using a hot-filament enhanced unbalanced magnetron sputtering system. The stoichiometry and nanostructure have been studied by x-ray photoelectron spectroscopy, transmission electron microscopy, scanning electron microscopy, and x-ray diffraction. Hardness, wear resistance, and impact resistance have been determined by nanoindentation, reciprocating-sliding, and ball-on-plate high-cycle impact. Evolution of the nanostructure as a function of composition and correlations of the nanostructure and mechanical properties of the CrCuN coatings are discussed. A nanostructure comprised of 1-3 nm alpha -Cr(N)and beta -Cr2Ngrains separated by intergranular regions of Cu gives rise to a coating with significantly enhanced resistance to impact wear. [J628]

"Binary and ternary NiTi-based shape memory films deposited by simultaneous sputter deposition from elemental targets"

The most challenging requirement for depositing NiTi-based shape memory thin films is the control of film composition because a small deviation can strongly shift the transformation temperatures. This article presents a technique to control film composition via adjustment of the power supplied to the targets during simultaneous sputter deposition from separate Ni, Ti, and X (e.g., Hf) targets. After optimization of sputter parameters such as working gas pressure, target-substrate distance, and target power ratio, binary Ni100-xTixthin films were fabricated and characterized by energy dispersive x-ray spectroscopy in a scanning electron microscope (to measure the film composition and uniformity), in situ x-ray diffraction (to identify the phase structures), and differential scanning calorimetry (to indicate the transformation and crystallization temperatures). To explore the possibility of depositing ternary shape memory NiTi-based thin films with a high temperature transformation 100°C, a Hf target was added to the NiTi deposition system. Annealing was carried out in a high vacuum furnace slightly above the films' crystallization temperatures (500 and 550 °C for NiTi and NiTiHf films, respectively). Differential scanning calorimetry (DSC) results of free-standing films illustrated the dependence of transformation temperatures on film composition: Ap and Mp (referring to the austenitic and martensitic peaks in the DSC curve) were above room temperature in near equiatomic NiTi and Ti-rich films, but below it in Ni-rich films. In NiTiHf films, the transformation temperatures were a function of Hf content, reaching as high as 414 °C (Ap) at a Hf content of 24.4 at. %. Atomic force microscopy revealed nanostructure surface morphology of both NiTi and NiTiHf films. Detailed characterization showed tha--t the film properties were comparable with those of NiTi and NiTiHf bulk alloys. [J629]

"Optical properties of porous nanostructured Y 2 O 3 :Eu thin films"

Nanostructured photoluminescent thin films of europium-doped yttrium oxide (Y2O3:Eu), a well-known luminescent material, were grown using electron-beam evaporation in combination with the glancing-angle deposition technique. GLAD makes use of controlled substrate motion during extremely oblique physical vapor deposition of a thin film resulting in a high degree of control over the nanostructure of the film. Scanning electron microscopy and x-ray diffraction were used to characterize film nanostructure, while the light emission properties of these films were characterized by photoluminescence measurements. Transmission ellipsometry measurements were used to determine the degree of selective transmission of polarized light through the samples. The polarization of the emission from chevronic and helical films was determined through the measurement of the Stokes parameters of the emitted light for each sample. Comparison of the degree of polarization during the emission experiments to the degree of selective transmission during the transmission experiments, as well as comparison of the sense of the polarization of the output light in each case, showed that a filtering effect related to the nanostructural morphology was likely the source of the polarization of the output light in both cases. [J630]

"Three-layered organic solar cells incorporating a nanostructure-optimized phthalocyanine:fullerene codeposited interlayer"

Three-layered organic solar cells incorporating a codeposited interlayer of fullerene and metal-free phthalocyanine, whose nanostructure was optimized by controlling the substrate temperature during coevaporation, showed a photoelectric conversion efficiency of 2.5% under illumination with simulated solar light. The three-layered cells were concluded to have a p-i-n-like energetic structure. [J631]

"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. [J632]

"High performance 100 mm -in-diameter true zero-order waveplates fabricated by imprint lithography"

Commercial quality high-performance true zero-order quarter waveplates based on artificial dielectric nanostructures were made by high throughput and low cost wafer-based nanofabrication processes. Both precise phase retardation (90°±2°across a 100mm-in-diameter glass wafer) and a high transmittance (98.8%)were achieved. The quarter waveplates with different center wavelengths, such as, 780nmand 660nm, have been fabricated for optical pick-up (CD/DVD) applications. The nanostructure based true zero-order quarter waveplates are operational at a large wavelength and temperature range under a wide incident angle. The developed high quality true zero-order quarter waveplates have the potential for many cost-sensitive optical applications. Furthermore, it opens the potential for integrated optical applications thanks to the nanofabrication processes. [J633]

"Nonvolatile phase change memory nanocell fabrication by femtosecond laser writing assisted with near-field optical microscopy"

The phase change memory cells were developed by using a combination system of a femtosecond laser with near-field scanning optical microscopy. The memory cells with feature size varying from 800nmdown to 90nmwere achieved. The cell functional performances were tested, and the scalability of the programming current as a function of the memory cell features was investigated. The optical near-field distance which is one of the critical factors to achieve high resolution nanostructures was studied experimentally with the consideration of the whole fabrication process for functional devices. The Bethe-Bouwkamp model was employed to study the effects of the optical near-field distance to the nanostructure geometry. The programming current of 0.8mAwas observed for the memory nanocell at a feature size of 90nm. [J634]

"Copper nanopattern on Si O 2 from sputter etching a Cu /Si O 2 interface"

We have observed a Cu nanostructure self-assembled on a SiO2substrate during ion beam etching the Cu/SiO2interface. We have deposited a thin Cu layer on a glass substrate and etched the deposited layer by a neutralized argon ion beam. At the stage when almost all metal is removed by etching, we have observed an 20-nm-sized Cu pattern on the substrate. By atomistic Monte Carlo simulations we have demonstrated that during sputter etching, a morphology self-organizes on the surface of the Cu layer whose size and shape matches the observed Cu nanostructure. We conclude that the observed Cu nanopattern on the substrate results from the surface morphology developed by sputter instability during etching of the deposited layer. [J635]

"Tunneling and nonlinear transport in a vertically coupled GaAs /AlGaAs double quantum wire system"

We report low-dimensional tunneling in an independently contacted vertically coupled quantum wire system. This nanostructure is fabricated in a high quality GaAs/AlGaAsparallel double quantum well heterostructure. Using a

unique flip chip technique to align top and bottom split gates to form low-dimensional constrictions in each of the independently contacted quantum wells we explicitly control the subband occupation of the individual wires. In addition to the expected two-dimensional (2D)-2D tunneling results, we have found additional tunneling features that are related to the one-dimensional quantum wires. [J636]

"Characterization of nanotextured AlN thin films by x-ray absorption near-edge structures"

AlN thin films have been grown on c-cut sapphire substrates by pulsed-laser deposition. The film epitaxially grown at 1073 K under vacuum of 5Ч10-4Pawas used to examine the crystallographic orientation dependence of Al K-edge x-ray absorption near-edge structures (XANES), which satisfactorily agrees with theoretical spectra obtained by first-principles calculations. The film grown at 1073 K with N2backfill of 7Ч10-2Pashows nanotextured structure with its cplane parallel to the substrate. Although the nanotexture is not evident by x-ray diffraction, XANES can unambiguously indicate the texturing. Cross-sectional high-resolution electron microscopy provides the evidence of the nanostructure. [J637]

"Propagation of shear bands in Ti 66.1 Cu 8 Ni 4.8 Sn 7.2 Nb 13.9 nanostructure-dendrite composite during deformation"

During deformation of Ti66.1Cu8Ni4.8Sn7.2Nb13.9nanostructure-dendrite composite, primary and secondary shear bands form under perpendicular orientation. Detailed investigation of the microstructure of deformed specimens reveals deformed body-centered-cubic (bcc) beta -Ti dendrites forming a stepped morphology at the interfaces between the bcc beta -Ti dendrites and the nanostructured matrix, consisting of hexagonal close packed (hcp) alpha -Ti and body-centered-tetragonal (bct) Ti2Cuphases. In the nanostructured matrix, the primary shear bands pass through coherent grain boundaries between the hcp alpha -Ti and the bct Ti2Cuphases. In contrast, the secondary shear bands in the nanostructured matrix are arrested by sandwiched nanoscale grains of the hcp alpha -Ti and bct Ti2Cuphases. [J638]

"Spin control in heteromagnetic nanostructures"

We suggest and verify experimentally a concept of heteromagnetic semiconductor structures. It is based on spin diffusion between layers of the nanostructure with different magnetic properties and allows to control the spin-switching rate for magnetic ions. A ten times increase of spin-lattice relaxation rate of magnetic Mn ions is achieved in Zn1-xMnxSe/Be1-yMnyTeheteromagnetic structures with an inhomogeneous distribution of Mn ions. [J639]

"Self-organized nanocolumnar structure in superhard TiB 2 thin films"

TiB2thin films are well known for their high hardness which makes them useful for wear-resistant applications. Overstoichiometric TiB2deposited at 300 °C by nonreactive sputtering has been shown to exhibit superhardness (H≥40GPa), while the hardness of their bulk stoichiometric counterparts is 25GPa. We show, using high-resolution transmission electron microscopy, that overstoichiometric TiB2.4layers have a complex self-organized columnar nanostructure. The 20nmwide columns, encapsulated in excess B and oriented along 0001, consist of a bundle of 5nmdiameter TiB2subcolumns separated by an ultrathin B-rich tissue phase. The nanocolumnar structure, which is thermally stable to postannealing temperatures up to 700 °C, inhibits nucleation and glide of dislocations during hardness indentation measurements, while the high cohesive strength of the B-rich tissue phase prevents grain-boundary sliding. The combination of these effects results in the observed superhardness of 60GPa. [J640]

"Field emission from AlN nanorod array"

Single-crystalline mushroom-like AlN nanorod array has been synthesized. The AlN nanorods, with diameters of 50-200nmand lengths of several micrometers, are distributed uniformly with density of 107-108rods/cm2. The field emission measurements show that the turn-on field is 8.8V/mcmat a field emission current density (J)of 10mu A/cm2, and the J(10.31mA/cm2)fluctuation is as small as 2% within an hour. The relationship between the nanostructure and field emission properties is discussed. The low turn-on field and high current stability demonstrate that the mushroom-like AlN nanorod array is a promising field emission material. [J641]

"Focused-ion-beam platinum nanopatterning for GaN nanowires: Ohmic contacts and patterned growth"

Nanopatterned Pt by Ga+focused ion beam (FIB) decomposition of an organometallic precursor forms low resistance ohmic contacts on 40-70nmdiameter GaN nanowires (NWs) grown by thermal reaction of Ga2O3and NH3. With no intentional doping, the wires are presumed to be ntype. Thus, the linear I-Vbehavior is surprising

since evaporated Pt usually forms Schottky barriers on nGaN. Ohmic behavior was not obtained for 130-140 diameter wires, even with thicker Pt contacts. A second application of FIB Pt nanopatterning was demonstrated by position-selective growth of GaN NWs on Pt catalyst dots. NW locations and density are defined by the position, size, and thickness of the Pt deposit. Combining these techniques provides a versatile platform for nanostructure research and development. [J642]

"Assembly and characterization of hybrid virus-inorganic nanotubes"

Recently, rod-shaped viruses have attracted attention as biological templates for assembly of nanostructures. Tobamoviruses such as the type strain of Tobacco mosaic virus (TMV-U1, or -common) have a cylindrical shape and dimensions suitable for nanoelectronic applications: 300nmlong and 18nmin diameter with a 4nmaxial channel. TMV particles can be coated with metals, silica, or semiconductor materials and may also form end-to-end assemblies to be used as interconnects or device channels. In this letter, we report the preparation of TMV-U1 templated organic-metal nanotubes, and their structural characterization using transmission electron microscopy and micro-Raman spectroscopy. Reproducible phonon signatures different from that of native TMV-U1 were observed from the metal-coated TMVs. Our results indicate that Raman spectroscopy can be used for monitoring of the bio-assisted nanostructure assembly and for analyzing the vibrational modes of the resulting bio-inorganic junctions. [J643]

"Reactive magnetron sputtering of hard Si-B-C-N films with a high-temperature oxidation resistance"

Based on the results obtained for C-N and Si-C-N films, a systematic investigation of reactive magnetron sputtering of hard quaternary Si-B-C-N materials has been carried out. The Si-B-C-N films were deposited on p-type Si(100) substrates by dc magnetron co-sputtering using a single C-Si-B target (at a fixed 20% boron fraction in the target erosion area) in nitrogen-argon gas mixtures. Elemental compositions of the films, their surface bonding structure and mechanical properties, together with their oxidation resistance in air, were controlled by the Si fraction (5-75%) in the magnetron target erosion area, the Ar fraction (0-75%) in the gas mixture, the rf induced negative substrate bias voltage (from a floating potential to -500V) and the substrate temperature (180-350°C). The total pressure and the discharge current on the magnetron target were held constant at 0.5Paand 1A, respectively. The energy and flux of ions bombarding the growing films were determined on the basis of the discharge characteristics measured for the rf discharge dominating in the deposition zone. Mass spectroscopy was used to show composition of the total ion fluxes onto the substrate and to explain differences between sputtering of carbon, silicon and boron from a composed target in nitrogen-argon discharges. The films, typically 1.0-2.4mcmthick, possessing a density around 2.4gcm-3, were found to be amorphous in nanostructure with a very smooth surface (Ra≤0.8nm)and good adhesion to substra--tes at a low compressive stress (1.0-1.6GPa). They exhibited high hardness (up to 47GPa) and elastic recovery (up to 88%), and extremely high oxidation resistance in air at elevated temperatures (up to a 1350°Csubstrate limit). [J644]

"Thermally activated switching in spin-flop tunnel junctions"

Magnetic tunnel junctions with a flux-closed sandwich replacing the single-soft layer have been proposed for increasing the magnetic stability of the junctions. Such flux-closed soft layers have two antiferromagnetic ground states and reverse by spin-flop switching. They are expected to essentially eliminate the critical issue of thermally activated reversal under half-select fields and ease the scaling of the emerging technology of magnetic random access memory. High-speed pulse measurements of such submicron spin-flop junctions performed over nine decades in time are reported here. The switching probability as a function of the pulse field amplitude and duration is analyzed to estimate the energy barrier to thermal activation. This activation energy is found to be substantially enhanced compared to the single-free layer case, and agrees well with the single-domain model prediction. [J645]

"Nanostructured tungsten carbide catalysts for polymer electrolyte fuel cells"

In this study, high current densities (i.e., 0.9A/cm2) have been obtained in a hydrogen/air polymer electrolyte fuel cell using nanoscale tungsten carbide as the anode catalyst and carbon supported platinum as the cathode catalyst under normal operating conditions of 80 °C and 3 atm. These results show a possibility of replacing precious metal anode catalysts with transition metal compounds for hydrogen oxidation, thereby creating a fundamental technology to reduce the cost of future fuel cell engines. The tungsten carbide-based catalysts were synthesized by means of chemically reduced mechanical alloying. The high electrocatalytic activity toward hydrogen oxidation reaction is attributed to the inherent W-C valence and the unique nanostructure of synthesized carbides. These properties were confirmed by x-ray diffraction and transmission electron microscopy. [J646]

"An array of Eiffel-tower-shape AlN nanotips and its field emission properties"

An array of Eiffel-tower-shape AlN nanotips has been synthesized and assembled vertically with Si substrate by a chemical vapor deposition method at 700 °C. The single-crystalline AlN nanotips along [001] direction, including sharp tips with 10-100 nm in diameter and submicron-sized bases, are distributed uniformly with density of 106-107tips/cm2. Field emission (FE) measurements show that its turn on field is 4.7 V/mcm, which is comparable to that of carbon nanotubes, and the fluctuation of FE current is as small as 0.74% for 4 h. It is revealed this nanostructure is available to optimize the FE properties and make the array a promising field emitter. [J647]

"Electronic transport imaging in a multiwire SnO 2 chemical field-effect transistor device"

The electronic transport and the sensing performance of an individual SnO2crossed-nanowires device in a three-terminal field-effect transistor configuration were investigated using a combination of macroscopic transport measurements and scanning surface-potential microscopy (SSPM). The structure of the device was determined using both scanning electron- and atomic force microscopy data. The SSPM images of two crossed one-dimensional nanostructures, simulating a prototypical nanowire network sensors, exhibit large dc potential drops at the crossed-wire junction and at the contacts, identifying them as the primary electroactive elements in the circuit. The gas sensitivity of this device was comparable to those of sensors formed by individual homogeneous nanostructures of similar dimensions. Under ambient conditions, the dc transport measurements were found to be strongly affected by field-induced surface charges on the nanostructure and the gate oxide. These charges result in a memory effect in transport measurements and charge dynamics which are visualized by SSPM. Finally, scanning probe microscopy is used to measure the current-voltage characteristics of individual active circuit elements, paving the way to a detailed understanding of chemical functionality at the level of an individual electroactive element in an individual nanowire. [J648]

"Experimental study and modeling of polydimethylsiloxane peristaltic micropumps"

We present here an experimental study of three-valve peristaltic micropumps fabricated using polydimethylsiloxane multilayer soft lithography, along with a simple model representing their behavior. Variations of the generated flow rate with peristaltic cycle frequencies, design parameters, actuation pressures, and fluid viscosities are analyzed experimentally for a set of ten micropumps. The largest flow rates are obtained for particular "optimal" basic parameters (actuation pressures and cycle frequencies) that depend on design features. A single-valve model, based on nonlinear equivalent electrical circuits, is numerically and analytically solved in relevant cases, leading to qualitative and quantitative agreements with experiments. From this theoretical study, useful predictive rules are deduced for pump design. The maximum flow rate we could achieve is 7.5mu L/min, one order-of-magnitude improvement compared to the highest level reported for this particular type of micropump. The design of the actuation system-including both internal and external micropump elements-was found crucial to achieving high flow rates. [J649]

"Correlation between the sp2 -phase nanostructure and the physical properties of unhydrogenated carbon nitride"

This paper consists of an investigation of the structural arrangement of the sp2phase in amorphous unhydrogenated carbon nitride (a-CNx)films and its effect on their physical properties. The a-CNxfilms (0.16 x 0.25)were synthesized using a hybrid deposition system combining laser ablation of graphite and a source of atomic nitrogen. The microstructure of the films was investigated by Raman spectroscopy and electron paramagnetic resonance (EPR), while their optical and mechanical properties were determined by spectroscopic ellipsometry and nanoindentation, respectively. It was found that deposition at high laser intensities leads to an increase in the spin density (1020/cm3)and the EPR linewidth (of a few gausses) along with a decrease in nitrogen content. Visible Raman measurements indicate that these effects are accompanied by an increase in the degree of disorder of the sp2phase, as inferred from the broadening and downshift of the GRaman band, and a reduction of the CN triple bond signal. The analysis of these results in terms of the structural configuration and bonding in the films, show that an enhancement of the connectivity of the sp2phase in the layers, takes place when deposition is performed at high laser intensities. These structural modifications are strongly correlated to a decrease in the optical gap from 0.61 to 0.21 eV as well as to an increase of the hardness value of the films from 12 to 24 GPa. The transition from a reduced to an enhanced connectivity of the sp2phase occurs when the nitrogen content decreases below 22 at. %, as a result of the detected reduction of the triply bonded CN specie- s in the layers. [J650]

"Nanoimprint and nanocontact technologies using hydrogen silsesquioxane"

Room-temperature nanoimprint lithography (RT-NIL) and nanocontact printing (RT-NCP) processes using hydrogen silsesquioxane (HSQ) are promising techniques for fabricating various nanostructure devices. We have evaluated the linewidth dependence of the HSQ imprinted depth and the baking-temperature dependence of HSQ replicated patterns after RT-NIL. We have also demonstrated an advanced bilayer resist process with HSQ as a top layer and AZphotoresist as a bottom layer; this process can be used to fabricate high-aspect resist patterns on a Si substrate for RT-NIL and RT-NCP. The etching-rate ratio of the AZphotoresist to HSQ exceeds 100 for O2reactive-ion etching, which means the etching tolerance of the HSQ top layer is sufficient to enable its use as a mask. We have fabricated high-aspect nanostructure patterns with 100 nm linewidth and 1 mcm height using RT-NIL and 150 nm linewidth and 1 mcm height by using RT-NCP. Furthermore, we have successfully transferred Au electrode patterns from a mold onto HSQ resin by using the adhesion properties of HSQ. [J651]

"Dependence of the electronic structure of self-assembled (In ,Ga)As /Ga As quantum dots on height and composition"

While electronic and spectroscopic properties of self-assembled In1-xGaxAs/GaAsdots depend on their shape, height, and alloy compositions, these characteristics are often not known accurately from experiment. This creates a difficulty in comparing measured electronic and spectroscopic properties with calculated ones. Since simplified theoretical models (effective mass, k·p, parabolic models) do not fully convey the effects of shape, size, and composition on the electronic and spectroscopic properties, we offer to bridge the gap by providing accurately calculated results as a function of the dot height and composition. Prominent features of our results are the following: (i) Regardless of height and composition, the confined electron energy levels form shells of nearly degenerate states with a predominant s,p,…orbital character. On the contrary, the confined hole energy levels form shells only in flat dots and near the highest hole level (HOMO). (ii) In alloy dots, the electrons s-psplitting depends weakly on height, while the p-psplitting depends nonmonotonically due to alloy fluctuations. In pure, nonalloyed InAs/GaAsdots, both these splittings depend weakly on height. Furthermore, the s-psplitting is larger, while the p-phas nearly the same magnitude. For hole levels in alloy dots, the s-psplitting decreases with increasing height (the splitting in tall dots being about four times smaller than in flat dots), whereas the p-psplitting remains nearly unchanged. Shallow, pure, nonalloyed dots have a s-psplitting of nearly the sa- me magnitude, whereas the p-psplitting is about three times larger. (iii) As height increases, the sand pcharacters of the wave function of the HOMO becomes mixed, and so does its heavy-hole and light-hole characters. (iv) In alloy dots, regardless of height, the wave function of low-lying hole states are localized inside the dot. Remarkably, in nonalloyed InAs/GaAsdots these states become localized at the interface as height increases. The localized states are nearly degenerate and polarized along [110]and [110]. This localization is driven by the peculiarities of the biaxial strain present in the nanostructure. [J652]

"Electronic properties and tunability in Si quantum rings"

We present an unconventional scheme that is able to dramatically modify single-electron states as well as their couplings in semiconductor nanostructures. The approach consists in perturbing the wave-function core (rather than the insignificant tail) of nanostructure states. We demonstrate this approach using a structure of silicon quantum rings. Anomalous interstate mixing, large tunability of orbital energy, and uncommon s/plevel crossing are predicted. [J653]

"Physical properties and inversion of conductivity type in nanocrystalline PbTe films"

This work is concerned with the effect of the nanostructure on the electrical conductivity of n-type In-doped PbTe thin films. Nanostructured thin films were prepared by varying the rate of nucleation as a function of the nature and temperature of the substrates. On low-temperature substrates, the increased rate of nucleation and the limited mobility of the atoms give rise to a nanostructured deposit with a 50 nm grain size. The broken bonds at the grain boundaries generate acceptor states in n-type films, capture electrons from the interior of the grains and give rise to p-type inversion layers between adjacent grains. In the nanostructured n-type films with the high density of grain boundaries, thermally activated hole conductivity becomes dominant and leads to its inversion from nto ptype. The experimental results confirm the physical model put forward by Neustroev and Osipov [L. N. Neustroev and V. V. Osipov, Sov. Phys. Semicond. 20, 34 (1986)] regarding the creation of inversion channels (p-type conductivity), generated by the diffusion of oxygen along the grain boundaries of polycrystalline lead chalcogenide films. In the present case, these inversion channels appear on account of the acceptor states that have been generated at the grain boundaries of the nanostructured thin layers. [J654]

"Double-handed circular Bragg phenomena in polygonal helix thin films"

Oblique-incidence physical vapor deposition has been used to create optical thin films with a polygonal helix-shaped nanostructure. A series of titanium dioxide thin films are investigated, including triangle, square,

pentagon, and star-shaped polygonal helices. Experimental optical measurements reveal a double-handed circular Bragg response: at one frequency band a polygonal helix reflects left-handed circularly polarized light, and at a second frequency band reflects right-handed circularly polarized light. The relative wavelength dependence of each reflection band is determined by the physical structure of the polygonal helix, a property that is set during the thin-film deposition process. Spectral-hole polarization filters, produced by adding twist and spacing layer defects to polygonal helix thin films, are also reported. [J655]

"Three-dimensional distribution of the spin-polarized current inside nanostructures"

We present a formalism to determine the three-dimensional (3D) distribution of the spin-polarized current and electrochemical potential inside arbitrary nanostructures such as magnetic/nonmagnetic layered pillars, etc. The model is based on dividing the nanostructure into a 3D electric circuit of spin-dependent-resistor elements, inside each of which the propagation is treated as a one-dimensional problem. The solutions presented here are calculated in the diffusive transport regime for the parallel/antiparallel magnetic states. [J656]

"Characterization of nanostructure in Si 1-x Ge x epilayers using x-ray reflectivity and fluorescence techniques"

X-ray reflectivity and angular dependence of x-ray fluorescence (ADXRF) techniques are used for nondestructive characterization of nanostructure and interface morphology in a series of Si1-xGexepilayers grown on Si by molecular-beam epitaxy. The ADXRF method is element specific, well suited for probing the depth profile of Ge in the system without disturbing the integrity of the material structure under study. The layer thickness, interfacial roughness, Ge concentration, lattice parameters, and x-ray optical constants for the entire series have been determined. The results show that the Si1-xGexepilayers with xvalues between 0.27 and 0.83 are neither completely pseudomorphic nor fully relaxed. We have thus demonstrated that the reflectivity and ADXRF methods can be used as effective tools for studying various types of nanostructure in alloys. [J657]

"Chemical patterning for the highly specific and programmed assembly of nanostructures"

We have developed a new chemical patterning technique based on standard lithography-based processes to assemble nanostructures on surfaces with extraordinarily high selectivity. This patterning process is used to create patterns of aminosilane molecular layers surrounded by highly inert poly (ethylene glycol) (PEG) molecules. While the aminosilane regions facilitate nanostructure assembly, the PEG coating prevents adsorption of molecules and nanostructures, thereby priming the semiconductor substrate for the highly localized and programmed assembly of nanostructures. We demonstrate the power and versatility of this manufacturing process by building multilayered structures of gold nanoparticles attached to molecules of DNA onto the aminosilane patterns, with zero nanocrystal adsorption onto the surrounding PEG regions. The highly specific surface chemistry developed here can be used in conjunction with standard microfabrication and emerging nanofabrication technology to seamlessly integrate various nanostructures with semiconductor electronics. [J658]

"Self-assembled quantum-dot molecules by molecular-beam epitaxy"

Self-assembled InAs quantum-dot (QD) molecules having high dot density and aligned dot set structure, which is defined by nanotemplates, were realized by thin capping and regrowth technique in a molecular-beam epitaxy process. Thin capping of GaAs on InAs QDs leads to the creation of nanoholes having a camel-like nanostructure due to anisotropic strain fields along the [110]crystallographic direction and anisotropic surface diffusion accompanying the QD collapse. Regrowth of InAs QDs on the nanohole templates initially results in the formation of QDs with good size uniformity in the middle of features with the shape of propeller blades. This takes place at the regrowth thickness of 0.6 monolayer (ML). The strain at propellers' edge starts to play its role, creating sets of quantum dots surrounding the initial and centered dots at the regrowth thickness of 1.2 ML. The elongated configuration of propellers' blades defines the pattern of QD sets having five to six dots on each side. The dot density of the QD molecules is 3Ч1010cm-2, one order of magnitude higher than that of initial dot density (2Ч109cm-2). [J659]

"Fabrication of two- and three-dimensional photonic crystals of titania with submicrometer resolution by deep x-ray lithography"

Two-dimensional photonic crystals of titanium dioxide are predicted to have many advantages over semiconductor photonic crystals, e.g., silicon and GaAs: in particular, low optical loss in the near infrared region used for optical communication, low thermal expansion, and a refractive index which is close to that of optical fibers. However, it is difficult to create micronanostructures in titanium dioxide, since semiconductor microfabrication techniques cannot be applied to titanium dioxide. As the first step, we calculated the photonic

band gap of titanium dioxide rod slab on SiO2. Band gap percent against thickness of the rod slab was also examined. Finally, we confirmed the most suitable structure for two-dimensional (2D) photonic crystals. A deep x-ray lithography technique was employed to create a very deep and precise template. Liquid-phase deposition was then used to faithfully deposit a tightly packed layer of titanium oxide onto the template. Finally, the template was selectively removed to obtain a photonic nanostructure. We also calculated the photonic band gap for the 3D structure of TiO2. A template for the most appropriate structure was fabricated using the method proposed by Yablonovitch. By employing the same method, we successfully obtained the 3D structure of TiO2. The refractive index of the obtained TiO2followed by heating at 700°Cwas determined as being 2.5, which is close to that of the anatase phase. [J660]

"Atmospheric pressure operation of a field emission diode based on self-assembled silicon nanostructures"

We report on the field emission from self-assembled silicon nanostructures fabricated on n-type silicon (100) substrates using electron beam annealing. Arrays of nanostructures with an average height of 8nmwere formed by substrate annealing at 1100°Cfor 15s. Simple field emission diode structures were fabricated using these nanostructured silicon substrates as cathodes separated from an aluminium anode by a 1mcmthick layer of photoresist. The dielectric leakage current was less than 0.4nAwhich was found to be a negligible component of the field emitted current flowing through the diode. Following conditioning, the Si nanostructure field emission characteristics become stable and reproducible with Fowler-Nordheim tunneling occurring for fields as low as 3.2Vmcm-1. At higher fields, current saturation effects are observed with current-field characteristics typical of space charge limited conduction. The low voltage operation of this device results in suppression of ionizing electron-molecule collisions and the diode has thus been shown to work well at atmospheric pressure. [J661]

"Defect control in nanoimprint lithography"

Major defects encountered in nanoimprint lithography (NIL) process, especially particle and gap associated defects are studied in this article. Unlike in other lithography, a particle induced defect in NIL is larger than the particle itself. To remove the particles, a dry clean process for the nanostructure-patterned surface is explored. The gap-associated defect is a unique phenomenon in NIL, which is induced by the incomplete contact between mold and substrate. The pressure required to eliminate voids during the NIL process is discussed. Based on the studies, both visual particle and void associated defects free 4in.and even larger wafers are achieved. [J662]

"Solvent vapor annealed block copolymer films on organosilane self-assembled monolayers"

Solvent vapor annealing is shown to be a useful technique for controlling the formation of poly(isoprene-b-styrene) (PI-b-PS) block copolymer thin film nanostructures. Annealing in methyl ethyl ketone (MEK) solvent vapor yields a hexagonal-type structure (78nmrepeat distance), while toluene yields a fingerprint texture. Solvent choice for spin coating dramatically changes the initial order in these films: MEK provides a useful hexagonal structure without annealing, while toluene yields a disordered nanostructure. N-octadecyltriethoxysilane is used to form a low surface energy self-assembled monolayer which effectively reduces pinning of the copolymer to the substrate, allowing the development of regions (1mcmin diameter) with a high degree of hexagonal order. However, after several hours of annealing in MEK vapor, the copolymer ultimately dewets from the surface. Contact mode scanning probe microscopy has proven itself to be a very useful tool for imaging the nanostructures, without damaging the films. Friction mode provides high contrast images of PI-b-PS nanostructures, suggesting the lack of a wetting layer in the solvent vapor annealed films. [J663]

"Patterned growth of self-assembled silicon nanostructures by ion implantation and electron beam annealing"

This paper discusses the suppression of self-assembled silicon nanostructure growth through high fluence ion implantation. The nanofabrication procedure involves annealing of untreated Si(100) substrates at 1100°Cfor 15susing a raster scanned 20keVelectron beam. Nanostructuring occurs as a result of kinetic amplification of the surface disorder induced by thermal decomposition of the native oxide. Radiation induced disorder of the Si substrate prior to annealing by ion-implantation modifies the potential energy surface and thus the growth of self-assembled nanostructures. Highly disordered Si(100) surfaces produced by high fluence implantation with nitrogen and silicon ions are shown to completely suppress nanostructure growth. Exploiting this phenomenon we have demonstrated selective area nanostructure growth in microscale regions. [J664]

"Thin-film transformations and volatile products in the formation of nanoporous low-k polymethylsilsesquioxane-based dielectric"

The thermal transformation of spin-cast thin films to produce nanoporous low-kdielectric layers has been investigated using polymethysilsesquioxane (PMSSQ) for the low-kmatrix and polymethylmethacrylate-co-dimethylaminoethylacrylate (PMMA-co-DMAEMA) as the porogen which is volatilized to leave nanopores in the matrix. Surface analysis methods, including time of flight-secondary ion mass spectrometry and x-ray photoelectron spectroscopy, and thin film analysis by small-angle neutron scattering revealed the kinetics of matrix crosslinking, while thermal desorption mass spectrometry showed the evolution of gaseous reaction products from porogen and matrix during the complex chemical transformations which occur with thermal cycling from 100°Cto450°C. Matrix crosslinking occurs primarily at lower temperatures (100-225°C), while porogen diffusion and decomposition begins somewhat above 200°C, leading to phase separation which creates the final nanoporous structure. Since matrix and porogen reaction kinetics have some overlap, relative kinetics can be important: e.g., matrix crosslinking proceeds more rapidly for PMSSQ precursors with high Si-OH content cf. low SiOH content, with implications for the morphology of porogen-derived nanostructure. As surface species transform (matrix crosslinking) and disappear (porogen volatilization), their complements are seen in the gas phase as reaction and decomposition products. Porogen decomposition is ligand selective, in that the N-containing ligand of DMAEMA is volatilized at considerably lower temperatures (200°C)than that (400°C)for the remaining specie--s (the PMMA ligand and the common backbone for both PMMA and DMAEMA). [J665]

"Ruthenium films by digital chemical vapor deposition: Selectivity, nanostructure, and work function"

Ruthenium electrodes were selectively deposited on photoresist-patterned HfO2surface [deposited on a SiOx/Siwafer by atomic layer deposition (ALD)] by a manufacturable, digital chemical vapor deposition (DCVD) technique. DCVD of Ru was carried out at 280-320 °C using an alternate delivery of Bis (2,2,6,6-tetramethyl-3,5-heptanedionato)(1,5-cyclooctadiene)Ru (dissolved in tetrahydrofuran) and oxygen. The as-deposited Ru films were polycrystalline, dense, and conducting (resistivity 20.6 mu Omega cm). However, Rutherford backscattering spectroscopy, x-ray photoelectron spectroscopy, and high-resolution electron microscopy results indicate the presence of an amorphous RuOxat the Ru grain boundaries and at the DCVD-Ru/ALD-HfO2interface. The estimated work function of DCVD-Ru on ALD-HfO2was 5.1 eV. Moreover, the equivalent oxide thickness, hysteresis in capacitance-voltage, and leakage current density at -2 V of the HfO2/SiOxdielectric, after forming gas (95% N2+5% H2)annealing at 450 °C for 30 min, were 1.4 nm, 20 mV, and 7.4Ч10-7 A cm-2,respectively. copyright 2004 American Institute of Physics. [J666]

"High detectivity InAs quantum dot infrared photodetectors"

We report a high detectivity of 3Ч1011cm Hz1/2/Wat 78 K for normal-incidence quantum dot infrared photodetectors with ten layers of undoped InAs/InGaAs/GaAs quantum dot active regions. The high detectivity seen at 1.4 V corresponds to photoresponse peaks at 9.3 and 8.7 mcm for positive and negative bias, respectively. copyright 2004 American Institute of Physics. [J667]

"Giant magnetoresistance in PtMn alloys"

The onset of chemical and magnetic order in PtMn is accompanied by a large increase in the resistivity, rho, contrary to that observed in nonmagnetic or ferromagnetic disorder-order transitions. We attribute this to a giant magnetoresistance like magnetic scattering off the antiferromagnetically aligned spins within the PtMn. The characteristics of the resistance change with anneal time in two regimes, with only the second regime involving a disorder/order transition. We have used the change of rho with time to calculate the activation energy for the L10transformation in PtMn and found it to be about 1.5 eV for thick films. The activation energy increases significantly for thinner films. copyright 2004 American Institute of Physics. [J668]

"First principles study of transition-metal substitutions in Sm -Co permanent magnets"

The microchemistry and magnetism of conventional and high-temperature Sm-Copermanent magnets are investigated by first-principles calculations. Particular emphasis is on the site preference for the substitution of Cu, Ti, and Zrin SmCo5and Sm2Co17compounds. Cusubstitution is more favorable in the 1:5 phase, in agreement with experimental findings. Titanium and zirconium have positive solution energies for both the phases, with Ti(Zr)having slight preference for the 1:5 (2:17) phase. Some Zrmay segregate to the phase boundaries because of its large solution energy. For Tiand Zrthe dumbbell site of the 2:17 phase is preferred over the other three inequivalent cobalt sites. These results are used to discuss the observed cellular nanostructure of the high-temperature Sm-Cohard magnets with composition close to the 2:17 phase. [J669]

"Tribonanolithography of silicon in aqueous solution based on atomic force microscopy"

The tribonanolithography (TNL) of silicon substrate in aqueous solution based on the use of atomic force microscopy is demonstrated. A specially designed cantilever with a diamond tip, which allows the formation of a

protruding oxide layer several nanometers high using a simple machining process with a given pitch, was applied to the TNL process in KOH solution instead of a conventional silicon cantilever. The anisotropic wet etching stopped in the modified area because silicon oxide was resistant to corrosion by KOH. The fabrication of a three-dimensional slant nanostructure is possible by taking advantage of the time lag of oxide formation during etching in KOH solution. [J670]

"Self-assembled growth and optical emission of silver-capped silicon nanowires"

Structured silver-capped silicon nanowires were fabricated via electroless metal deposition on a silicon wafer in an ionic silver HF solution through selective chemical etching. Their formation mechanism was explained on the basis of self-assembled localized microscopic electrochemical cell model. The metal-semiconductor composite nanostructure was found to have a strong ultraviolet-emitting property with an emission peak position at 330 nm. The intensity of the peak nonmonotonously varies with annealing temperature and time, but its position remains unchanged. Emission and excitation spectral analyses suggest that the ultraviolet emission is closely related to the existence of silver vacancy defects in silver nanocaps formed during sample fabrication. A specific vacancy density is required to produce the strong ultraviolet emission. copyright 2004 American Institute of Physics. [J671]

"Spin-transfer-induced precessional magnetization reversal"

A magnetoelectronic device is proposed in which a spin-current pulse produces a rapid reversal of the magnetization of a thin film nanomagnet. A spin-transfer torque induces the reversal and the switching speed is determined by the precession frequency of the magnetization in a thin film element's demagnetization field. Micromagnetic simulations show that this switching occurs above a threshold pulse current and can be faster than 50 ps. In contrast to present spin-transfer devices, the switching does not require an initial fluctuation or deviation of magnetic layers from collinear alignment and is far more energy efficient. This device operates at room temperature and can be realized with present-day magnetic nanostructure technology. copyright 2004 American Institute of Physics. [J672]

"Ultrafast InGaAs/InGaAlAs multiple-quantum-well electro-absorption modulator for wavelength conversion at high bit rates"

We report on InGaAs/InGaAlAs electro-absorption modulators for ultrafast all-optical signal processing. The structure design is based on the use of small conduction and valence band offsets. Switching windows as short as 5 ps for a 2 V applied reverse bias have been obtained by cross-absorption modulation. copyright 2004 American Institute of Physics. [J673]

"Bulk nanostructure formation directly from the multicomponent alloy melt"

The first bulk homogeneous nanocrystalline Zr60Al15Ni10Co15(at. %) alloy prepared by melt casting without the amorphous matrix is reported. In this work, the complete grain refinement directly by solidification processing, when qualitatively compared to the previously reported nanocrystallization by postdevitrification of amorphous alloy solid precursors, produces nanograins that have a relatively narrower size range (7.4 nm in average) and are randomly oriented. The total inhomogeneous chemical affinity of the multicomponent alloy was proposed to thermodynamically favor the three-dimensional nanoscale nucleation from alloy melts. Clustering of different atoms in the ZrAlNiCo alloy occurs while the material is still in the molten state. copyright 2004 American Institute of Physics. [J674]

"Crossover from tunneling to incoherent (bulk) transport in a correlated nanostructure"

We calculate the junction resistance for a metal-barrier-metal device with the barrier tuned to lie just on the insulating side of the metal-insulator transition. We find that the crossover from tunneling behavior in thin barriers at low temperature to incoherent transport in thick barriers at higher temperature is governed by a generalized Thouless energy. The crossover temperature can be estimated from the low-temperature resistance of the device and the bulk density of states of the barrier. copyright 2004 American Institute of Physics. [J675]

"Enhancement of fracture toughness in nanostructured diamond-SiC composites"

We synthesized diamond-SiC nanocomposites with superhardness and greatly enhanced fracture toughness through a synthetic approach based on high-energy ball milling to form amorphous Si precursors followed by rapid reactive sintering at high pressure (P) and high temperature (T). We show how the simultaneous P-Tapplication allows for better control of the reactive sintering of a nanocrystalline SiC matrix in which diamond crystals are embedded. The measured fracture toughness KICof the synthesized composites has been enhanced greatly, as much as 50% from 8.2 to 12.0 MPa m1/2, as the crystal size of the SiC matrix decreases from 10

mcm to 20 nm. Our result contradicts a commonly held belief of an inverse correlation between hardness and fracture toughness. We demonstrate the importance of nanostructure for the enhancement of mechanical properties of the composite materials. copyright 2004 American Institute of Physics. [J676]

"High-coercivity Co-ferrite thin films on (100)-SiO 2 substrate"

Co-ferrite films were deposited on SiO2single-crystal substrates. The as-deposited films were amorphous. The crystallization required an annealing at 700 °C or higher. Magnetic properties were found to be strongly dependent on annealing temperature, annealing duration, and film thickness. A small film thickness can restrict the formation of large particles. A coercivity as high as 9.3 kOe was achieved in the 50 nm film after annealing at 900 °C for 15 min deposited on (100)-SiO2substrate. The high coercivity was associated with a nanostructure, lattice strain, and larger Raman shift with a relatively sharp peak. copyright 2004 American Institute of Physics. [J677]

"Conductive nanostructure fabrication by focused ion beam direct-writing of silver nanoparticles"

A focused ion beam has been used to directly pattern thin films of organometallic silver nanoparticles down to a resolution of 100nm. The unexposed regions were washed in hexane leaving the desired pattern, and subsequent annealing formed conductive, metallic features. Multiple-layer structures were also fabricated by spin-coating and exposing additional films of silver nanoparticles on top of already patterned structures. The sensitivity of the nanoparticles to 30keVGa+ions was measured to be approximately 5mu C/cm2. Using this technique test structures were fabricated in two and three dimensions with resistivities as low as 288mu Omega cmand 13mu Omega cmfor single- and multiple-layer structures, respectively, as compared to a value of 1.589mu Omega cmfor bulk silver. To our knowledge, this is the highest demonstrated throughput for any electron or ion beam direct-write process utilizing metal-organic precursors. [J678]

"Boron nitride nanotubes: Pronounced resistance to oxidation"

Boron nitride (BN) nanotubes have the same nanostructure as carbon nanotubes but are found to exhibit significant resistance to oxidation at high temperatures. Our systematic study has revealed that BN nanotubes are stable at 700 °Cin air and that some thin nanotubes (diameter less than 20 nm) with perfect multiwalled cylindrical structure can survive up to 900 °C.Thermogravimetric analysis reveals an onset temperature for oxidation of BN nanotubes of 800 °Ccompared with only 400 °Cfor carbon nanotubes under the same conditions. This more pronounced resistance of BN nanotubes to oxidation is inherited from the hexagonal BN and also depends on the nanocrystalline structure. This high level of resistance to oxidation allows promising BN nanotube applications at high temperatures. copyright 2004 American Institute of Physics. [J679]

"Instrument for the investigation of the nanostructure of Pu and other actinides"

An instrument for the synthesis and analysis of nanoparticles and ultrathin films of Pu and other actinides has been constructed. To facilitate the production of nanoscale specimens of these materials, pulsed laser ablation was chosen for the deposition process. The highly toxic and radioactive nature of these materials created a challenging safety environment that needed to be addressed before any work could begin. Particular attention has been paid in this respect towards our future work with plutonium, though the design structure presented here would work equally well with other nonradioactive toxic or reactive materials. The analytical capabilities of the instrument include in situ photoelectron spectroscopy, low energy electron diffraction, scanning tunneling microscopy, and scanning tunneling spectroscopy. The instrument design and first results will be discussed. copyright 2004 American Institute of Physics. [J680]

"Organic phototransistor based on intramolecular charge transfer in a bifunctional spiro compound"

We report on the fabrication of organic phototransistors based on the spiro-conjugated molecule 2,7-bis-(N,N'-diphenylamino)-2',7'-bis(biphenyl-4-yl)-9,9'-spirobifluorene.Intramolecular charge transfer leads to an increase in charge carrier density, providing the amplification effect. The sensitivity is better than 1 A/W for ultraviolet light at 370 nm, making the device interesting for sensor applications. copyright 2004 American Institute of Physics. [J681]

"Dielectric function of thin-film titanium oxide with a granular nanostructure"

It is shown here that a simple weighted average dielectric function describes the experimental infrared reflection/absorption spectra of titanium oxide films with a granular nanostructure. The films were grown on unheated substrates by reactive sputter deposition using a Ti metal target and a 10 mTorr pure O2discharge. The films' average dielectric function is derivable from a Maxwell-Garnett model in which randomly oriented

nanograins with anatase short-range atomic order are embedded in a conducting background. In contrast, dielectric functions calculated using effective-medium and Maxwell-Garnett theories that do not consider the background fail to adequately account for the experimental absorption peak positions. High-resolution transmission electron microscopy confirmed the films' granular nanostructure and the presence of Ti suboxides as a minority constituent. We associate the anatase-like constituent with the model's embedded grains, and the Ti suboxide constituent with the model's background medium. The formalism that is developed here is applicable to any composite system consisting of grains embedded in a medium whose dielectric function is much larger than that of the grains. [J682]

"Fabrication of (In,Ga)As quantum-dot chains on GaAs(100)"

Nanostructure evolution during the growth of multilayers of In0.5Ga0.5As/GaAs (100)by molecular-beam epitaxy is investigated to control the formation of lines of quantum dots called quantum-dot chains. It is found that the dot chains can be substantially increased in length by the introduction of growth interruptions during the initial stages of growth of the GaAs spacer layer. Quantum-dot chains that are longer than 5 mcm are obtained by adjusting the In0.5Ga0.5Ascoverage and growth interruptions. The growth procedure is also used to create a template to form InAs dots into chains with a predictable dot density. The resulting dot chains offer the possibility to engineer carrier interaction among dots for novel physical phenomena and potential devices. copyright 2004 American Institute of Physics. [J683]

"Directed nanostructural evolution in Ti 0.8 Ce 0.2 N layers grown as a function of low-energy, high-flux ion irradiation"

We use a combination of alloying and low-energy ion irradiation during film growth to controllably manipulate the nanostructure of TiN-based layers. Ti0.8Ce0.2Nfilms are grown on SiO2at 350 °Cusing UHV reactive magnetron sputtering in N2.The N2+-to-metal ratio incident at the growing film is maintained constant at 15, while the ion energy EN2+is varied from 14 to 45 eV. Films grown with EN2+=14 eVconsist of equiaxed nanograins with an average size of 2.0 nm, while layers deposited with EN2+=45 eVexhibit a 2-nm-wide nanocolumnar structure. In both cases, the films are dense, atomically smooth, and have strong 002 texture with low stress. This is in dramatic contrast to TiN films deposited under the same conditions, which are underdense with extremely rough surfaces and consist of broad (30 nm) columns. We attribute the formation of controlled nanostructures to the interplay between ion-irradiation-induced effects and thermally driven Ce surface segregation, leading to continuous renucleation during film growth. copyright 2004 American Institute of Physics. [J684]

"Metal nanoparticle precipitation in periodic arrays in Au 2 O -doped glass by two interfered femtosecond laser pulses"

We report on the precipitation control of Au nanoparticles in periodic arrays in silicate glass. Au2O-doped glass samples were first irradiated by two 800 nm interfered femtosecond laser pulses at room temperature and then heat treated at 550 °Cfor the Au nanoparticle precipitation in the laser irradiation areas. One-dimensional periodic arrays of the Au nanoparticles were controlled by changing the pulse energy and the incident angle between the interfered laser pulses. The smallest dimension in the obtained arrays was a width of 300 nm. The mechanism of the metal nanoparticle precipitation by this technique was discussed. Only two pulses are required to encode these periodic microstructures, which are applicable to emerging nanostructure devices such as optical memory with ultrahigh storage density, micrograting with high diffractive efficiency and integrative micro-optical switches. copyright 2004 American Institute of Physics. [J685]

"Correlation between nanostructure and electron emission characteristics of a ballistic electron surface-emitting device"

The mechanism of ballistic electron emission from nanocrystalline silicon diodes has been studied for nanocrystallized polysilicon (NPS) based devices. The electron emission characteristics of two devices with NPS layers prepared under different conditions are compared in relation to the nanostructural analyses by transmission electron microscope (TEM) and energy-dispersive x-ray microanalyzer (EDX). In the sample where a chainlike nanocrystalline silicon (nc-Si) structure is produced along columnar poly-Si grains, a sufficient electron emission current density of 3.0 mA/cm2was observed with a high emission efficiency (2.8%) and stability. The surface and interfacial oxidation of nc-Si particles is another important factor for efficient emission. The results indicate that control of interconnected nc-Si structures is a key issue for the efficient ballistic electron emission. copyright 2004 American Vacuum Society. [J686]

"Formation and blistering of GaAsN nanostructure layers"

We report the formation and blistering of GaAsN nanostructure layers induced by nitrogen ion implantation into GaAs followed by high-temperature rapid thermal annealing. The GaAsN nanostructure layers consist of zincblende GaN-rich GaAsN nanostructures in an amorphous matrix, apparently formed near the depth of maximum ion damage. Cross-sectional transmission electron microscopy reveals a series of nanometer-sized cavities near the depth of maximum nitrogen concentration, suggesting the formation of nitrogen gas bubbles during annealing. The nitrogen bubbles coalesce and push away the GaAsN nanostructure layer, forming micrometer-sized blisters. The simultaneous formation and blistering of GaAsN nanostructure layers may provide an opportunity for the integration of the nanostructure layers with a variety of substrates. copyright 2004 American Vacuum Society. [J687]

"Room temperature nanofabrication of atomically registered heteromolecular organosilicon nanostructures using multistep feedback controlled lithography"

Ultrahigh vacuum scanning tunneling microscopy is employed for the nanofabrication and characterization of atomically registered heteromolecular organosilicon nanostructures at room temperature. In the first fabrication step, feedback controlled lithography (FCL) is used to pattern individual 2,2,6,6-tetramethyl-1-piperidinyloxy (TEMPO) free radical molecules at opposite ends of the same dimer row on the Si(100)-2Ч1:Hsurface. In atomic registration with the first pattern, FCL is subsequently applied for the removal of a single hydrogen atom. The resulting dangling bond templates the spontaneous growth of a styrene chain that is oriented along the underlying dimer row. The styrene chain growth is bounded by the originally patterned TEMPO molecules, thus resulting in a heteromolecular organosilicon nanostructure. The demonstration of multistep FCL suggests that this approach can be widely used for fundamental studies and fabricating prototype devices that require atomically registered organic molecules mounted on silicon surfaces. [J688]

"Noble magnetic films for effective electromagnetic noise absorption in the gigahertz frequency range"

To meet the requirement that radio-frequency (RF) electromagnetic noise absorbers must be very thin to be installed in extremely integrated electronic components, we studied a new type of granular film deposited by coevaporation. The films have a peculiar nanostructure that exhibits a magnetic anisotropy with the easy axis perpendicular to the film plane . In this paper, practical noise suppressing features and advantage of this peculiar nanostructure film are investigated, comparing with a conventional noise suppression sheet made of a composite magnetic material. First, measurements are performed using the microstrip line method, and second with a prototype of digital circuit driven at 50 MHz that produces higher harmonic current noise at frequencies over 1 GHz. In both cases, the films exhibit remarkable ability of noise absorption that suggests high possibility of a thin film absorber which works effectively to suppress noise radiation and transmission from high-speed IC leading to appreciable improvement of RF performance of various electronic components. Numerical analysis based on the finite-difference time-domain (FDTD) method was also performed assuming the noise suppression sheet placed over a microstrip line. The analysis confirmed that re-radiation of electromagnetic noise from the sheet is negligible and it is absorbed mainly by magnetic loss of the sheet material. [J689]

"Nanostructure and magnetic properties of FePt:C cluster films"

Magnetic properties and nanostructure of FePt:C cluster-deposited films with C volume fraction of 7%, 14%, 33%, and 45% have been studied. As-deposited FePt:C films were prepared by a multilayer method in which FePt layers were deposited from a cluster source employing a gas-aggregation technique and C layers from a normal sputtering gun. In the as-deposited films, FePt clusters with fcc structure are embedded in the C matrix. The high anisotropy FePt L10cluster structure was realized in the films via post-deposition annealing and the nanostructure of the films was observed by high-resolution transmission electron microscope (TEM). The results for a film with 45 vol. % C showed that FePt clusters are well separated by C matrix and the cluster diameter is about 4.5 nm. The coercivity increases with increase of annealing temperature; coercivities larger than 9 kOe were achieved in the films after annealing at a temperature of 700°C and above. Magnetization reversal of the films was studied by moment-decay measurements and the data were fitted with the Sharrock formula. For the film with 45 vol. % C annealed at 625°C, the thermal stability factor KuV*/kB,T activation volume V*, and anisotropy constant Kuare 231, 0.83Ч10-18cm3and 1.2Ч107erg/cm3, respectively. [J690]

"Tunable optical nanocavity based on modulation of near-field coupling between subwavelength periodic nanostructures"

We present the design and analysis of a tunable resonant optical filter based on modulation of the near-field coupling between two subwavelength periodic nanostructures embedded in a Fabry-Per'rot cavity. Due to the transverse localization of the optical field in the subwavelength gratings, their relative positioning strongly

influences the near-field coupling between them and, thus, affects the resonance of the cavity. Rigorous electromagnetic analysis tools are applied to determine the optical characteristics of the filter with respect to the nanostructure lateral alignment, small variations in the shape of the nanostructures, and the physical separation of the nanostructures. [J691]

"Modification of electrical properties and performance of EVA and PP insulation through nanostructure by organophilic silicates"

Nanostructured materials are attracting increased interest and applications. Exciting perspectives may be offered by electrical insulation. Polymeric nanofilled materials may find new and/or upgraded applications in the electrical and electronic industry, replacing conventional insulation to provide improved performances in electrical apparatus, as regards, e.g., reliability, environmental compatibility and power rating. This paper shows that electrical properties of nanocomposite insulating materials for DC applications, specifically space charge, conductivity and breakdown voltage, can improve significantly with respect to the basis, unfilled materials. Reference is made to two polymeric materials, i.e. poly(ethylene-covinylacetate) (EVA) and polypropylene (PP), that are widely used as electrical insulation, e.g. for cables and capacitors. The nanofiller consists of an organophilic layered silicate, specifically an extra-pure synthetic fluorohectorite modified by means of interlayer exchange of sodium cations for protonated octadecylamine NH3+(ODA), in a weight concentration of maximum 6%. In both materials the space charge accumulation rate as a function of applied electric field is significantly reduced, while the electrical conductivity is raised. The breakdown voltage can increase for the nanofilled materials. [J692]

"Preparation and purification of synthetic protein nanoparticulates"

The protein nanostructure used in this study (bovine serum albumin; BSA nanoparticles) were fabricated with an average nanoparticle diameter 150 nm based on the principle of coacervation. Practical recovery of nanoparticulate mimics, of products such as plasmid DNA and viruses as putative gene therapy vectors from model systems, has been studied. The adsorbents employed in this study for the recovery of nanoparticles had one of four discrete designs i.e. microporous (pore size 0.8 μm), solid phase (nonporous) and pellicular (pore size [J693]

"Three-dimensional nanostructuring with femtosecond laser pulses"

The development of simple laser-based technologies for the fabrication of complicated three-dimensional (3-D) microstructures with a structure size down to 100 nm is reported. These technologies are based on nonlinear multiphoton laser-matter interaction processes allowing to overcome the diffraction limit and to fabricate 3-D structures inside transparent materials. Examples on nanostructuring of metals, dielectrics, and polymers are presented. [J694]

"Destructive constructions of nanostructures with carbon nanotubes through nanorobotic manipulation"

Nanostructures are constructed with destructively fabricated nano building blocks based on multiwalled carbon nanotubes through three-dimensional nanorobotic manipulation in free space. In situ mechanical property characterization is applied for the selection of a nanotube with desired elasticity. Destructive fabrication is demonstrated as an effective way to obtain layered and/or sharpened structures of nanotubes for the applications as nanobearings and probe tips, linear nanobearing motion has been observed, and a method is shown by using surface clamping van der Waals forces for the better control of the geometries of the nanotubes with destructive fabrication. The prepared building blocks are positioned together with nanorobotic manipulators under real-time observation with a field-emission scanning electron microscope, and are constructed through electron-beam-induced deposition. [J695]

"Binding of semiconductor quantum dots to cellular integrins"

There is currently a major international effort aimed at integrating semiconductor nanostructures with biological structures. This paper reports the functionalization of cadmium sulfide quantum dots with peptides that facilitate the selective binding of these quantum-dot-peptide complexes to integrins in the membranes of cancer cells of the MDA-MB-435 cell line. In addition, this paper focuses on the roles that biological environments play in altering and determining the optical and vibrational properties of these nanostructures. [J696]

"Analysis of cellular structure by light scattering measurements in a new cytometer design based on a liquid-core waveguide"

The results of applying a novel microfluidic optical cytometer to generate and observe the light scattered from biological cells over a wide range of angles are presented. This cytometer incorporates a waveguide that increases the intensity of the scattered light to the extent that an inexpensive digital camera can be used to detect the light over a large solid angle. This device was applied to yeast cells and latex beads and experimental data were compared with the results of a finite difference time-domain (FDTD) method of simulation. The simulated scattering patterns were calculated from reported values of optical parameters and are in good qualitative agreement with experiment. It is demonstrated that this system could be used to acquire information on the microstructure and potentially the nanostructure of cells. [J697]

"A micromechanical flow sensor for microfluidic applications"

We fabricated a microfluidic flow meter and measured its response to fluid flow in a microfluidic channel. The flow meter consisted of a micromechanical plate, coupled to a laser deflection system to measure the deflection of the plate during fluid flow. The 100 μm square plate was clamped on three sides and elevated 3 μm above the bottom surface of the channel. The response of the flow meter was measured for flow rates, ranging from 2.1 to 41.7 μL/min. Several fluids, with dynamic viscosities ranging from 0.8 to 4.5Ч10-3N/m, were flowed through the channels. Flow was established in the microfluidic channel by means of a syringe pump, and the angular deflection of the plate monitored. The response of the plate to flow of a fluid with a viscosity of 4.5Ч10-3N/m was linear for all flow rates, while the plate responded linearly to flow rates less than 4.2 μL/min of solutions with lower dynamic viscosities. The sensitivity of the deflection of the plate to fluid flow was 12.5±0.2 μrad/(μL/min), for a fluid with a viscosity of 4.5Ч10-3N/m. The encapsulated plate provided local flow information along the length of a microfluidic channel. [J698]

"Finite element modelling of nanostructured piezoelectric resonators (NAPIERs)"

A new modification to the traditional piezoelectric thin film bulk acoustic wave resonator (FBAR) and solidly mounted acoustic wave resonator (SMR) is proven to significantly improve their performances. The proposed design involves the surface micro/nano structuring of planar piezoelectric thin films to realize an array of a large number of rod-like structures. In contrast to the plate-like thickness extensional resonance in traditional FBAR and SMR devices, the rod-like structures can be excited in their length extensional resonance, yielding a higher electromechanical coupling factor and effectively eliminating the spurious resonances from lateral modes of vibration. The designs have been investigated by two and three-dimensional finite element analyses and one-dimensional transmission-line modelling. The results show that significant increases in the electromechanical coupling factor of ca. 40% can be achieved by using the rod-like length extensional resonances as compared with the plate-like thickness extensional resonances in traditional devices. Simulations show that rod width-to-thickness aspect ratios of less than 0.5 could result in an electromechanical coupling factor (keff2) of over 10% for a zinc oxide device, compared with approximately 7% for a conventional design. [J699]

"Quasi-bound state theory of field-dependent photogeneration from polymer-embedded nanoparticles"

A quantum mechanical model of field-dependent photogeneration from polymer-embedded nanoparticles is presented. In this formalism, the rate of escape of a photocreated charge from the nanoparticle into the surrounding polymer matrix is found by calculating the lifetime of its quasi-bound state (QBS) wavefunction. The theory is used to model some typical nanoparticles: CdSe and CdS quantum dots and a CdSe-CdS core/shell nanostructure. It is found that the QBS lifetime undergoes a rapid collapse at critical values of applied field, resulting in a sudden increase in photogeneration efficiency. [J700]

"Low-cost edge-emitting DFB laser arrays for DWDM communication systems implemented by bent and tilted waveguides"

This paper emphasizes methodology concerning variations of the emission wavelengths of edge-emitting semiconductor lasers. We present a method based on tilted distributed feedback (DFB) gratings to be used in combination with specially bent or tilted straight waveguides for the low-cost and ultraprecise definition of different wavelength channels in lasers for Dense wavelength division multiplexing (DWDM) fiberoptic communication systems. The homogeneous DFB grating field is defined using low-cost processes and is tilted with respect to a preferential direction defined by the device borders or the crystal geometry. Our method allows ultraprecise definitions of the DWDM wavelengths and is applicable index- and complex-coupled DFB gratings in both isolated lasers and arrays. Design, technological implementation, and experimental characterization of the devices is presented in this paper. Thin-film heaters are used for correcting small wavelength deviations occurring due to technologically induced tolerances. [J701]

"Nanostructuring of silicon (100) using electron beam rapid thermal annealing"

A technique for the rapid, uncomplicated and lithography free fabrication of silicon nanostructures on both n-type and p-type Si(100) substrates is presented. The nanofabrication method employs electron beam rapid thermal annealing of Si(100) substrates which have undergone no prior processing and thus still contain the native oxide. The resulting nanostructures are distributed across the entire Si surface and are square based and aligned to the [110] direction. Nanostructure growth was only observed in the temperature range 800-1200 °C and has been shown to occur following annealing durations as short as 3 s. Nanopillars over 20 nm high have been fabricated following annealing for 120 s. The initial stage of nanostructure growth involves thermal decomposition of the native oxide resulting in atomic scale disorder of the Si surface. Following complete oxide desorption, diffusive Si species migrate across the surface in response to diffusion barriers established on the strained potential-energy surface, nucleating islands at kinetically favored sites. With continued annealing the island number and size evolves according to crystal ripening processes. Enhancement of the oxide desorption and crystal growth rates due to electron irradiation are discussed. copyright 2004 American Institute of Physics. [J702]

"Electron transport mechanisms in thin boron-doped diamond films"

Electron transmission spectroscopy is used to examine the effect of transport distance, diamond nanostructure, and electron affinity on the cold emission characteristics of thin nanocrystalline diamond films. Energy distribution and intensity measurements are taken from films having different thicknesses (0.15, 2, and 4 mcm) and surface properties (hydrogenated, cesiated), and two distinct transmission regimes are identified that exhibit fundamentally different characteristics. In measurements taken at sufficiently high beam energy Eo,electrons are transported through the conduction band of the diamond and emitted at a low-affinity surface, with transmission yields generally greater than 1. In this regime, the dependence on Eoresults from the finite escape depth of the conduction-band electrons, which is determined to be 1 mcm for these films based on a Monte Carlo analysis of the incident electron range. In measurements taken at lower values of Eo,electrons are generated outside of this escape range and are unable to reach the surface via conduction-band transport. In this regime, the transmission data are dominated by a much broader, low-intensity distribution, and the transmission yields are substantially lower than 1. The transmission is furthermore completely insensitive to changes in the surface properties of the diamond. Based on the nanostructure of the films, electrons are most likely transported along grain boundaries that propagate through the films. copyright 2004 American Institute of Physics. [J703]

"Low-temperature growth of ZnO nanostructure networks"

Networks consisting of one-dimensional ZnO nanowires and two-dimensional ZnO nanowalls were synthesized using a catalyst-free low-temperature approach. The size of the nanostructure was much smaller than that obtained by the previous catalyst-assisted method. The nanostructures exhibited stable excitonic states at room temperature, and emission due to exciton-exciton scattering was observed. copyright 2004 American Institute of Physics. [J704]

"Nanohole-array size dependence of soft x-ray generation enhancement from femtosecond-laser-produced plasma"

Nanostructured targets are very attractive for enhancing the intensity of x-ray pulses generated from laser-produced-plasma. In order to clarify the enhancement mechanism, the nanohole-array size dependence of the characteristics of soft x-ray pulse generation from femtosecond-laser-produced plasma was investigated in detail. We found that the highest x-ray intensity can be obtained and the x-ray pulse duration kept relatively short with a nanohole-array alumina target with a 500 nm hole interval and a 450 nm hole diameter. A 40-fold soft x-ray fluence enhancement and a nine-fold soft x-ray pulse peak intensity enhancement can be obtained. The relatively short x-ray pulse duration of 19 ps can be maintained because the target structure has high local density and nanometer-sized spaces. Similar enhancement effects can be expected by using a nanostructured target with wall thickness of less than 100 nm, space size of around a few 100 nm, and nanostructure depth larger than 20 mcm. [J705]

"Influence of process parameters on the morphology of Au /SiO 2 nanocomposites synthesized by radio-frequency sputtering"

Metal nanoparticles on oxide matrices have gained a markedly increasing consideration with regard to both scientific and applicative purposes, thanks to the possibility of tailoring the system characteristics by a proper choice of the preparation route and the processing conditions. In the present work, Au/SiO2nanocomposites were prepared by radio-frequency (rf) sputtering of gold from Arplasmas on amorphous silica substrates. Particular attention was devoted to the influence of the synthesis parameters on the chemicophysical properties

of the final nanosystems. To this regard, both in situ and ex situ characterization techniques were adopted. In particular, laser reflection interferometry was employed for an in situ monitoring of growth processes, while ex situ analyses were specifically dedicated to the investigation of Au/SiO2nanostructure, chemical composition, optical properties, and surface morphology (glancing-incidence x-ray diffraction, transmission electron microscopy, spectroscopic ellipsometry, x-ray photoelectron spectroscopy, ultraviolet-visible absorption, and atomic force microscopy). The obtained results showed the possibility of tailoring the Au/SiO2morphology from clusterlike to islandlike systems or continuous films, with consequent modification of the optical properties, by a proper choice of total pressure, rf power, deposition time, and growth temperature. [J706]

"Atomic scale stresses and strains in Ge /Si (001) nanopixels: An atomistic simulation study"

Recent progress in the growth of nanostructures on nonplanar (patterned) substrates has brought to the forefront issues related to atomic-level surface and subsurface stress and strain field variations, as these govern the process of formation of such nanostructures and strongly affect their physical properties. In this work, we use atomistic simulations to study the atomically resolved displacements, stresses, strains, and the strain energy in laterally finite nanoscale Si(001)mesas, uncovered and covered with the lattice-mismatched Geoverlayers. The spatial variations of the stress are examined both across the surface profile of the mesas and in the direction down to the substrate. We find that the hydrostatic stress and strain at the Ge/Siinterface undergo rapid changes from tensile in the interior of the Simesa to compressive in the Geoverlayer, with the transition taking place over distances of the order of Silattice constant. Substantial relaxation of the hydrostatic stress and strain, in both the lateral and vertical directions, is observed in the Geoverlayer, in the Si(001)mesa interior, and in the substrate. Atomic displacement fields, computed in the Geoverlayer and in the Si(001)mesa interior, demonstrate considerable inhomogeneity due to both finite geometry effects and the lattice-mismatched Geoverlayer-induced stresses. The maximum magnitude of displacements is as large as 0.7 E, even in the case of uncovered Si(001)mesa. Moreover, we find nonzero displacements in the Sisubstrate as far deep as 100 ML(monolayer) from the Ge/Siinterface, showing that a substantial degree of the misfit-induced stress accommodation occurs through relaxation in the Si(001)mesa interior and the substrate. The topology of the equal displacement contours, in regions adjacent to the mesa edges and corners, is close to semielliptical. To reveal the impact of stress accommodation in the mesa interior and in the substrate, we compute the strain energies of the Geoverlayer atoms as a function of both the Si(001)mesa height and the Geoverlayer thickness. We find that the normalized (per Geatom) elastic energy of a fixed thickness overlayer decreases with increasing mesa depth. At a fixed mesa height, the Geoverlayer energy per Geatom increases as a function of Geoverlayer thickness. In both cases, the dependencies are shown to be adequately fitted with exponential forms. The shear stresses in both bare and 16 MLthick Geoverlayer covered mesa systems show dramatic variations in both lateral and vertical directions. These variations are responsible for nonlinear stress-strain behavior in the regions around the finite geometry features (i.e., edges and corners). [J707]

"Templated wide band-gap nanostructures"

In this two-pronged work we report (a) a study of defect nucleation in three-dimensional confined nanoislands and (b) a surface-elasticity induced size effect in the optoelectronic properties of embedded and templated semiconducting nanostructures. Several key features in the design of nanostructure templates are analyzed and dislocation free contour maps are presented for combination of various lattice mismatches, substrates, and geometrical dimensions. Unlike the case for thin epitaxial films, it is found that for nanostructures, below a certain critical lateral dimension, dislocation free structures of any thickness can be grown. With regards to the optoelectronic properties of nanostructures, while size dependency due to quantum confinement and electrostatic interactions are well known, we show that an additional size-dependent strain is caused by the distinct elastic behavior of surfaces and interfaces at the nanoscopic scale compared to the macroscopic scale. This is in contrast to the usual way strain is linked to optoelectronic properties, i.e., via classical elasticity, which ignores surface energies and is intrinsically size independent. Surface strains appear to be only influential in the nanometer regime due to appreciable surface-to-volume ratios. Among our major conclusions are that errors as large as 100 meV in band-gap prediction can incur if this size-dependent surface effect is ignored. copyright 2004 American Institute of Physics. [J708]

"Crystallization, morphology and magnetic properties of melt-spun (Nd,Pr,Dy)2 (Fe,Co,Mo)14 B/α-Fe nanocomposites"

Crystallization, phase evolution, nanostructure, exchange coupling, and hard magnetic properties of melt-spun Nd2.4Pr5.6Dy1Fe85B6and Nd2.4Pr5.6Dy1Fe78Co6Mo1B6nanocomposites have been studied. All the Nd2.4Pr5.6Dy1Fe85B6alloys annealed for 30 s at 565°C or above contain nanostructured α-Fe and Nd2Fe14B-type (2:14:1) phases, whereas Nd2.4Pr5.6Dy1Fe78Co6Mo1B6alloys annealed at 600°C or below are mainly composed of α-Fe and a metastable 1:7 phase. A small amount of 2:14:1 phase forms after annealing at 600°C.

When annealed at 640°C or above, the hard phase in Nd2.4Pr5.6Dy1Fe78Co6Mo1B6alloys is the 2:14:1 phase rather than the 1:7 phase. The differences in magnetic properties of the Nd2.4Pr5.6Dy1Fe85B6and Nd2.4Pr5.6Dy1Fe78Co6Mo1B6nanocomposites at different anneal temperatures result from the different nanostructures, exchange coupling and phase components present in the alloys, in particular from the different amount of the 1:7 phase. [J709]

"Biomolecule-compatible support structures for biomolecule coupling to physical measuring principle surfaces"

As part of studies on biomolecule-compatible interfacial structures for practice-relevant biosensor and biochip developments, new film-forming aminocelluloses of the 'P-CH2-NH-(X)-NH2' type (P=cellulose) with spacer structures (X=special oligoamine residues) at C6 and solubilising groups (S=tosylate or carbanilate) at C2/C3 of the anhydroglucose unit (AGU) were synthesised and their film properties and covalent coupling with enzyme protein examined. Depending on the nature and degree of substitution (DS(S)) of the ester groups (S) at C2/C3, the new aminocellulose derivatives are soluble either in DMA and DMSO (with S=carbanilate) or in water (with S=tosylate). The aminocellulose derivatives form transparent films from their solutions. AFM investigations of the film surfaces have either shown very flat (topography 2end groups. By means of the covalent coupling of the new aminocelluloses with glucose oxidase (GOD) it was shown that the enzyme coupling efficiency can be decisively optimised by the interplay of aminocellulose structure, coupling structure and enzyme protein. [J710]

"Relationships among equivalent oxide thickness, nanochemistry, and nanostructure in atomic layer chemical-vapor-deposited Hf-O films on Si"

The relationships among the equivalent oxide thickness (EOT), nanochemistry, and nanostructure of atomic layer chemical-vapor-deposited (ALCVD) Hf-O-based films, with oxide and nitrided oxide interlayers on Si substrates, were studied using x-ray photoelectron spectroscopy (XPS), high-resolution transmission electron microscopy (HRTEM), scanning transmission electron microscopy (STEM) in annular dark-field imaging (ADF), and parallel electron energy-loss spectroscopy (PEELS), capacitance-voltage, and leakage-current-voltage measurements. The XPS (Hf 4fbinding energy shift) studies indicated the formation of Hf-O-Si bonds in as-deposited amorphous films, the amount of which was influenced by the interlayer composition and annealing conditions. After post-deposition annealing in N2and O2,the Hf-O layers were nanocrystalline. Although HRTEM images showed a structurally sharp interface between the Hf-O layer and the interlayer, angle-resolved XPS, ADF imaging, and PEELS in the STEM revealed a chemically diffused HfSiOxregion in between. This interdiffusion was observed by the detection of Si (using Si Ledge) and Hf (using Hf O2,3edge) in the Hf-O layer and the interlayer. For an annealed Hf-O/interlayer stack, with an ALCVD target thickness of 4.0 nm for the Hf-O layer on 1.2 nm of nitrided chemical oxide, the experimentally measured EOT and leakage current (at -1 V) were 1.52 nm and 10-8 A/cm2.A three-layer (1.2 nm interlayer of nitrided chemical oxide/compositionally graded, 2 nm region of HfSiOx/2 nmHfO2layer) capacitor model was used to determine the respective contributions to the measured EOT, and the dielectric permittivity of the interlayer was found to be 6.06. These studies clearly indicate that a total EOT of 1 nm and below is attainable in the Hf-N-O-Si/Si-N-O system. copyright 2004 American Institute of Physics. [J711]

"Nanostructural and mechanical properties of nanocomposite nc-TiC /a-C:H films deposited by reactive unbalanced magnetron sputtering"

Thin films of nc-TiC/a-C:Hnanocomposite have been deposited by reactive magnetron sputtering at substrate bias values of -240 and -91 V. The grain size and grain separation, which together define the nanostructure, are correlated to the amount of the amorphous phase. From the size of the TiC grains measured by x-ray diffraction and the amorphous hydrogenated carbon (a-C:H)phase content determined by x-ray photoelectron spectroscopy, the mean grain separation is estimated using a simple model for the nanostructure. Films deposited at -240 V show a hardness enhancement for a-C:Hphase contents in the range 10% to 30% with TiC grain sizes around 5 nm. The mean grain separation for such films was estimated to be 0.3 nm. Films with higher a-C:Hphase contents still have 5 nm small grains, but their mean grain separation is larger than 0.5 nm; their hardness is thus determined by the properties of the amorphous matrix. A less pronounced hardness enhancement is observed for films deposited at -91 V. They have larger grains and larger mean gain separations and show smaller hardness values. The hardness of the films, among other mechanical properties, is controlled by the nanostructure. Raman measurements have shown that a-C:His present in films with mean grain separation down to 0.2 nm. Coefficients of friction against steel lower than 0.3, independent of the substrate bias, are found for films with mean grain separations as low as 0.15 nm. Self-lubrication due to a-C:Hcan explain the observed friction behavior, although the presence of a-C:Hcannot be proved by Raman spectroscopy for films with mean grain separations smaller than 0.2 nm. It is shown that the substrate bias is crucial in obtaining increased hardness of nc-TiC/a-C:Hnanocomposite thin films. In contrast to the hardness of

the coatings, their friction behavior is not affected by the substrate bias. copyright 2004 American Institute of Physics. [J712]

"Amplification of coherent anti-Stokes Raman scattering by a metallic nanostructure for a high resolution vibration microscopy"

On the basis of the mechanism of surface enhanced Raman scattering, it is shown that coherent anti-Stokes Raman scattering (CARS) of molecules attached to isolated gold nanoparticles are strongly enhanced and the signal from each particle is well localized. In addition to well-known advantages of CARS, the surface enhanced CARS combined with a scanning system of metallic nanoprobe tip can realize high spatial resolution CARS microscopy beyond the diffraction limit of light by locally enhancing the weak signals from the small sample volume. This concept is realized by tip-enhanced coherent anti-Stokes Raman spectroscopy using a metallic nanoprobe of near-field scanning optical microscope. copyright 2004 American Institute of Physics. [J713]

"Effect of the polar surface on GaN nanostructure morphology and growth orientation"

Wurtzite gallium nitride nanostructures were grown by thermal reaction of gallium oxide and ammonia. The resulting morphology varied depending on ammonia flow rate. At 75sccmonly nanowires were obtained, while polyhedral crystals and nanobelts were observed at 175sccm. Scanning electron microscopy and transmission electron microscopy revealed both thin smooth and thick corrugated nanowires. The growth orientations of most of the smooth ones, as well as the nanobelts, were perpendicular to the caxis (), while the corrugated nanowires and the large polyhedra grew parallel to . We propose a model to explain these variations of morphology and growth orientation in terms of the Ga/Nratio and the different characteristic length of {0001} polar surface in the different nanostructures. [J714]

"Dimensional structural transition in CdTe /Cd x Zn 1-x Te nanostructures"

CdTenanostructures were grown on CdxZn1-xTebuffer layers by using molecular-beam epitaxy and atomic-layer epitaxy. The atomic force microscopy image showed that uniform CdTequantum dots were formed on ZnTebuffer layer. Photoluminescence measurements showed that the excitonic peak corresponding to the interband transitions from the ground electronic subband to the ground heavy-hole band in the CdTe/CdxZn1-xTenanostructure shifted to a higher energy with increasing Cdmole fraction. The activation energy of the electrons confined in the CdTe/ZnTequantum dots was higher than those of electrons in CdTe/CdxZn1-xTenanostructures. These results can help improve understanding of the dimensional structural transition in CdTe/CdxZn1-xTenanostructures. [J715]

"Nanocantilevers made of bent silicon carbide nanowire-in-silicon oxide nanocones"

We report the plasma-assisted synthesis of nanocones on a nickel-coated silicon substrate using tetramethyl silane as the gas precursor. These nanocones consist of coaxially aligned, crystalline beta -SiC nanowires surrounded by conical-shaped, amorphous silicon oxide precipitates. The propensity of the SiC wire to undergo changes in the growth axis directs the bending of the nanocones, giving rise to structures resembling nanocantilevers. The growth mechanism that controls the nanostructure formation is discussed. [J716]

"Nanogranular Fe x Ni 23-x B 6 phase formation during devitrification of nickel-rich Ni 64 Fe 16 Zr 7 B 12 Au 1 amorphous alloy"

Nickel-rich amorphous precursors with chemical composition of Ni64Fe16Zr7B12Au1were produced by melt-spinning technique and then heat treated at temperatures ranging from 435to600°Cfor 1hto form a nanostructure. Properties of the amorphous and the nanocrystalline samples were investigated by the differential scanning calorimetry, the x-ray diffraction (XRD), the vibrating sample magnetometry, and Mossbauer techniques. The annealing favors the emergence of cubic FexNi23-xB6crystalline grains (10-25nmin diameter). Magnetic measurements made at 4.2-1100Kreveal rather high value of saturation magnetization (nearly 60 and 40Am2/kgat 4.2Kand room temperature, respectively) in amorphous as well as in nanocrystalline states. These facts are consistent with 300K57FeMossbauer effect results which are well supported by the calculations of Ni and Fe magnetic moments in Ni23B6and Fe23B6phases, using the spin polarized tight binding linear muffin-tin orbital method. However, anomalous high magnetic moments of Fe atoms were found in some inequivalent positions in the crystal structure. [J717]

"Heat-assisted magnetization switching in elongated submicrometer Permalloy structures"

The effect on switching behavior of locally heating individual Permalloy nanostructures is reported. The samples consisted of isolated magnetic structures with an aluminum conducting strip on top at one end of each structure,

through which direct current passed to heat the nanostructure. Magnetization switching in individual nanostructures was detected using the magneto-optic Kerr effect. The average coercivity fell with increasing current in the aluminum strip by up to 20%, but, interestingly, the change in absolute magnitude of the coercivity was similar for nanowires of different width for current densities approaching 1011Am-2in the aluminum conductor. The temperature rise at this current density is less than 40K. [J718]

"Giant Zeeman effect of excitons in a hybrid nanostructure of diluted magnetic semiconductor quantum well sandwiched in Co wires"

Giant Zeeman effects of excitons in a hybrid nanostructure of diluted magnetic semiconductor (DMS) quantum well (QW) with ferromagnetic Co have been demonstrated, where the DMS-QW wire with the width of 200 nm is sandwiched in the Co wires and magnetic fields nearly perpendicular to the well plane can efficiently be applied from the Co wires to all of the DMS QW. The spectral shape of excitonic photoluminescence and the field dependence show clearly that the microscopic perpendicular fields generated from the Co wires induce the giant Zeeman shifts of excitons in the DMS QW. [J719]

"Schottky diode characteristics of electrodeposited Au /n-Si (111) nanocontacts"

Au/n-Si(111)contacts with interface areas in the range of 10-12cm2have been fabricated at the solid/liquid interface by electrochemical Aunucleation onto n-Si(111):Hsubstrates. The contacts show a Schottky diode behavior with current densities much higher than expected from thermionic emission theory. The applied sophisticated in situ measurement technique allows, in general, in situ studies of electronic properties at any (semi-) conducting nanostructure at solid/liquid interfaces under well-defined conditions. [J720]

"Three-dimensional mapping of the strain anisotropy in self-assembled quantum-wires by grazing incidence x-ray diffraction"

Three-dimensional strain mapping of InAs self-assembled nanowires on an InP substrate using grazing incidence x-ray diffraction is reported. A remarkable anisotropy was observed for the strain components, parallel [-220]and perpendicular [220] to the wire axis. The highest strain relaxation was measured along the [220] direction. The relationship between the interatomic distances along the [-220]and [220] directions, for each zposition (height) in the nanostructure, was obtained by angular scans in the vicinity of the (040) reciprocal lattice point. [J721]

"Field emission properties of self-assembled silicon nanostructures on n-and p -type silicon"

This letter considers field emission from self-assembled silicon nanostructure arrays fabricated on n- and p-type silicon (100) substrates using electron beam rapid thermal annealing. Arrays of nanostructures with an average height of 8 nm were formed by substrate annealing at 1100 °C for 15 s. Following conditioning, the Si nanostructure field emission characteristics become stable and reproducible with Fowler-Nordheim tunneling occurring for fields as low as 2Vmcm-1. At higher fields, current saturation effects are observed for both n-type and p-type samples. These studies suggest that the mechanism influencing current saturation at high fields acts independently of substrate conduction type. [J722]

"Imaging optical near-fields of nanostructures"

We present a method for imaging the optical near-fields of nanostructures, which is based on the local ablation of a smooth silicon substrate by means of a single, femtosecond laser pulse. At those locations, where the field enhancement due to a nanostructure is large, substrate material is removed. The resulting topography, imaged by scanning electron or atomic force microscopy, thus reflects the intensity distribution caused by the nanostructure at the substrate surface. With this method one avoids a possible distortion of the field distribution due to the presence of a probe tip, and reaches a resolution of a few nanometers. Several examples for the optical near-field patterns of dielectric and metallic nanostructures are given. [J723]

"In situ real time process characterization in nanoimprint lithography using time-resolved diffractive scatterometry"

To optimize nanoimprint lithography (NIL), it is essential to be able to characterize and control the NIL process in situ and in real time. Here, we present a method for in situ real-time NIL process characterization using time-resolved diffractive scatterometry (TRDS). A surface relief diffraction grating is used as the imprint mold, and the diffracted light intensity is monitored continuously during the imprint process. We use a scalar diffraction model to calculate the diffraction intensity as a function of the mold penetration ratio. Simulations show good agreement with the experimental results. Our results indicate that TRDS offers a powerful characterization tool that can be used for in situ, real-time NIL process control. [J724]

"Single-molecule spontaneous emission close to absorbing nanostructures"

The spontaneous emission of a single molecule is substantially modified close to a metallic nanostructure. We study the spectral behavior of the radiative and nonradiative decay rates and of the local-field factor in the vicinity of a plasmon resonance. We show that the highest fluorescence enhancement is obtained for an emission wavelength redshifted from the plasmon resonance, and that quenching always dominates at plasmon resonance. These results may have experimental implications in spectroscopy and monitoring of elementary light sources. [J725]

"High-sensitivity sensor of low relative humidity based on overlay on side-polished fibers"

A low relative humidity (RH) sensor based on overlay on side-polished fiber is presented. The evanescent field from a single-mode optical fiber is coupled to a TiO2waveguide overlay. The transmission response exhibits sharp resonances whose central wavelengths are linearly shifted with RH. This behavior is due to the porous columnar nanostructure of the TiO2film. The water is adsorbed in the pores of the nanostructure changing the refractive index of the layer and causing a shift of the wavelength resonances. The response of the sensor is determined by the shape and size of the pores. The optical fiber evanescent field sensor developed has a linear response and high sensitivity (0.5 nm/% RH) for low RH (RH 0%-15%) at 26.1°C±0.6°C. The lack of hysteresis in the adsorption-desorption cycle has been checked. The development of a sensor with tailored response is envisaged using properly techniques to control the porosity of the material. [J726]

"Transfer of nanoporous pattern of anodic porous alumina into Si substrate"

Nanohole arrays in a Si substrate with a self-ordered configuration having a 100 nm hole periodicity were fabricated by the pattern transfer of the hole configuration of anodic porous alumina. The self-ordered anodic porous alumina used as a mask was directly prepared by anodizing an aluminum film sputtered on a Si substrate. The transfer of the nanoporous pattern of anodic alumina into the Si substrate could be achieved by removing silicon oxide, which was produced by the anodic oxidation of the local part of the Si substrate underneath the barrier layer corresponding to the pore base. In addition, we confirmed that the transformation of the nanostructure of porous alumina grown on a Si substrate is comparable to the current transient during alumina film formation. copyright 2003 American Institute of Physics. [J727]

"Ultrafast patterning of nanostructures in polymers using laser assisted nanoimprint lithography"

We propose and demonstrate a nanopatterning technique, laser-assisted nanoimprint lithography (LAN), in which the polymer is melted by a single excimer laser pulse and then imprinted by a mold made of fused quartz. LAN has been used to pattern nanostructures in various polymer films on a Si or quartz substrate with high fidelity over the entire mold area. Here we show 200 nm pitch gratings with 100 nm linewidth and 90 nm height. The entire imprint from melting the polymer to completion of the imprint is less than 500 ns. The mold has been used multiple times without cleaning between each imprint. LAN not only greatly shortens the imprint processing time, but also significantly reduces the heating and expansion of the substrate and mold, leading to better overlay alignment between the two. copyright 2003 American Institute of Physics. [J728]

"Dynamic and atomistic deformation of sp2 -bonded boron nitride nanoarrays"

With the aim of developing a nanostructure, we produced an sp2-bonded boron nitride nanoarray (BNNA), and observed its dynamic deformation behavior using high-resolution transmission electron microscopy with a piezoceramic tube for three-axis positioning of an indenter. The BNNA has remarkable flexibility and resiliency, such that no permanent deformation occurred when it was bent repeatedly to the minimum radius of curvature of about 4 nm. Even in repeated bends to the minimum radius of curvature of about 0.3 nm, the BNNA underwent no catastrophic failure. copyright 2003 American Institute of Physics. [J729]

"Si nanocrystals obtained through polymer pyrolysis"

In this letter, we report the formation of bulk samples of silica-based glass containing Si nanocrystals (Si-ncs) by pyrolysis of a preceramic precursor. The starting precursor is a sol-gel-derived polysiloxane containing only Si-H groups which leads, after annealing in a controlled atmosphere in the range 1000-1200 °C, to the precipitation of Si-ncs. Characterization of the nanostructure was performed by x-ray diffraction and Raman scattering analyses. Room-temperature luminescence experiments show the interesting optical properties of the Si-ncs/SiO2material. copyright 2003 American Institute of Physics. [J730]

"Scanning tunneling microscope mediated nanostructure fabrication from GeH 4 on Si(111)-(7Ч7)"

The tungsten tip of a scanning tunneling microscope, covered with GeHxby exposure to GeH4,was used to locally grow nanometer-sized Ge or GeHxislands on a Si(111)-(7Ч7) surface. This was achieved by transfer of material from the tip to the surface, induced by voltage pulses. A model, based on the diffusion of adsorbates on the tip and desorption stimulated by an electric field, is presented to account for the results. copyright 2003 American Institute of Physics. [J731]

"Imaging of optical field confinement in ridge waveguides fabricated on very-small-aperture laser"

Optical field confinement in a ridge waveguide nanostructure ("C" aperture) designed for ultrahigh-density recording was observed using an apertureless near-field scanning optical microscope. The aperture was fabricated on a commercial edge-emitting semiconductor laser as the light source. High-contrast near-field images at both 1Чand 2Чlock-in detection frequencies were obtained. The emission patterns are in agreement with theoretical simulation of such structures. A 90 nmЧ70 nmfull width half maximum spot size was measured and is comparable to the ridge width of the aperture. copyright 2003 American Institute of Physics. [J732]

"Nonvolatile electrical bistability of organic/metal-nanocluster/organic system"

Two-terminal electrical bistable devices have been fabricated using a sandwich structure of organic/metal/organic as the active medium, sandwiched between two external electrodes. The nonvolatile electrical bistability of these devices can be controlled using a positive and a negative electrical bias alternatively. A forward bias may switch the device to a high-conductance state, while a reverse bias is required to restore it to a low-conductance state. In this letter, a model to explain this electrical bistability is proposed. It is found that the bistability is very sensitive to the nanostructure of the middle metal layer. For obtaining the devices with well-controlled bistability, the middle metal layer is incorporated with metal nanoclusters separated by thin oxide layers. These nanoclusters behave as the charge storage elements, which enable the nonvolatile electrical bistability when biased to a sufficiently high voltage. This mechanism is supported by the experimental data obtained from UV-visible absorption spectra, atomic force microscopy, and impedance spectroscopy. copyright 2003 American Institute of Physics. [J733]

"Surface morphology control of InAs nanostructures grown on InGaAs/InP"

The evolution of the surface morphology of InAs nanostructures grown on InGaAs/InP by molecular-beam epitaxy was studied through atomic force microscopy imaging. Randomly distributed quantum dots and quantum wires were reproducibly achieved by adjusting proper growth parameters such as InAs deposition thickness, growth temperature, arsenic overpressure, and InAs growth rate. It is observed that a thick InAs layer, high growth temperature, high arsenic overpressure, and high growth rate promote the formation of quantum dots. We propose that when InAs is deposited, the interaction of the total strain in the InAs layer and the surface strain distribution in the underlying matrix layer might be the determinant factor of the nanostructure morphology. Thick InAs, which increases the total strain of the InAs layer, is preferred to form quantum dots. Surface diffusion of In adatoms is another important factor affecting the surface morphology. A high growth temperature promotes homogeneous diffusion, while a high arsenic overpressure and growth rate reduces the surface diffusion of the In adatoms. These factors induce the formation of quantum dots. copyright 2003 American Institute of Physics. [J734]

"Enhanced photoluminescence of InGaAs/GaAs quantum dots induced by nanoprobe pressure effects"

Marked enhancement of photoluminescence of InGaAs/GaAs quantum dots (QDs) was observed by the nanoindentation of the light-collecting fiber nanoprobe onto the sample surface. In order to analyze its mechanism, calculations of the nanoprobe-induced strain and the energy-band profiles in the bulk GaAs surrounding InGaAs QDs have been performed on the bases of linear continuum elastic theory and six-band strain Hamiltonian. The calculations have revealed that the confinement potential for light holes was generated by the nanoprobe indentation. The results obtained in this study show that nanometer-scale strain modulation by nanoprobe indentation has potential for the investigation of semiconductor nanostructure physics. copyright 2003 American Institute of Physics. [J735]

"Consolidation and magnetic properties of nanostructured Ni75 Fe25"

In the fabrication of nanostructured soft magnetic materials, powder processing is an attractive approach as it provides ability for mass production of bulk-volume magnetic components. In this approach, consolidating while retaining required nanostructure of the nanopowder is a big challenge. In this work, the as-synthesized

Ni75Fe25nanoparticles were consolidated by hot pressing. The results indicate that high packing density is achievable. In the hot press processing, two physical interactions are decisive in determining the magnetic softness of the material: internal demagnetizing effect caused by porosity and exchange coupling. This study demonstrates that in order to eliminate demagnetizing effect and to make the exchange coupling dominant, the nanopowders have to be over 95% dense. [J736]

"Room-temperature Si single-electron memory fabricated by nanoimprint lithography"

We report the design, fabrication, and characterization of room-temperature Si single-electron memories using nanoimprint lithography (NIL). The devices consist of a narrow channel metal-oxide-semiconductor field-effect transistor and a sub-10-nm storage dot, which is located between the channel and the gate. The memories operate at room temperature by charging and discharging one electron in or out of the dot. The charge retention time is up to two days. NIL is shown to be tailored for nanodevice fabrication. By using NIL as a nanolithography tool, the single-electron memory is more feasible for mass production. copyright 2003 American Institute of Physics. [J737]

"X-ray photoelectron spectroscopy study of the first stages of ZnO growth and nanostructure dependence of the effects of polarization at ZnO /SiO 2 and ZnO /Al 2 O 3 interfaces"

A critical characteristic of nanoparticles and, in general, of nanomaterials, is the overweighing importance of the surface and interface layers relative to the bulk because of the small size of the aggregates (in three dimensions) or thickness of the layers (in the case of two dimensions) that constitute the nanomaterial. This article reports the characterization of interface layers of ZnO/MOx(MOx:Al2O3and SiO2)using x-ray photoelectron spectroscopy (XPS). Careful experiments consisting of the deposition of ZnO material on SiO2and Al2O3substrates have been performed. Several samples were produced and characterized in situ. The nanostructure of the first stages of growth of the ZnO deposited was determined by Tougaard peak-shape analysis of several photoelectron peaks in both the substrate and overlayer and the growth mechanisms determined were found to be consistent. Thus, the actual nanostructure of the growing ZnO films was carefully determined. In addition, the chemical interaction at the ZnO/MOxinterface was monitored by following the variation of the Auger parameter of the Zn atoms as the amount of ZnO deposited was increased. Thus, changes of the Auger parameter of the Zn atoms were correlated with the actual nanostructures formed by the ZnO deposits. From this information, a model is presented that accounts for changes in the electronic parameters determined by XPS as a result of bonding and polarization interaction at the interface. copyright 2003 American Vacuum Society. [J738]

"Nanostructure science and technology: Impact and prospects for biology"

Life processes function by the activity of complex interacting molecular systems. Advances in nanostructure science and technology are providing powerful tools for investigating those systems. Developments such as atomic force microscopy, luminescent quantum dots, and nanofabricated probes have provided new capabilities for molecular and cell biology. The function of biomolecules, cellular components, and organelles and the interaction of living cells with their environment can now be explored in exquisite detail with nanoscale probes and devices. Materials and devices engineered at the nanometer scale are being developed and employed in biochemical analysis, medical diagnostics, and therapeutic devices. With the ability to understand, manipulate, and harness enzymes, receptors, and other biomolecules, new types of biosensors are emerging and new research approaches to biological systems are becoming possible. copyright 2003 American Vacuum Society. [J739]

"Patterned magnetic media from self-assembly template methods"

Using lyotropic liquid crystalline phases and self-assembly from colloidal suspensions of polystyrene latex spheres, well-ordered, nanostructured templates were prepared. The results of electrochemical deposition of magnetic metals and alloys in the voids of these templates are presented. This technique has enabled the creation of magnetic nanostructures with 3D-achitectures on length scales 4 nm-1 μm. Changes in coercive field, by more than an order of magnitude were found, dominated by the effects of domain wall pinning. Clear transverse magnetisation suggests a Bloch type of domain walls. The in-plane component of the magnetic field drives the magnetic hysteresis. The templated electrodeposition technique offers the potential of a low-cost preparation method for sub-micron patterned magnetic media. [J740]

"Modeling of ultrawidely tunable vertical cavity air-gap filters and VCSELs"

Tunable vertical cavity devices including an air-gap integrated in the cavity have been designed, fabricated, and investigated. The ultrawide wavelength tuning is realized by micromechanical actuation of Bragg mirror

membranes. Based on optical and mechanical model calculations, the air-gap filters and vertical cavity surface emitting lasers (VCSELs) are designed for investigating mainly the optical tuning efficiency. In our research, we focus on two different mirror material systems, dielectric Si3N4/SiO2and InP/air-gap Bragg mirrors and on two tuning concepts, respectively. For the dielectric mirrors, continuous tuning is achieved by thermal actuation of the Si3N4/SiO2mirror membranes, and for InP/air-gap mirrors, electrostatic actuation of the InP membranes is used. To verify the optical and mechanical simulations, InP/air-gap filters are characterized by measuring reflectance spectra and the tuning behavior. The measured results agree with the simulations used to optimize the micromechanical and optical characteristics of air-gap filters and VCSELs for optical communication applications. [J741]

"Artificial dielectric devices for variable polarization compensation at millimeter and submillimeter wavelengths"

Variable polarization compensation has been demonstrated at 100 GHz. The device consists of two interlocking V-groove artificial dielectric gratings that produce a birefringence that varies with the separation distance. A maximum retardance of 74° has been obtained experimentally in a silicon device, in good agreement with rigorous coupled-wave computer simulations. Further simulations predict that adding quarter wave dielectric antireflection (AR) coatings to the outer surfaces of the device can reduce the insertion loss to below 4 dB. The use of rectangular grooved gratings provides increased retardance and reduced loss. It is predicted that a coupled device with rectangular grooved gratings will be capable of maximum retardance in excess of 180°, with low insertion loss ([J742]

"Morphology evolution during strained (In,Ga)As epitaxial growth on GaAs vicinal (100) surfaces"

Molecular-beam-epitaxy growth of strained (In,Ga)As on GaAs vicinal (100) surfaces is investigated by scanning tunneling microscopy. Surface roughing as the consequence of step bunching driven by strain is explored. By tuning the In content over the range from 0.05 to 0.2, the step bunching is observed to exhibit considerable uniformity and order. These results experimentally demonstrate that strain-driven step bunching is a viable approach to provide templates for nanostructure growth. copyright 2003 American Institute of Physics. [J743]

"Large electric-field induced electron drift velocity observed in an In x Ga 1-x As-based p-i-n semiconductor nanostructure at T=300 K"

Transient subpicosecond Raman spectroscopy has been used to measure electron transport properties in an InxGa1-xAs-basedsemiconductor nanostructure under the application of an electric field. The deduced electron drift velocity has been found to be significantly larger than either GaAs or InP-based p-i-nnanostructures under similar experimental conditions. We attribute this finding to both the smaller electron effective mass and the larger Gamma to L (X)energy separations in InxGa1-xAs.The experimental results are compared with ensemble Monte Carlo calculations. copyright 2003 American Institute of Physics. [J744]

"Quantum-well microtube constructed from a freestanding thin quantum-well layer"

We fabricated and experimentally investigated a nanostructure known as a quantum-well (QW) microtube, which is a fine tube with a micron- or nanometer-order diameter fabricated by rolling a semiconductor GaAs QW. Although the wall thickness is only 40 nm, the system retains the quantum properties of a QW, and photoluminescence from the QW subband can be clearly observed. Even though the QW width is sufficiently small to make the QW subband type-II band-aligned, a type-II to type-I transition caused by uniaxial strain in the microtube allows for optical emission. copyright 2003 American Institute of Physics. [J745]

"DNA size separation using artificially nanostructured matrix"

We have demonstrated two types of size separation of biomolecules using a nanostructured matrix artificially fabricated using electron-beam lithography: sieve-type separation using a regular pillar array structure and size exclusion chromatography (SEC) type separation using a structure with narrow and wide gaps. With these devices, samples of double-stranded DNA molecules (2, 5, and 10 k base pairs) were clearly separated into bands; smaller molecules eluted earlier in the sieve type while they eluted later in the SEC type. The nanostructured matrix enables various types of molecular separation by changing the design of the nanostructure. Moreover, it should be easy to integrate the matrix with other biomolecular fluidic devices because it does not require a filling medium. copyright 2003 American Institute of Physics. [J746]

"Fabrication of 60-nm transistors on 4-in. wafer using nanoimprint at all lithography levels"

Nanoimprint lithography (NIL) is a paradigm-shift method that has shown sub-10-nm resolution, high throughput,

and low cost. To make NIL a next-generation lithography tool to replace conventional lithography, one must demonstrate the needed overlay accuracy in multilayer NIL, large-area uniformity, and low defect density. Here, we present the fabrication of 60-nm channel metal-oxide-semiconductor field-effect transistors on whole 4-in. wafers using NIL at all lithography levels. The nanotransistors exhibit excellent operational characteristics across the wafer. The statistics from consecutive multiwafer processing show an average overlay accuracy of 500 nm over the entire 4-in. wafer. The accuracy is much better when the field size is reduced. The overlay accuracies are limited by the current alignment method and can be improved substantially. The work presents a significant advance in nanoimprint development and its applications in manufacturing of integrated electrical, optical, chemical, and biological nanocircuits. copyright 2003 American Institute of Physics. [J747]

"Angular dependence of spin-transfer switching in a magnetic nanostructure"

We measured switching of a thin film nanomagnet driven by spin-polarized current in giant magnetoresistance spin valves as small as 50 nmЧ100 nm. Spin-transfer reversal is observed in both dc current and magnetic field sweeps, with a switching current of 5 mA, for example, for a bit with 900 Oe switching field in zero current. We studied the dependence of spin-transfer switching on the relative angle between the layer magnetizations by using a magnetic field to orient the magnetization of a bulk magnetic layer at an angle to a patterned layer held in place by shape anisotropy. The critical current is a minimum for collinear magnetizations and diverges as 1/|cos | as increases to 90°, consistent with switching current calculations using the Slonczewski spin-transfer torque model. copyright 2003 American Institute of Physics. [J748]

"Ultralow biased widely continuously tunable fabry-Perot filter"

Optical filters capable of single control parameter-based wide tuning are implemented and studied. The surface micromachined Fabry-Perot filter consists of two InP-air-gap distributed Bragg reflectors and shows a wavelength tuning of more than 140 nm using only a single voltage of up to 3.2 V at currents below 0.2 mA. The membrane-based filter is designed to block all wavelengths in the whole range of 1250-1800 nm apart from its transmission wavelength. [J749]

"Fabrication of nanostructured superconducting single-photon detectors"

Fabrication of NbN superconducting single-photon detectors, based on the hotspot effect is presented. The hotspot formation arises in an ultrathin and submicrometer-width superconductor stripe and, together with the supercurrent redistribution, leads to the resistive detector response upon absorption of a photon. The detector has a meander structure to maximally increase its active area and reach the highest detection efficiency. Main processing steps, leading to efficient devices, sensitive in 0.4-5 μm wavelength range, are presented. The impact of various processing steps on the performance and operational parameters of our detectors is discussed. [J750]

"Laser synthesis of carbon-rich SiC nanoribbons"

A nanosecond pulsed laser direct-write and doping (LDWD) technique is used for the fabrication of carbon-rich silicon carbide nanoribbons heterostructure in a single crystal 4H-SiC wafer. Characterization by high-resolution transmission electron microscope and selected area electron diffraction pattern revealed the presence of nanosize crystalline ribbons with hexagonal graphite structure in the heat-affected zone below the decomposition temperature isotherm in the SiC epilayer. The nanoribbons exist in three layers each being approximately 50-60 nm thick, containing 15-17 individual sheets. The layers are self-aligned on the (0001) plane of the SiC epilayer with their c axis at 87° to the incident laser beam. The LDWD technique permits synthesis of heterostructured nanoribbons in a single step without additional material or catalyst, and effectively eliminates the need for nanostructure handling and transferring processes. copyright 2003 American Institute of Physics. [J751]

"As-quenched and nanocrystallized structure for Nb-poor Fe-Nb-B-P-Cu soft magnetic alloys melt spun in air"

The as-quenched and nanocrystallized structures for Nb-poor Fe-Nb-B(-P-Cu) alloys melt spun in air have been investigated. The Nb-poor Fe85Nb6B9alloy has the as-quenched structure composed of an amorphous phase and large alpha -Fe grains with 20-45 nm in size. The large alpha -Fe grains should remain after crystallization and result in a nonuniform nanocrystalline structure with the low permeability (mu e)of 14 000 at 1 kHz. The simultaneous replacement of B by 1 at % P and Fe by 0.1 at % Cu for the alloy decreases the alpha -Fe grain size to nanoscale in an as-quenched state, and realizes a uniform crystallized nanostructure and good magnetic properties (mu e=41 000at 1 kHz and Bs=1.61T) comparable to those of the typical Fe-M-B nanocrystalline alloys with a fully amorphous phase in an as-quenched state produced in a vacuum or Ar atmosphere. This result indicates that the precursor to the uniform nanostructure with high mu eis not always a fully amorphous phase, and there is a possibility to realize the higher Bsmaterials with higher Fe contents. copyright 2003

American Institute of Physics. [J752]

"Comprehensive description of the dynamical screening of the internal electric fields of AlGaN/GaN quantum wells in time-resolved photoluminescence experiments"

We present a combined theoretical and experimental analysis to describe the interplay between polarization field, charge screening, and radiative and nonradiative recombinations in AlGaN/GaN-based nanostructures. We perform the study of photoluminescence (PL) in both stationary and time-resolved PL (TR-PL) conditions, considering also the effect of temperature on the different recombination mechanisms, and especially on nonradiative recombinations. The theoretical analysis is obtained by coupling a complete self-consistent solution of Schrodinger and Poisson equations to determine the electronic states in the nanostructure with a rate equation model to account for time-dependent effects of charge rearrangement. We review the topic of polarization field screening taking into account the most recent results on the evaluation of the very strong coefficients for spontaneous and piezoelectric polarizations that have recently been predicted for III-V nitride semiconductors with natural wurtzite symmetry, and we show how the screening influences both static and dynamic recombination mechanisms. Experimental results are obtained for high-quality GaN/AlGaN multiple quantum wells by means of both continuous-wave (cw) and TR-PL techniques. The case of single quantum well is also considered. The PL measured decays show a time dependence that is not only controlled by radiative lifetimes, which depend on the fields inside the GaN wells, but also on the carrier recombinations through nonradiative channels. We demonstrate that PL emission is influenced by charge accumulation in the well, and a loss of carriers from the ground level induced by an interplay between radiative and nonradiative recombination processes. Moreover, from the analysis of the temperature dependence of the TR-PL decays, we deduce important confirmations of a thermally activated detrapping mechanism that strongly affects the nonradiative recombination processes. copyright 2003 American Institute of- Physics. [J753]

"Compact, robust, and flexible setup for femtosecond pulse shaping"

We present an improved design and adjustment concept for femtosecond pulse shaping. The concept results in a compact and robust pulse shaping setup. A systematic adjustment procedure, high reproducibility and stability, as well as easy adaptability to different femtosecond laser sources are the key features of the presented design. The constructed prototype pulse shaper was tested in an open loop and feedback-controlled adaptive pulse shaping on two different femtosecond laser sources. copyright 2003 American Institute of Physics. [J754]

"Strain-driven facet formation on self-assembled InAs islands on GaAs (311)A"

The shape of InAs three-dimensional islands grown on GaAs(311)A substrates by molecular-beam epitaxy was investigated by in situ scanning tunneling microscopy. The island is found to be laterally surrounded by (111)A and {110} facets together with a convex curved region close to the (100) facet. The top ridge of the islands is atomically resolved to be the most recently discovered high-index surface {11,5,2}. This observation points to the importance of the study of nanostructure growth on high-index surfaces and their characterization. copyright 2003 American Institute of Physics. [J755]

"Enhanced photoluminescence from CdS:Mn/ZnS core/shell quantum dots"

Enhanced photoluminescence (PL) is reported from Mn2+-doped CdS nanocrystals capped with ZnS (CdS:Mn/ZnS core/shell) that were prepared using a reverse micelle route. Compared to organically (n-dodecanethiol) capped CdS:Mn nanocrystals, CdS:Mn/ZnS core/shell nanocrystals exhibited much stronger and sharper Mn2+ 4T1-6A1yellow PL emission. This is presumably the result of effective passivation of CdS surface states by the ZnS shell and consequent suppression of nonradiative recombination transitions. The core/shell nanostructure was confirmed using x-ray photoelectron spectroscopy and energy dispersive spectroscopy data. copyright 2003 American Institute of Physics. [J756]

"Visible photoluminescence from nanostructured Si-based layers produced by air optical breakdown on silicon"

Pulsed radiation of CO2laser has been used to produce an optical breakdown on a silicon target in atmospheric air. After several breakdown initiations near the threshold of plasma production, a highly porous layer was formed under the radiation spot on the silicon surface. The fabricated layers presented the porosity of 75%-80% and were formed of silicon nanocrystals imbedded in SiO2matrix. They exhibited strong photoluminescence (PL) around 2.0 eV, which was stable to a prolonged continuous illumination of samples. Possible mechanisms of nanostructure formation and PL origin are discussed. copyright 2003 American Institute of Physics. [J757]

"New fabrication approach to fine multifilamentary Nb3 (Al,Ge) superconductors using an intermediate rapid quenching technique"

Drawability of Nb/Al-Ge composite has been improved by a reel-to-reel intermediate rapid quenching technique. The intermediate rapid quenching is performed at an early stage of the fabrication process of multifilamentary wires to convert the coarse Al-Ge core structure into very fine microstructure. Depending on the heat treatment condition, an Al-Ge nano-structure can be obtained in the core. The hardness of the Al-Ge core is balanced with that of the Nb matrix. This technique thus allows construction of multifilamentary structure easily. In addition, it also allows an easy increase of Ge content to 25 at% in the Al-Ge core and reduction of the nonsuperconducting matrix ratio to less than 1. By a diffusion reaction heat treatment at 1400°C for the developed multifilamentary Nb/Al-Ge wire, non-Cu Jc=75 A/mm2at 21 T, 4.2 K has been obtained so far. [J758]

"Mossbauer study of the magnetism and structure of amorphous and nanocrystalline Fe 81-x Ni x Zr 7 B 12 (x=10-40) alloys"

Soft magnetic amorphous and nanocrystalline Fe81-xNixZr7B12 (x=0-40)alloys with very low coercivity and improved mechanical properties, as compared with the NANOPERM alloys, were prepared by a melt-quenching technique. The nanostructure was formed by annealing amorphous precursors in the temperature range TA=440-620 °C.Formation of the nanocrystalline phase was studied by Mossbauer spectroscopy, differential scanning calorimetry, and x-ray diffraction techniques. The composition of the nanocrystalline phase strongly depends on the Ni content in the alloy. For x 30the dominating nanocrystalline phase is the bcc Fe, similarly to the NANOPERM alloys. However, the alloy with x=40behaves in a clearly different way. Annealing of the Fe41Ni40Zr7B12alloy at TA=520-620 °Ccauses the formation of the nanograins of magnetically ordered cubic (FeNi)23B6and FeNi phases, as identified by the Mossbauer and x-ray diffraction measurements. Annealing at temperatures exceeding 590 °C leads to the Mossbauer spectra at room temperature dominated by a single-line nonmagnetic component. Mossbauer measurements performed at low temperatures reveal a superparamagnetic origin of this spectral component. The superparamagnetic relaxation at the sample surfaces is restricted by the stress induced surface anisotropy related to the crystallization of the amorphous phase as revealed by the conversion electron Mossbauer results. The conversion ele- ctron Mossbauer measurements which allowed the comparison of the surface and bulk crystallization of Fe81-xNixZr7B12alloys show clear differences between the surface and bulk crystallization for all alloy compositions. Unconventional Mossbauer studies utilizing radio frequency (rf) fields provide information on the soft magnetic nature of the alloys by observing the degree of rf-induced collapse of the hyperfine fields. The rf-Mossbauer technique, being particularly sensitive to magnetic anisotropy, provided information on the anisotropy fields in the alloys. It was found that the nanocrystalline FeNiB phase is magnetically very soft as revealed by the rf-Mossbauer technique. The complete rf collapse of the magnetic hyperfine structure was observed for the nanocrystalline Fe41Ni40Zr7B12alloy in clear distinction to the FeNiZrB alloys with x≤30and to similar earlier studies of NANOPERM alloys. An improved magnetic softness combined with much reduced brittleness of the Fe41Ni40Zr7B12samples offer attractive possibilities for technical applications of the nanocrystalline Ni-containing alloys. copyright 2003 American Institute of Physics. [J759]

"RC-coupled ferromagnetic single-electron transistors"

We study quantitatively the operation of ferromagnetic single-electron transistors coupled to the controlling gate potential by the gate resistance and gate capacitance in series. In this type of the device, several metastable charge states are possible within the range of Coulomb blockade. The enhancement and hysteresis of tunnel magnetoresistance on the drain and gate voltages are predicted. The inelastic macroscopic quantum tunneling of charge and the existence of several charge states play an important role in the unique behavior of tunnel magnetoresistance. This implies that RC-coupled ferromagnetic single-electron transistors have a functionality as novel magnetoresistive nanostructure devices. copyright 2003 American Institute of Physics. [J760]

"Transmission of low-energy electrons in boron-doped nanocrystalline diamond films"

Transmission electron spectroscopy is used to examine the low-energy electron transport and emission properties of nanocrystalline chemical-vapor-deposited diamond films. In particular, the intensity and energy distribution of transmitted electrons are measured as a function of film thickness and incident-beam parameters. Low-energy transmission is detected in measurements from two films of thickness 0.15 and 2.5 mcm with similar boron concentrations. The transmitted energy distributions are very similar for the two samples and are nearly identical to those obtained in reflection measurements. The full width at half maximum of the transmitted distribution is slightly broader for the thinner film (0.8-0.9 eV)than for the thicker film (0.6-0.7 eV),and the maximum transmission yields are similar (3-5emitted electrons per incident electron). However, different beam energies are required to produce the low-energy transmission. The energy-dependent data is interpreted using Monte Carlo simulations along with a qualitative model of the diamond nanostructure. From this analysis, the low-energy-electron escape depth is confirmed to be as long as 1 mcmin the 2.5-mcm-thick sample. copyright

2003 American Institute of Physics. [J761]

"Nanostructure and infrared photoluminescence of nanocrystalline Ge formed by reduction of Si 0.75 Ge 0.25 O 2 /Si 0.75 Ge 0.25 using various H 2 pressures"

Nanocrystalline Ge in SiO2was synthesized by the reduction of Si0.75Ge0.25O2with H2,at various annealing temperatures (ranging from 700 to 900 °C), with various H2partial pressures (100% N2, 6% H2:94% N2, and 100% H2),and for a range of times. Cross-sectional transmission electron microscopy (XTEM) reveals a strong dependence of nanocrystal distribution and structure on annealing temperature and H2partial pressure. The oxide/semiconductor interface served as a seed layer for the growth of large Ge crystallites, whereas nanocrystals formed in the bulk of the oxide for high H2partial pressures or low temperatures. The mechanisms involved in nanocrystal formation are discussed in the context of XTEM and Raman spectroscopy results. Select nanocrystalline Ge samples were characterized optically with infrared photoluminescence (PL) measurements at 4 K, using a 488 nm Ar laser excitation. Nanocrystalline Ge samples with small nanocrystals (15 nm)exhibited a broad infrared PL background ranging from about 1.0-1.7 mcm. The broad background is attributed to quantum confinement in the Ge nanocrystals, consistent with a wide distribution of nanocrystal sizes and hence a broad range of confinement energies. copyright 2003 American Institute of Physics. [J762]

"Origins of the elastic behavior of nanoparticle chain aggregates: Measurements using nanostructure manipulation device"

Nanoscale studies were conducted on the dynamic behavior of individual nanoparticle chain aggregates (NCAs) and their networks. For this purpose, device was fabricated to apply tension to NCA under controlled conditions. The device is composed of a specimen support and a cartridge. The specimen support is a deformable alloy disk with a narrow slit across which the NCAs are deposited; the cartridge is used to connect the specimen support to a specimen elongation support holder. The aggregates were stretched using the specimen holder to widen or narrow the slit gap at speeds from 0.5 to 300 nm/s and the motion was observed with a transmission electron microscope. Most of the studies were made with carbon NCA (primary particle size between 11 and 16 nm) generated by laser ablation of a graphite target. The aggregates were deposited on the specimen support (disk) to form bridges across the slit. When tension was applied, the NCA chains remained attached at the slit edges; the chains stretched as kinks on the scale of a few particle diameters were straightened by rotation and/or grain boundary sliding at particle-particle interfaces. After the chain became taut, increasing tension produced little additional extension. Eventually, the chain broke, the tension relaxed, and the elastically strained portions along the NCA recovered. This led to fast contraction of the two broken ends. In one of the cases studied in detail, a small primary particle in the chain doubled in length before the chain broke at this site. This probably occurred because of the high tensile stress in the small particle. In separate experiments, a network of carbon NCA was produced by increased deposition around the slit of a specimen support. Chains in the network broke successively as the network stretched. Some of the chains broke midway and not at the junctures with each other. They contracted fast showing behavior similar to that of the individual aggregates. Possible applications to the b- ehavior of nanocomposite materials composed of blends of NCAs and molecular polymers (e.g., rubber) are described. copyright 2003 American Institute of Physics. [J763]

"Effects of substrate temperature on nanostructure and band structure of sputtered Co 3 O 4 thin films"

Effects of substrate temperature (Ts)on nanostructure and band structure of sputtered Co3O4thin films were investigated. The lattice constant of Co3O4sputtered at room temperature was longer than the reported bulk Co3O4value. It decreased with increasing Tsand approached the reported value. Average grain size of the film formed at Ts=918 Kwas 13.6 nm which was twice as big as that of the film obtained at Ts=293 K.Intensities of optical absorption peaks increased with increasing Ts.Band gaps corresponding to the charge transfer from Co2+(pi *e)to Co2+(pi *t2)(0.8 eV),from Co3+(pi 2t2)to Co2+(sigma *t2)(1.3 eV),and from O2-(pi *Gamma)to Co2+(sigma *t2) (2.1 eV)increased as a function of Ts.Detailed analysis of the optical absorption spectra in the infrared region indicated that there were many kinds of defects in the Co3O4thin film formed at Ts=293 Kand there were fewer defects in the film formed at Ts=91- 8 K.The defects, low density, and increasing interface area at intergrains of nanoparticles caused a lowering of Egat lower substrate temperature. copyright 2003 American Institute of Physics. [J764]

"Atomic layer chemical vapor deposition of ZrO 2 -based dielectric films: Nanostructure and nanochemistry"

A 4 nm layer of ZrOx(targeted x 2)was deposited on an interfacial layer (IL) of native oxide (SiO, t 1.2 nm)surface on 200 mm Si wafers by a manufacturable atomic layer chemical vapor deposition technique at 300

°C. Some as-deposited layers were subjected to a postdeposition, rapid thermal annealing at 700 °C for 5 min in flowing oxygen at atmospheric pressure. The experimental x-ray diffraction, x-ray photoelectron spectroscopy, high-resolution transmission electron microscopy, and high-resolution parallel electron energy loss spectroscopy results showed that a multiphase and heterogeneous structure evolved, which we call the Zr-O/IL/Si stack. The as-deposited Zr-O layer was amorphous ZrO2-rich Zr silicate containing about 15% by volume of embedded ZrO2nanocrystals, which transformed to a glass nanoceramic (with over 90% by volume of predominantly tetragonal-ZrO2(t-ZrO2)and monoclinic-ZrO2(m-ZrO2)nanocrystals) upon annealing. The formation of disordered amorphous regions within some of the nanocrystals, as well as crystalline regions with defects, probably gave rise to lattice strains and deformations. The interfacial layer (IL) was partitioned into an upper SiO2-rich Zr silicate and the lower SiOx.The latter was substoichiometric and the average oxidation state increased from Si0.86+in SiO0.43(as-deposited) to Si1.32+in SiO0.66(annealed). This high oxygen deficiency in SiOxwas indicative of the low mobility of oxidizing specie in the Zr-O layer. The stacks were characterized for their dielectric properties in the Pt/{Zr-O/IL}/Si metal oxide-semiconductor capacitor (MOSCAP) configuration. The measured equivalent oxide thickness (EOT) was not consistent with the calculated EOT using a bilayer model of ZrO2and SiO2,and the capacitance in accumulation (and therefore, EOT and kZr-O)was frequency dispersive, trends well documented in literature. This behavior is qualitatively explained in terms of the multilayer nanostructure and nanochemistry that evolves. copyright 2003 American Institute of Physics. [J765]

"Suppression of superconductivity due to spin imbalance in Co/Al/Co single electron transistor"

Transport properties of ferromagnetic/nonmagnetic/ferromagnetic single electron transistors are investigated as a function of external magnetic-field, temperature, bias, and gate voltage. By designing the magnetic electrodes to have different switching fields, a two-mode device is realized having two stable magnetization states, with the electrodes aligned in parallel and antiparallel. Magnetoresistance of approximately 100% is measured in Co/AlOX/Al/AlOX/Codouble tunnel junction spin valves at low bias, with the Al spacer in the superconducting state. The effect is substantially reduced at high bias and temperatures above the TCof the Al. The experimental results are interpreted as due to spin imbalance of charge carriers resulting in suppression of the superconducting gap of the Al island. copyright 2003 American Institute of Physics. [J766]

"Structure and magnetic properties of nanostructured Pr 1-x Gd x Co 5 (x=0-1) powders prepared by mechanical alloying"

The phase components, structures, and magnetic properties of Pr1-xGdxCo5(x=0-1)powders synthesized by mechanical alloying and subsequent annealing have been investigated systematically. The optimal magnetic properties, with a coercivity of 12.5 kOe, a remanence ratio of 0.72, and a maximum energy product of 12.7 MGOe, have been obtained from PrCo5powders milled for 5 h and annealed at 700 °C for 2 min. The remanence and maximum energy product were decreased monotonically with increasing Gd content, whereas the coercivity was increased, reaching a maximum of 23.7 kOe in Pr0.2Gd0.8Co5powders. X-ray diffraction and transmission electron microscopy observations reveal that an uniform (Pr,Gd)Co5/(Pr,Gd)2Co17nanostructure with an average grain size of 20-30 nm forms in the powders annealing at 700 °C. The obtained magnetic hardening apparently originates from the high anisotropy field of the hard (Pr,Gd)Co5phase and the uniform nanostructure developed by mechanical alloying and subsequent annealing. copyright 2003 American Institute of Physics. [J767]

"Effects of surface step and substrate temperature on nanostructure of L 10 -FePt nanoparticles"

The variation of the particle size, particle density, and its relation to the hard magnetic properties of FePt nanoparticles with respect to substrate temperatures and substrate surface morphologies has been investigated. On geometrically flat surfaces, densely dispersed FePt nanoparticles with a particle density of 1012 cm-2were obtained at a substrate temperature below 573 K, while substrate temperatures between 623 and 823 K are necessary for obtaining well-oriented and well-isolated L10-FePtnanoparticles with large coercivity. Isolated particles fabricated above 573 K did not coalesce largely upon annealing at 873 K, which can be attributed to the "anchoring effect" of Pt "seed" particles. The coercivity of FePt nanoparticles was measured at 300 K damped with decreasing particle sizes below 10 nm. High-density areal packing of Fe/Pt nanoparticles could be fabricated at 673 K on a slightly inclined NaCl(001) substrate with surface steps. These particles coalesced easily upon annealing along the step edges. copyright 2003 American Institute of Physics. [J768]

"Magnetic properties of (Nd,Pr,Dy)2 Fe 14 B /alpha -Fe nanocomposite magnets crystallized in a magnetic field"

The effect of applying a magnetic field during the crystallization process of a melt-spun Nd2.4Pr5.6Dy1Fe85B6alloy on the nanostructure, crystallographic texture, exchange coupling, and magnetic

properties has been studied. Compared with samples annealed without magnetic field, there was a noticeable improvement in the intrinsic coercivity iHc,the remanence Br,and the maximum magnetic energy product (BH)maxfor Nd2.4Pr5.6Dy1Fe85B6alloys annealed in a 12 kOe field. The magnetic performance improved with an increase in the magnetic fields applied up to 9 kOe. Crystallographic alignment and magnetically anisotropic behavior were found in the samples crystallized in the magnetic field. The improvement in magnetic properties after magnetic crystallization is considered to be the result of both magnetic-field-induced crystallite alignment and enhanced exchange coupling due to a reduction of grain size. copyright 2003 American Institute of Physics. [J769]

"Magnetic properties of L 10 FePt and FePt:Ag nanocluster films"

A sputtering gas-aggregation technique has been used to prepare FePt and FePt:Ag nanocluster films. The cluster size was controlled in a range from 3 to 6 nm. FePt cluster films were directly deposited onto Si substrate; FePt:Ag cluster films were fabricated by depositing a FePt cluster layer between a Ag underlayer and overlayer. Nanostructure and magnetic properties of the samples were characterized by x-ray diffraction, transmission electron microscopy, and magnetometry. The high magnetic anisotropy L10fct phase was realized in the films annealed at a temperature of 550 °Cand above. The orientation of clusters is random. The coercivity increases with an increase of annealing temperature; high in-plane and out-of-plane coercivities, exceeding 10 kOe, were achieved in both FePt and FePt:Ag cluster films after annealing. For FePt:Ag films, the coercivity increases with Ag underlayer thickness, tAg,and reaches about 17 kOe at room temperature for tAg=5 nmafter annealing at 650 °Cfor 10 min. The high coercivity is closely correlated with the degree of L10ordering and nanostructure of the films. copyright 2003 American Institute of Physics. [J770]

"Effects of rapid thermal annealing on nanostructure, texture and magnetic properties of granular FePt:Ag films for perpendicular recording (invited)"

We report effects of rapid thermal annealing on nanostructure, texture, and magnetic properties of granular FePt:Ag films. It was found that the orientations of FePt grains were dependent strongly on the as-deposited multilayer structure and the annealing processes. Through the control of the annealing processes, (001) textured L10granular FePt:Ag films were obtained. Magnetic measurements revealed that saturation magnetization Ms,perpendicular coercivity Hc,and remanence ratio Mr/Ms,were also dependent on the annealing temperature, annealing time and Ag content. Perpendicular Hcvalues increased from 1.5 to 15 kOe when the annealing temperature changed from 400 to 600 °C for 600 s. Perpendicular Hcvalues remained about 11 kOe when the annealing time changed from 5 to 600 s. The effect of Ag content on magnetic properties is reported. copyright 2003 American Institute of Physics. [J771]

"Structure and properties of artificial [J(La 0.7 Sr 0.3 MnO 3)m (SrTiO 3)n]15 superlattices on (001)SrTiO 3 ."

Complex [(La0.7Sr0.3MnO3)m(SrTiO3)n] [(LSMO)m/(STO)8]15superlattices with different layer thicknesses (m=5, 8, 12, 16, 32)have been prepared using pulsed liquid injection metalorganic chemical vapor deposition. Transmission electron microscopy and electron diffraction reveal a very clear and well-separated layer sequence. The remarkable microstructure, as well as the ferromagnetic transition temperature, depends on the LSMO layer thickness. Apart from a very clear layer sequence, electron microscopy shows evidence of a self-assembled nanostructure formation: SrMnO3nanoinclusions and associated SrTiO3-SrMnO3thin walls. A formation model and growth mechanism for the self-assembled structure is proposed, based on high resolution and energy filtered elemental imaging. copyright 2003 American Institute of Physics. [J772]

"Effects of the morphology and nanostructure on the optical nonlinearities of Au:BaTiO 3 nanocomposite films"

Metal nanocomposite thin films formed by nanometer-sized gold particles embedded in BaTiO3matrices (Au:BaTiO3)were fabricated on MgO (100) and glass substrates using a pulsed-laser deposition technique. The high-resolution transmission electron microscopy analysis indicated that the morphology of gold particles and the structure of BaTiO3matrices changed remarkably with the change of the substrate temperatures. Crystal lattice fringes from the Au nanocrystals and BaTiO3matrices were clearly observed. The nonlinear optical properties of the Au:BaTiO3nanocomposite films were measured using the Z-scan method at the wavelength of 532 nm. A sign reversal was demonstrated in the nonlinear absorption coefficient (beta) and the nonlinear refractive index (n2)of Au:BaTiO3films with the same Au concentration but a different nanostructure. copyright 2003 American Institute of Physics. [J773]

"Influence of nanostructure and nitrogen content on the optical and electrical properties of

reactively sputtered FeSiAl(N) films"

In this study, the optical properties and dc resistivity of a series of FeSiAl(N) films reactively sputtered with different partial pressures of N were investigated. Spectroscopic ellipsometry was used to measure the real and imaginary parts of the complex dielectric functions. There is a distinct micro/nanostructural transition from single-phase columnar body-centered-cubic (bcc) grains for partial pressure (pp) of nitrogen in sputtering gas ≤4% to a two-phase nanocomposite of equiaxed bcc nanograins in an amorphous matrix for films deposited with ≥5% pp N. To assess the effect of surface oxidation on the optical properties, optical measurements were repeated on the 2 and 5% pp N films (representative of the two different types of films with different structures) after they were sputter etched in situ while performing depth profiling of the chemical composition using x-ray photoelectron spectroscopy. The low-nitrogen films (≤4%ppN)showed a dielectric function typical of a metal whose charge carrier contribution can be described by a classical free electron Drude model. The nanostructured films (≥5%ppN)showed a positive real part of the dielectric function epsilon 1and no evidence of free-carrier plasmon excitation. The optical conductivity decreased and the dc resistivity increased by about a factor of 2.5 as the film structure changed from a single phase columnar structure to the two-phase material that consisted of nanograins in an amorphous matrix. copyright 2003 American Institute of Physics. [J774]

"Nonlithographic approach to nanostructure fabrication using a scanned electrospinning source"

We have used deposited polymeric nanofibers as nonlithographic templates for the fabrication of semiconductor nanostructures. We deposited oriented poly(methyl methacrylate) (PMMA) fibers, with diameters ranging from 85 to 350 nm, on the surface of various substrates using a microfabricated electrospinning source. By utilizing the small apex of a microfabricated source, a stable Taylor cone was formed as an electrostatically driven source of polymer solution directed toward the substrate. By attaching the target substrate to a rotating counter electrode, isolated and oriented PMMA fibers were deposited. We used these fibers as etch masks to pattern nanostructures in the surface of a silicon wafer. This method provides a simple, nonlithographic approach to forming nanostructures on a wide variety of substrates, such as silicon, aluminum, silicon dioxide, silicon nitride, and glass. The fiber deposition can be oriented with respect to surface features, allowing for realization of nanodevice architectures. copyright 2003 American Vacuum Society. [J775]

"Observation of ultrashort pulse propagation anisotropy in a semiconductor quantum nanostructure optical waveguide by cross-correlation frequency resolved optical gating spectroscopy"

Femtosecond optical pulse propagation in a quantum well (QW) waveguide and a quantum wire (QWR) waveguide was investigated by cross-correlation frequency resolved optical gating (XFROG) spectroscopy. An optical pulse transmitted through the GaAs QW waveguide was found to stretch greatly from 140 fs to almost 1 ps due to nonlinear dispersion around the heavy hole exciton resonance at transverse electric polarization in a near resonant experiment. In contrast, only slight chirping of the pulse transmitted was observed either at transverse magnetic polarization or off resonance for both polarizations. In the GaAs QWR waveguide, the polarization anisotropy of a crescent shaped QWR could also be observed in terms of dispersion by XFROG spectroscopy in spite of the small absorption compared with that in the QW. copyright 2003 American Institute of Physics. [J776]

"Growth and nanostructure of conformal ruthenium films by liquid-source metalorganic chemical vapor deposition"

A commercially available metalorganic compound, namely Bis (2,2,6,6-tetramethyl-3, 5-heptanedionato)(1,5-cyclooctadiene)Ruthenium, or Ru(THD)2CODwas evaluated for growth, nanostructure, and conformality of ruthenium films using a manufacturable, liquid-source metalorganic chemical vapor deposition technique. The deposition of Ru films (60-200 nm) was carried out on various substrates at a temperature (Tsub)of 250-320 °C via the oxygen-assisted pyrolysis of Ru(THD)2COD.In the kinetically controlled regime, the activation energy for the deposition of Ru on amorphous-HfO2/SiO2/Siwas 136 kJ/mol. However, at Tsub 290 °C,the nearly temperature-independent growth rate was indicative of the mass-transport controlled regime. The as-deposited Ru films exhibited dense and polycrystalline grain structure, with a moderate preference for the (001) orientation. X-ray photoelectron spectroscopy revealed the presence of RuO2in metallic Ru films deposited at a Tsubas low as 260 °C. In addition, high-resolution transmission electron microscopy showed amorphous grain boundaries in Ru films and a disorder interface layer between Ru and HfO2surface. The Ru films, however, were electrically conductive (27 mu Omega cm). In addition, Ru films deposited on patterned TiN/Si substrates in the kinetically controlled regime at 250 °C exhibited nearly 100% step coverag- e. copyright 2003 American Institute of Physics. [J777]

"Fabrication of nanoscale gratings with reduced line edge roughness using nanoimprint

lithography"

Line edge roughness is an important factor contributing to the problem of performance degradation in various nanoscale devices. We have developed two smoothing techniques based on nanoimprint lithography for the fabrication of nanoscale gratings with significantly reduced line edge roughness. Compared with other smoothing techniques reported before, our methods are low-cost, effective, and easy to implement. These technologies have been used for the fabrication of smooth nanochannels for stretching and separating double-stranded DNA molecules. They are also compatible with a wide range of materials and applications, including subwavelength optics, bioanalysis and micro/nano-fluidic systems. copyright 2003 American Vacuum Society. [J778]

"Fabrication of large area subwavelength antireflection structures on Si using trilayer resist nanoimprint lithography and liftoff"

In this article we report on the fabrication of subwavelength antireflection structures on silicon substrates using a trilayer resist nanoimprint lithography and liftoff process. We have fabricated cone-shaped nanoscale silicon pillars with a continuous effective index gradient, which greatly enhances its antireflective performances. Our measurements show that the two-dimensional subwavelength structure effectively suppresses surface reflection over a wide spectral bandwidth and a large field of view. A reflectivity of 0.3% was measured at 632.8 nm wavelength, which is less than 1% of the flat silicon surface reflectivity. copyright 2003 American Vacuum Society. [J779]

"Role of nanostructure on electron field emission from amorphous carbon thin films"

The mechanism of electron field emission from different forms of amorphous carbon (a-C) thin films is discussed. We show that it is possible to explain electron emission from a variety of amorphous carbon films by understanding the nature of electron states near the Fermi level. The films can be described as consisting of conductive sp2C clusters lying within a more insulating sp3C matrix. We show that the trend in the threshold field for emission can be explained in terms of improvements in the connectivity between these sp2clusters and that cluster concentration and size can be in turn controlled by the choice of deposition conditions. The presence of the dielectric inhomogeneity between the two regions of sp2clusters and sp3C matrix is also shown to be very important in understanding the apparently low barrier heights that appear in the analysis of the current-voltage emission characteristics using the Fowler-Nordheim theory. This article attempts to set the framework for a unified model for electron emission from carbon films. copyright 2003 American Vacuum Society. [J780]

"Large area direct nanoimprinting of SiO 2 -TiO 2 gel gratings for optical applications"

We demonstrated an economical way of fabricating gel-film-based devices by combining nanoimprint lithography (NIL) and a sol-gel technique. A novel imprinting procedure, new mold surface passivation, and an effective surfactant added to sol were developed. Gratings with 300 nm pitch and 80 nm linewidth and waveguide gratings with varying periods were imprinted in a single step and with excellent uniformity into the gel films coated on a quarter of 4 in. wafers, respectively. Surface roughness measurements of waveguide gratings by atomic force microscope showed smooth profiles with root mean square roughness less than 6 nm. NIL is an excellent patterning technology for gel-film-based optical devices. copyright 2003 American Vacuum Society. [J781]

"Selective sublimation processing of a molybdenum-tungsten mixed oxide thin film"

Thin films of Mo and W mixed oxides were achieved by reactive sputtering, assisted by the selective sublimation processing technique. Deposition of the film resulted in nucleation of Mo oxide in a Mo-W-O amorphous matrix, then the film underwent partial crystallization and oxidation on annealing. A two-phased nanostructure was achieved, featuring substoichiometric MoO3flakes dispersed over a porous W-Mo-O film. Diffusion of Mo ions toward the film surface and sublimation of MoO3were observed, the latter resulting in porosity increase of the layers through annealing. This behavior is interesting because it allows one to establish the content of residual Mo in the W-Mo-O film. Moreover, the presence of dispersed Mo and W anions in the WO3or MoO3phases inhibited grain coalescence upon annealing. The films were tested as chemo-resistive sensors towards CO at concentration level useful for environmental monitoring. copyright 2003 American Vacuum Society. [J782]

"Nanotechnology and biomimetics with 2-D protein crystals"

The application potential of crystalline bacterial cell surface layers (S-layers) as nature-tailored supramolecular structures is described. The fabrication of supramolecular devices requires molecules that are capable of interlocking in a well-defined manner. Thus, molecular self-assembly systems that exploit the molecular-scale manufacturing precision of biological systems are prime candidates for supramolecular engineering. Although

self-assembly of molecules is an ubiquitous strategy of morphogenesis in nature, researchers in the area of molecular nanotechnology and biomimetics are only beginning to exploit its potential for the functionalization of surfaces and interfaces as well as for the production of biomimetic membranes and encapsulation systems. This article presents an overview of a new approach in nanostructure technology and biomimetics based on crystalline bacterial cell surface layers. [J783]

"Nanostructure and magnetic properties of BN-encapsulated Fe(B) and Fe 2 N nanoparticles prepared by dual ion-beam sputtering"

BN-Fe nanocomposite films have been produced by dual ion-beam sputtering codeposition. The effect of using a reactive nitrogen assistance beam during the elaboration process has been studied by transmission electron microscopy, selected area electron diffraction, grazing incidence small-angle x-ray scattering, and magnetic measurements. Experimental results show that without assistance, we produce nearly spherical Fe(B) nanoparticles (2-3 nm in diameter) exhibiting a superparamagnetic behavior. When growing under assistance, we obtain vertically elongated nanoparticles of paramagnetic zeta -Fe2Nencapsulated in disordered hexagonal BN. This study demonstrates the possibility of producing encapsulated nanoparticles with high shape anisotropy by activating the surface diffusion of the incoming deposited species. copyright 2003 American Institute of Physics. [J784]

"Dynamic modeling and scaling of nanostructure formation in the lithographically induced self-assembly and self-construction"

We numerically studied the dynamical formation process and the scaling of the nanostructures in the lithographically induced self-assembly and self-construction of thin polymer films. Our studies show that the period of the self-assembled pillars depends on the ratio between the surface tension force and the electrostatic force. The viscosity of the polymer has no effect on the final pillar shape. When the feature width of the mold is comparable to or smaller than the most unstable disturbance wavelength of the system, the initially self-assembled pillars will merge to form a self-constructed mesa. copyright 2003 American Institute of Physics. [J785]

"Alignment of liquid crystals with periodic submicron structures ablated in polymeric and indium tin oxide surfaces"

We show that a periodic nanostructure patterned into a polymeric or indium tin oxide (ITO) surface is capable of aligning liquid crystal (LC) molecules. Gratings of different depths were created on thin polymeric or ITO surfaces with submicron and micron periods by superposition of ultraviolet plane waves. The depth of the gratings was varied by changing the fluence of the laser. This method allows to pattern orientations over small areas and does not suffer from the disadvantages of rubbing based alignment methods. LC alignment was tested by forming twisted nematic cells. Anchoring energies were calculated from measurements of the twist angles. copyright 2003 American Institute of Physics. [J786]

"In(Ga)As self-assembled quantum ring formation by molecular beam epitaxy"

The effect of growth conditions on the morphological properties of InAs/GaAs(001) quantum dots covered by a thin (3 nm) GaAs cap has been studied by atomic force microscopy. Each dot turns into an elongated nanostructure at 540 °C upon deposition of the cap in As4atmosphere, while structures with two humps are obtained when capping at 500 °C. The use of As2atmosphere instead of As4at 500 °C leads to the formation of quantum rings. Photoluminescence spectroscopy and polarization photoluminescence (PL) at 15 K show dramatic changes due to the different kinds of confinement. This allows the possibility of tailoring PL emission by controlling the size and shape. copyright 2003 American Institute of Physics. [J787]

"Simulating collective magnetic dynamics in nanodisk arrays"

We study the magnetostatic interactions in planar arrays of single domain, magnetic disk nanostructures. We derive equations for the time evolution of magnetization and energy, and use these results to simulate the relaxation of these systems with a Monte-Carlo model. Our model confirms that relaxation of a one-dimensional array into one of its ground states occurs by propagating the inversion site along the line. A two-dimensional honeycomb array enters a metastable state of frustrated spiral domains due to the availability of low-energy configurational states. This model has potential application in the design of magnetic nanostructure systems for data storage and data processing applications. copyright 2003 American Institute of Physics. [J788]

"Tuning efficiency and linewidth of electrostatically actuated multiple air-gap filters"

We investigated the tuning efficiency of electrostatically actuated multiple air-gap filters fabricated in InP for dense wavelength division multiplex applications by comparing measured tuning curves with the results of optical and mechanical simulations. These filters exhibit a record tuning range of 127 nm at 7.3 V tuning voltage. The filters were measured in reflection using standard single mode fiber. The subsequent analysis is based on a one-dimensional electromechanical and optical model providing a reasonable estimation for the pull-in voltage. Optical simulations show that the filter linewidth does not affect the tuning efficiency. copyright 2003 American Institute of Physics. [J789]

"Magnetic domain wall dynamics in a permalloy nanowire"

Experimental results of domain wall propagation velocity as a function of applied field in a 200-nm-wide permalloy nanostructure are presented. The structure was fabricated by focused-ion beam milling and designed to separate the domain wall nucleation from propagation. The measured velocities are very high, up to 1500 m/s at 49 Oe and the field dependence of the velocity is interpreted in terms of thermally activated wall motion through a series of pinning sites and a wall geometry that changes as a function of field. [J790]

"Large pure refractive nonlinearity of nanostructure silica aerogel"

The nonlinear refraction coefficient of silica aerogel was estimated to be -1.5Ч10-15 m2/W(-3.67Ч10-9 esu)with a signal-beam z-scan spectroscopy. The third-order nonlinear refraction coefficient of nanostructure silica aerogel was almost five orders larger than the nonlinear refraction (chi 3)of bulk material. The large nonlinear refraction with high nonlinear figure of merit is an ideal optical property for nonlinear optical applications. copyright 2003 American Institute of Physics. [J791]

"Magnetic properties and magneto-optical effect of Co 0.5 Fe 2.5 O 4 nanostructured films"

Co0.5Fe2.5O4ferrite films with nanostructure have been prepared by rf sputtering on a quartz substrate and annealed at temperatures from 400 to 600 °C in air. The magnetic properties and magneto-optical effect have been studied. It has been found that nanocrystalline Co0.5Fe2.5O4films exhibit good magnetic properties and a large magneto-optical effect. The magnetization, coercivity, remanence ratio, and maximum energy product are 455 emu/cm3, 2.8 kOe, 0.72 MGOe, and 2.4 MGOe, respectively. The magneto-optical Faraday rotation is -3.4°/mcm at short wavelength and 4°/mcm at the wavelength of 740 nm. These characteristics make them very promising to be used for magneto-optical recording and for permanent magnets. The influence of the distribution of Co2+ions on magnetic properties and magneto-optical effect has been discussed. copyright 2003 American Institute of Physics. [J792]

"Magnetic properties of SmCo7 /Co and Sm(Co,Fe)7 /α-(Fe,Co) nanocomposite magnets prepared by magnetic annealing"

The effect of applying a magnetic field during the crystallization process of mechanically milled SmCo9.5and Sm(Co0.88Fe0.12)9.5alloys on the nanostructure, exchange coupling, and magnetic properties has been studied. Compared with samples annealed without the magnetic field, there was a noticeable improvement in the intrinsic coercivity iHc, the remanence Br, and the maximum magnetic energy product (BH)maxfor SmCo9.5and Sm(Co0.88Fe0.12)9.5alloys annealed in a 10 kOe field. An improvement of 31.5% of (BH)maxwas obtained for SmCo9.5alloy after the magnetic annealing. Better rectangularity of the demagnetization curves was also observed for SmCo9.5and Sm(Co0.88Fe0.12)9.5alloys after the magnetic annealing. The improvement in the magnetic properties after magnetic annealing is considered to be the result of enhanced exchange coupling, resulting from modifications of nanostructure induced by the magnetic field during the crystallization process of the mechanically milled alloys in a nearly perfect amorphous state. [J793]

"Modifying the nanostructure of Co[JSiO2] samples by controlled annealing"

In situ measurements of resistance were made on cosputtered Co0.35[SiO2]0.65granular films during annealing. The aim is to control the thermal treatment parameters and map the microstructural changes of the samples, with the respective magnetotransport response. Results of transmission electron microscopy, dc magnetization, and temperature dependence of resistivity, after annealing, show a clear evolution in the nanostructure of the samples, with increasing average Co grain sizes and wider dispersion. [J794]

"Apertureless optical near-field fabrication using an atomic force microscope on photoresists"

We present an apertureless optical near-field fabrication using an atomic force microscope. With this technique, we can directly pattern 100 nm lines that are smaller than the diameter of the incident far-field diffraction spot on positive photoresist spin coated over glass substrate. The nanostructure fabrication was carried out by the field

enhancement generated at the tip apex of an apertureless probe illuminated with a 403 nm laser light. Results also show that the amount of energy required to induce photolysis seems to decrease in the presence of the tip. copyright 2002 American Institute of Physics. [J795]

"Self-assembly of Si nanoclusters on 6H-SiC (0001)-(3Ч3) reconstructed surface"

Scanning tunneling microscopy (STM) and x-ray photoelectron spectroscopy (XPS) were used to observe the formation of metastable (6Ч6)-Sinanoclusters (diameter 16.5±0.1 A)on 6H-SiC(0001)-(3Ч3)surface. STM and XPS data suggest that these clusters are derived from the ejection of the Si-tetracluster unit of the initial (3Ч3)reconstruction at elevated temperatures and occur in a less Si-rich environment than the initial surface. The observed surface restructuring is related to the reconfiguration of coplanar Si bonds within the (3Ч3)unit cell. The occurrence of these regularly sized "magic" clusters demonstrates the potential of nanostructure formation of Si on SiC. copyright 2002 American Institute of Physics. [J796]

"Normal-incidence voltage-tunable middle- and long-wavelength infrared photoresponse in self-assembled InAs quantum dots"

We report the realization of electron intraband absorption based middle- (5.6 mcm) and long- (10 mcm) wavelength infrared (IR) photoresponse for normally incident radiation on InGaAs-capped GaAs(001)/InAs quantum dots (QDs) in a n-i(QD)-nstructure. The relative photoresponse in this dual-wavelength structure is tunable up to two orders of magnitude with bias. The full width at half maximum of the long-wavelength IR intraband photocurrent peak at 80 K is as narrow as 8.2 meV. copyright 2002 American Institute of Physics. [J797]

"Intraband-transition-induced dipoles in self-assembled InAs/GaAs(001) quantum dots"

We present experimental evidence for the existence and directionality of dipoles induced by intraband transitions from the electron ground states to high, bound excited states in self-assembled InAs/GaAs quantum dots (QDs). Moreover, the orientation of the interband transition induced dipoles is also determined for the same QDs. The findings indicate the potential use of intraband dipoles in asymmetric QDs in proposed quantum gates. copyright 2002 American Institute of Physics. [J798]

"Shifted hysteresis loops from magnetic nanowires"

We demonstrate that positively and negatively field-shifted magnetic hysteresis loops can be obtained from a single continuous L-shaped magnetic nanostructure. This is achieved by controlling the coercivity of one arm of the L-shape structure with the magnetization direction of the orthogonal arm. Furthermore, a memory effect is demonstrated by reversing the magnetization direction of one arm while leaving the other unchanged. Good discrimination between the different switching field magnitudes and the ease of fabrication make these continuous magnetic structures more suitable than chains of discrete magnetic dots for performing logical operations. copyright 2002 American Institute of Physics. [J799]

"Fabrication of 70 nm channel length polymer organic thin-film transistors using nanoimprint lithography"

We report on the fabrication of short-channel polymer organic thin-film transistors (OTFTs) using nanoimprint lithography. Currently, there is significant interest in OTFTs due to their potential application in inexpensive, large-area electronics. However, polymer carrier mobilities are typically poor, and thus to increase the OTFT drive current per unit area, there is a need for short-channel devices. We have fabricated working devices with channel lengths from 1 mcm down to 70 nm with high yields. The performance of these devices was studied as the channel length was reduced. We find that drive current density increases as expected, while the on/off current ratio remains 104.However, at short-channel lengths, OTFTs no longer saturate due to space charge limiting current effects. copyright 2002 American Institute of Physics. [J800]

"Selective manipulation of InAs quantum dot electronic states using a lateral potential confinement layer"

To further the objective of controlled manipulation of the electronic states in epitaxial island quantum dots (QDs), we introduce the notion of a lateral potential confinement layer (LPCL) whose judicious placement during island capping allows selective impact on ground and excited electron and hole states. The energy states of InAs/In0.15Ga0.85AsQDs are manipulated using 10-monolayer-thick In0.15Al0.25Ga0.60AsLPCLs positioned at the bottom, upper, and top region of the QDs. The changes in the photoluminescence (PL) and PL excitation spectra reveal the nature of the electronic transitions impacted selectively through the spatial charge distributions

of the states involved. copyright 2002 American Institute of Physics. [J801]

"Simultaneous observation of electron and hole velocity overshoots in an Al 0.3 Ga 0.7 As -based p-i-n semiconductor nanostructure"

We report experimental results on simultaneous measurement of electron as well as hole transient transport in an Al0.3Ga0.7As-based p-i-nsemiconductor nanostructure by using picosecond/subpicosecond Raman spectroscopy. Electron and hole velocity overshoots are directly observed. It is demonstrated that at T=300 K,E=15 kV/cm,and electron-hole pair density n 5Ч1017 cm-1,electron overshoots its steady-state value by a factor of about 7; whereas hole about 2.5. These experimental results are discussed and explained. copyright 2002 American Institute of Physics. [J802]

"Spinodal patterning in organic-inorganic hybrid layer systems"

We demonstrate a general feature of organic films between a substrate and a deformable cladding layer: the capability of forming periodic structures by heating above the glass transition temperature of the organic film. This patterning process by self-organization is caused by the interplay of dispersion interactions and mechanical stress which leads to spinodal deformation. The dynamic evolution of the structures was investigated by time-resolved light diffraction. By prepatterning the substrate, the direction of the waves can be controlled. copyright 2002 American Institute of Physics. [J803]

"Single crystal silver nanowires prepared by the metal amplification method"

We present a method of fabricating single crystal silver nanowires based on the electroless deposition of silver into the pores of the polycarbonate membranes by the metal amplification process. A gold film on one side of the nanoporous membrane is used as the initiation layer for the silver crystal growth, while the pores of the membrane are used for guiding the growth of the silver crystal into a cylindrical nanostructure. Optical microscopy and spectroscopy of individual nanowires, transmission electron microscopy (TEM), and TEM diffraction crystallography were used to characterize the silver nanostructures. The metal amplification technique presents an electroless, simple, and inexpensive solution to the challenge of fabricating silver nanowires for electronic, optical, and biological applications. copyright 2002 American Institute of Physics. [J804]

"Improved corrosion resistance of IrMn by Cr and Ru additions"

The magnetic and corrosion properties of Ir16Mn84with Ru and Cr additions have been studied. Spin valves with Ir16Mn84-Ruhave slightly lower Hexand Tbthan when pure Ir16Mn84is used. The corrosion properties improve, Hexand Tbimprove with 3 vol % Cr, but drop considerably with more Cr additions, losing 21% of the pure IrMn value by 12 vol % Cr. The corrosion current and potential are Ic=8mu A/cm2and E0=-580mV respectively, for Ir16Mn84with 12 vol % Cr. This represents a significant improvement over pure Ir16Mn84,which has Ic=100mu A/cm2and E0=-1300mV. When Ru is used as the additive, Icand E0are 10 mu A/cm2and -100 mV, respectively, for 9 vol %. Cr is the superior additive, especially in small concentrations where it shows a significant decrease in the Icwithout degrading the magnetic properties. copyright 2002 American Institute of Physics. [J805]

"Formation and disappearance of a nanoscale silver cluster realized by solid electrochemical reaction"

We have developed a nanostructuring method using the solid electrochemical reaction induced by a scanning tunneling microscope (STM). This method has some distinctive features that have not previously been obtained by conventional nanostructuring STM methods. The formation and disappearance of the nanostructure are reversible, and the rates can be controlled using STM. These features are realized via a local oxidation/reduction reaction of mobile metal ions in an ionic/electronic mixed conductor. In this study, a crystal of silver sulfide (Ag2S),a mixed conductor, was used as the material for the STM tip. A nanoscale Ag cluster was formed at the apex of the Ag2Stip when a negative bias voltage was applied to the sample. The Ag ions in the Ag2Stip are reduced to Ag atoms by the tunneling electrons from the sample, and the Ag cluster is formed by the precipitation of the Ag atoms at the apex of the tip. The Ag cluster shrank gradually and disappeared when the polarity of the sample bias voltage was switched to positive. Ag atoms in the Ag cluster are oxidized to Ag ions, and the Ag ions redissolve into the Ag2Stip. The formation and disappearance rates of the cluster were controlled by regulating the tunneling current. copyright 2002 American Institute of Physics. [J806]

"In search of nanoperfection: Experiment and Monte Carlo simulation of nucleation-controlled step doubling"

In order to make effective use of the extreme density of nanoscale elements that form spontaneously in self-assembling architectures, one must address the associated issue of minimizing defect creation during the formation of such structures. In this article we examine the competing roles that nucleation kinetics and two-dimensional growth processes play in nanostructure formation and defect minimization. We employ oxygen-induced step doubling of vicinal Ni(977) surfaces as our physical system, using elevated temperature scanning tunneling microscopy and Monte Carlo simulations to extract the desired details of interface evolution. Two interesting topological defect features are observed on the surface after doubling reaches its asymptotic limit: (i) "frustrated ends," which form when two counter-propagating step-doubling events having a single step in common intersect, leaving a stable topological defect, and (ii) residual "isolated single steps," which form when a single step is unable to partner with an adjacent step. This latter defect occurs when a single step is surrounded on both sides by previously doubled structures. In an attempt to understand and control these results, Monte Carlo simulations indicate that experimental control of the delicate and competing interplay of nucleation kinetics and two-dimensional growth kinetics is the key to the formation of more perfect interfaces. In this instance this corresponds to using a small initial oxygen exposure and reduced substrate temperature to achieve a doubled surface of higher perfection. Such optimized interfaces can act as templates for guiding the hierarchical assembly of nanowires and other nanoscale molecular assemblies. copyright 2002 American Institute of Physics. [J807]

"Logarithmically perturbed two dimensional oscillator model of a quantum-dot nanostructure"

We present a logarithmically perturbed two-dimensional isotropic oscillator model of a quantum-dot nanostructure. The logarithmic potential has an ionic line charge physical origin. We estimate the magnitude of this line charge and we obtain the matrix elements required by perturbation theory. The measured ground-state energy depression for a GaAs/AlGaAs/InGaAs heterostructure can be quantitatively accounted for by the model (although not uniquely). We include the effects of nonzero angular momentum states, which play a significant role in determining the dot current-voltage curves. We mention the immediate selection rule imposed by a perturbing potential of rotational symmetry, together with further analytic results. copyright 2002 American Institute of Physics. [J808]

"Effects of the matrix on self-organization of InAs quantum nanostructures grown on InP substrates"

We have studied the influence of matrix materials on the self-organization of InAs nanostructures grown on InP substrates by molecular-beam epitaxy. Our results show that InAs quantum dots are formed on InAlGaAs, whereas quantum-wire-like structures are produced on InAlAs and InGaAs. Tuning from vertical anticorrelation in InAs/InAlAs superlattices to vertical correlation in InAs/InGaAs and InAs/InAlGaAs superlattices is observed, which is explained by the size effects in the nanostructure-nanostructure interaction. copyright 2002 American Institute of Physics. [J809]

"Nanostructure of sol-gel films by x-ray specular reflectivity"

Recently, several studies have been carried out on sol-gel films for optical applications, mostly motivated by the quickness and low cost of the film preparation process. In order to preserve the coherence properties of the light, improvements in the current quality of such films are necessary as well as appropriated techniques for structural characterization and quality control. X-ray specular reflectivity could be one of such techniques, but it is limited by the complexity of the internal nanostructure of the films. In this work, we have developed a procedure to extract the exact density profile of sol-gel films, and applied it to analyze a sol-gel derived Er2O3film. copyright 2002 American Institute of Physics. [J810]

"Strain distribution control on the silicon wafer scale for advanced nanostructure fabrication"

Looking to the long-term future of Si semiconductor technology, we propose, fabricate, and demonstrate strain distribution control on the planar Si wafer scale for advanced nanostructure self-assembly. Oxygen ions are implanted through patterned layers on the Si wafer; the sample is then annealed at 1325 °Cto produce bulk oxide inclusions which yield a strain distribution. Strained epitaxial growth of Ge on the Si(001) substrate surface at 550 °Cin ultrahigh vacuum produces three-dimensional islands whose location and size distribution are well controlled. The degree of localization control is in agreement with simulations of the elastic strain distribution. copyright 2002 American Institute of Physics. [J811]

"Thermal conductance and electron-phonon coupling in mechanically suspended nanostructures"

We have fabricated and characterized the principal thermal properties of a mechanically suspended nanostructure, consisting of a micron-scale suspended GaAs island, upon which we have defined superconductor-insulator-normal metal tunnel junctions. The tunnel junctions allow for sensitive thermometry and

heating of the electrons in a thermally isolated normal metal element, permitting the determination of the low-temperature thermal conductance of the legs that support the GaAs island, as well as the low-temperature electron-phonon coupling. This device forms the basis of a nanoscale bolometric detector, whose optical performance can be estimated from these measurements. copyright 2002 American Institute of Physics. [J812]

"Temporal and thermal studies of charge transportation in self-assembly organic photovoltaic devices"

The charge transport of holes injected into organic nanostructure photovoltaic devices using the third harmonic of a pulsed infrared laser was studied. The devices were fabricated using the electrostatic self-assembly technique. From temporal and thermal time-of-flight studies, we determined the drift mobility to be in the range of 10-7-10-6 cm2/(V s)in 120 nm thick films. A model was adopted that accounts for the Pool-Freknel type effects to characterize the devices, including the electric-field coefficient and the activation energy. Using similar techniques, fill factor of 0.34±0.02at 1 mW/cm2intensity was determined for the devices. copyright 2002 American Institute of Physics. [J813]

"Gradient nanostructures for interfacing microfluidics and nanofluidics"

It is difficult to introduce long genomic DNA molecules into nanometer scale fluidic channels directly from the macroscale world because of the steep entropic barrier caused by necessary stretching of the polymer. We present a very simple technique using optical lithography to fabricate continuous spatial gradient structures which smoothly narrow the cross section of a volume from the micron to the nanometer length scale, greatly reducing the local entropic barrier to nanochannel entry. This technique, diffraction gradient lithography, can be very valuable for the fabrication of micro/nano total analysis systems. copyright 2002 American Institute of Physics. [J814]

"Fabrication of 10 nm enclosed nanofluidic channels"

We made uniform arrays of nanometer scale structures using nanoimprint lithography over large areas (100 mm wafers). The nanofluidic channels were further narrowed and sealed by techniques that are based on nonuniform deposition. The resulting sealed channels have a cross section as small as 10 nm by 50 nm, of great importance for confining biological molecules into ultrasmall spaces. These techniques can be valuable fabrication tools for Nanoelectromechanical Systems and Micro/Nano Total Analysis Systems. copyright 2002 American Institute of Physics. [J815]

"High critical current density and improved irreversibility field in bulk MgB 2 made by a scaleable, nanoparticle addition route"

Bulk samples of MgB2were prepared with 5, 10, and 15 wt % Y2O3nanoparticles, added using a simple solid-state reaction route. Transmission electron microscopy showed a fine nanostructure consisting of 3-5 nm YB4nanoparticles embedded within MgB2grains of 400 nm size. Compared to an undoped control sample, an improvement in the in-field critical current density JCwas observed, most notably for 10% doping. At 4.2 K, the lower bound JCvalue was 2Ч105 A cm-2at 2 T. At 20 K, the corresponding value was 8Ч104 A cm-2.Irreversibility fields were 11.5 T at 4.2 K and 5.5 T at 20 K. copyright 2002 American Institute of Physics. [J816]

"Nanocomputing by field-coupled nanomagnets"

Demonstrates through simulations the feasibility of using magnetically coupled nanometer-scale ferromagnetic dots for digital information processing. Microelectronic circuits provide the input and output of the magnetic nanostructure, but the signal is processed via magnetic dot-dot interactions. Logic functions can be defined by the proper placements of dots. We introduce a SPICE macromodel of interacting nanomagnets and use this tool to design and simulate the proposed nanomagnet logic units. This SPICE model allows us to simulate such magnetic information processing devices within the same framework as conventional electronic circuits. [J817]

"Microscopical characterization of nanocapsules templated on ionic crystals and biological cells toward biomedical applications"

Nanocapsules, fuzzy assemblies of polyelectrolyte, represent a comparatively new class of colloids with controlled nanostructure and tunable properties. Due to the fact that the core as well as the dissolution influences the wall texture and the properties of the hollow capsules, the use of carbonate crystals as template is most convenient. Yeast cells constitute as a core candidate as well. They are a good system for testing the protective ability of shells and the permeability of the walls with respect to the needs of biological systems,

namely, feeding and stability against attacks. The main features of the nanocapsules have been studied by two-photon, confocal, and atomic force microscopy. Nanocapsules are of biomedical interest because they can be used, for example, for the controlled release and targeting of drugs as well as for the protection of enzymes, proteins, and foreign cells. [J818]

"Laser-like mechanoluminescence in ZnMnTe-diluted magnetic semiconductor"

Laser-like mechanoluminescence is reported in the spintronic material ZnMnTe. The luminescence was also observed when the material was exposed to UV and x-rays. Photoluminescence spectra consisted of peaks at 386.5 and 648 nm, which may be attributed to band gap, and Mn2+levels, respectively. Lattice contraction, sharpness of the x-ray diffraction peak, and the blueshift in the energy gap confirm the nanostructure of the material. A possible mechanism for lasing is also suggested. copyright 2002 American Institute of Physics. [J819]

"Fabrication and optical characterization of template-constructed thin films with chiral nanostructure"

We report the fabrication of thin films perforated by high aspect ratio helical or chevron pores by an extension of the glancing angle deposition (GLAD) technique. The perforated films were created by transferring the nanostructure of a GLAD template film into target materials such as polymers and spin-on-glasses and subsequently removing the template. The pore shapes are shown to be highly controllable and films designed to suit particular applications are discussed. By a double templating technique, we replicate the structure of the original film using alternate materials, which are typically less suited to the unmodified GLAD technique. Helical films of Cu and Ni were created by this method and the process should be transferable to additional electrodeposited materials. The optical rotatory power of perforated thin films formed on glass substrates was characterized and perforated films were shown to be effective in rotating the polarization plane of linearly polarized incident light by as much as 1.4°/μm. [J820]

"Improvement in coercivity by high-speed crystallization for PrFeB-Based nanocomposite magnets"

We crystallized amorphous Pr12Fe83B5flakes by conventional and pulse annealings with various heating rates, and studied the effects of the heating rate on the magnetic and structural properties of the achieved nanocomposite PrFeB/α-Fe magnets. An increase in the heating rate beyond 850 K/min improved the coercivity and the squareness of hysteresis loops. Crystallization by pulse annealing for 1.8 s led to a coercivity of 400 kA/m, a remanence of 1.3 T, and a maximum energy product of 135 kJ/m3, on average. It was also clarified that an increase in the heating rate reduces the grain size and results in a narrow distribution of the grain size. These changes in the nanostructure are consistent with the observed improvement in magnetic properties in terms of micromagnetic simulation of magnetic properties of nanocomposite magnets. [J821]

"In situ ordered polycrystalline FePt L10 (001) nanostructured films and the effect of CrMn and Zn top layer diffusion"

The nanostructure and magnetic properties of in situ ordered polycrystalline FePt thin films (9 nm) have been studied. Films were deposited with a MgO underlayer onto Si and glass substrates using conventional rf diode sputtering. Perpendicular anisotropy was obtained when the substrate temperature exceeded 490 °C. The maximum order parameter (S) was estimated to be 0.9. The coercivities (Hc)ranged from 5 to 12 kOe. Observed high values of the coercive squareness (S*)indicate the existence of exchange coupling. High resolution transmission electron microscopy indicates a defective region which might be associated with defect-related localized incoherent nucleation, thereby inducing low values of Hc.Zn and CrMn top layers at ambient temperature were deposited after the deposition of FePt films at elevated temperatures. Rapid thermal annealing of these samples at 180-450 °C for 1 min resulted in a decrease of S*from 0.8-0.85 to 0.5-0.6. copyright 2002 American Institute of Physics. [J822]

"Spin-polarized current induced magnetization switch: Is the modulus of the magnetic layer conserved? (invited)"

The direct effect of spin-polarized current on magnetization states is studied on various electrodeposited single contacted nanowires (diameter about 60 nm). Three kinds of samples have been studied: (1) Homogeneous Ni nanowires, (2) nanowires composed of both a homogeneous Ni part and a multilayered Co(10 nm)/Cu(10 nm) part, (3) pseudospin-valve pillars Co(30 nm)/Cu(10 nm)/Co(10) electrodeposited in Cu wires. The magnetization reversal due to the current injection is observed in the three cases. The effect is observed with using different experimental protocols, including current activated after-effect measurements. The results obtained suggest that two different mechanisms are able to account for the magnetization reversal: exchange torque and spin transfer.

We propose a definition of the two mechanisms based on the conservation or nonconservation of the magnetic moment of the ferromagnetic nanostructure. copyright 2002 American Institute of Physics. [J823]

"Tailoring mid- and long-wavelength dual response of InAs quantum-dot infrared photodetectors using In x Ga 1-x As capping layers"

We report on the tailoring of detection bands of InAs quantum-dot infrared photodetectors (QDIPs) using InxGa1-xAscapping layers and on the realization of voltage-tunable two-color QDIPs for mid-wavelength infrared (MWIR) and long-wavelength infrared (LWIR) detection. QDIPs having 2.0 ML InAs QDs capped by 20 ML In0.15Ga0.85Aslayer show bias-dependent photocurrent peak positions in the LWIR regime (8-9 mcm)which are redshifted with respect to those (5-7 mcm)in the counterpart QDIPs without InxGa1-xAscapping layers. QDIPs having 2.5 ML InAs QDs capped by a 30 ML In0.15Ga0.85Aslayer have a bimodal QD size distribution and show voltage-tunable MWIR (5.5-6 mcm)and LWIR (9-11 mcm)photoresponse. At low bias, MWIR photoresponse is dominant whereas with increasing bias, the LWIR photoresponse becomes dominant. copyright 2002 American Vacuum Society. [J824]

"Sub-50 nm nanopatterning of metallic layers by green pulsed laser combined with atomic force microscopy"

Pulsed-laser assisted nanopatterning of metallic layers on silicon substrates under an atomic force microscope (AFM) tip has been investigated. A 532 nm Nd:YAG pulsed laser with a pulse duration of 7 ns was used. Boron doped silicon tips were used in contact mode. This technique enables the processing of structures with a lateral resolution down to 10 nm on gold and copper layers. Nanopatterns such as pit array and multilines with lateral dimensions between 10 and 50 nm and depths between 2.5 and 21 nm have been created. The experimental results and mechanism of the nanostructure formation are discussed. The created features were characterized by AFM, scanning electron microscope, and Auger electron spectroscopy. The apparent depth of the created pit has been studied as a function of laser intensity or laser pulse numbers. The dependence of nanoprocessing on the geometry parameters of the tip and on the optical and thermal properties of the processed sample has also been investigated. Thermal expansion of the tip, the field enhancement factor underneath the tip, and the sample surface heating were estimated. It is proposed that the field-enhancement mechanism is the dominant reason for this nanoprocessing. copyright 2002 American Vacuum Society. [J825]

"Fabrication of nanocontacts for molecular devices using nanoimprint lithography"

We present a simple process to fabricate gold nanocontacts with a gap as small as sub-10 nm. This method uses a two-step process of nanoimprint lithography (NIL) and electromigration. First, 20 nm wide gold nanowires were fabricated by NIL on a silicon dioxide substrate. Then by passing an electric current through a nanowire, the nanowire is split into two wires with a gap as small as sub-10 nm by electromigration. This fabrication method offers a fast and effective process for producing large numbers of nanocontacts for use in molecular self-assembly, and thus greatly enhances the probability of successful capture of single molecules. copyright 2002 American Vacuum Society. [J826]

"Intraband and interband photocurrent spectroscopy and induced dipole moments of InAs/GaAs(001) quantum dots in n-i-n photodetector structures"

We have investigated normal-incidence intra- and interband spectra of self-assembled steep InAs/GaAs(001) quantum dots (QDs) with an average height of 8.0 nm and average base width of 21 nm placed in n-i(QDs)-nphotodetector structures. The ground state occupation of the QDs in the n-i(QDs)-nconfiguration is examined and used to assign observed intraband transitions. A photovoltaic effect in intraband photocurrent is observed and shown to arise from induced dipole moments. Stark shift in interband photocurrent spectroscopy reveals the presence and direction of interband transition induced dipoles, making this study the first to determine both intra- and interband dipoles in the same ensemble of QDs. copyright 2002 American Vacuum Society. [J827]

"Single-crystal Si formed on amorphous substrate at low temperature by nanopatterning and nickel-induced lateral crystallization"

Single-crystal silicon has been achieved by patterning amorphous silicon film on silicon dioxide substrate into nanoscale lines and nickel-induced lateral crystallization. Line width affects the single-crystal silicon formation significantly. Narrow line widths, 30 nm or less, resulted in little lateral crystallization; while for line widths above 250 nm, multiple grains started to form. In-situ transmission electron microscope observation has been used to study the crystallization process. Lithography-constrained single seeding is proposed to explain the single-crystal formation. copyright 2002 American Institute of Physics. [J828]

"Observation of two- and three-dimensional magnesium oxide nanostructures formed by thermal treatment of magnesium diboride powder"

A simple thermal treatment has been used to produce a variety of elongated single crystalline magnesium oxide nanostructures. Incipient evaporation of a magnesium diboride starting powder combined with a mixed oxygen/argon process gas provided the constituents for nanostructure growth. Electron diffraction and energy dispersive x-ray spectroscopy confirm the single crystalline nature and chemical composition of the objects, and the atomic surface plane is observed to be of the (001) type. Transmission electron microscopy and scanning electron microscopy reveal several MgO morphologies including linear nanobelts and two- and three-dimensional entities that contain approximately ninety degree angles. Atomic steps are observed on the inner edges of these angles, but are absent from the outer rims. The experimental conditions used to form these nanoscale materials and possible applications are described. copyright 2002 American Institute of Physics. [J829]

"Nanostructure fabrication by direct electron-beam writing of nanoparticles"

Direct additive-layer fabrication of nanostructures is a widely sought goal, which is not possible using traditional layered resist optical and electron-beam lithographic techniques. However, recently, it has been shown that certain metallic and semiconducting nanoparticles capped with protective organic groups are promising "inklike" resist materials for patterning a variety of electronic and mechanical structures [C. A. Bulthaup etal, Appl. Phys. Lett. 79, 1525 (2001)]. Several groups have successfully patterned single-layer gold nanoparticle films by means of direct electron-beam writing [X. M. Lin, R. Parthasarathy, and H. M. Jaeger, Appl. Phys. Lett. 78, 1915 (2001); T. R. Bedson, R. E. Palmer, T. E. Jenkins, D. J. Hayton, and J. P. Wilcoxon, Appl. Phys. Lett. 78, 1921 (2001); L. Clarke etal, Appl. Phys. Lett. 71, 617 (1997)]. In this work, we apply these materials in a new lithographic mode, using an electron beam to cause direct sintering of these 2-10 nm nanoparticles, building structures of multiple layers and multiple materials with linewidth resolutions of 80-100 nm. copyright 2002 American Vacuum Society. [J830]

"Giant tunneling magnetoresistance in polycrystalline nanostructured Znx Fe3-x O4 -α-Fe2 O3"

Giant tunneling magnetoresistance effect (TMR) as large as 1280% at 4.2 K and 158% at 300 K was observed in Zn0.41Fe2.59O4-α-Fe2O3polycrystalline sample. The Zn0.41Fe2.59O4grains are separated by insulating α-Fe2O3thin layer boundaries, The pattern of nanostructure has been verified by transmission electron microscopy and a high-resolution electron microscope, and the thickness of α-Fe2O3boundary is about 6-7 nm. The huge TMR is attributed to the high spin-polarization of Zn0.41Fe2.59O4grains and insulating antiferromagnetic α-Fe2O3thin layer. The conductivity is found to depend exponentially on reciprocal temperature, which means the electronic transfer is dominated by thermally activated tunneling from grain to grain. The ZnxFe3-xO4ferrite is a new type half-metallic material and has a huge TMR at room temperature. [J831]

"Characterization of reflectivity inversion, alpha-and beta -phase transitions and nanostructure formation in hydrogen activated thin Pd films on silicon based substrates"

Optically thin palladium metal films evaporated on different silicon based substrates are investigated following exposure to different concentrations of hydrogen gas in air. Laser modulated reflectance off the palladium surface of silicon oxide and silicon nitride substrates is used to recover information regarding the reflectivity inversion and alpha /beta -phases of the palladium complex after both first and multiple gas cycling. Atomic force microscopy confirms the formation of metal nanostructures following exposure to hydrogen of the optically thin palladium films. copyright 2002 American Institute of Physics. [J832]

"Pulsed-laser assisted nanopatterning of metallic layers combined with atomic force microscopy"

Pulsed-laser assisted nanopatterning of metallic layers on silicon substrates under an atomic force microscope (AFM) tip has been investigated. A 532 nm Nd:YAG pulsed laser with a pulse duration of 7 ns was used. Boron doped silicon tips were used in contact mode. This technique enables processing of structures with a lateral resolution down to 10 nm on the copper layers. Nanopatterns such as pit array and multilines with lateral dimensions between 10 and 60 nm and depths between 1.5 and 7.0 nm have been created. The experimental results and mechanism of the nanostructure formation are discussed. The created features were characterized by AFM, scanning electron microscope and Auger electron spectroscopy. The apparent depth of the created pit has been studied as a function of laser intensity or laser pulse numbers. Dependence of nanoprocessing on the geometry parameters of the tip and on the optical and thermal properties of the processed sample has also been investigated. Thermal expansion of the tip, the field enhancement factor underneath the tip, and the sample surface heating were estimated. It is proposed that field-enhancement mechanism is the dominant reason for this nanoprocessing. copyright 2002 American Institute of Physics. [J833]

"Picosecond ultrasonics study of the vibrational modes of a nanostructure"

We report experiments in which a subpicosecond pump light pulse is used to excite vibrations in a nanostructure consisting of a periodic array of copper wires embedded in a glass matrix on a silicon substrate. The motion of the wires after excitation is detected using a time-delayed probe light pulse. From the measured data, it is possible to determine the frequencies nu nand damping rates Gamma nof a number of the normal modes of the structure. These modes have frequencies lying in the range 1-30 GHz. By comparison of the measured nu nand Gamma nwith the frequencies and damping rates calculated from a computer simulation of the vibrations of the nanostructure, we have been able to deduce the vibration patterns of six of the normal modes. copyright 2002 American Institute of Physics. [J834]

"Gold elliptical nanoantennas as probes for near field optical microscopy"

We investigate the light scattering by individual nanometer-sized gold particles attached at the apex of fiber-based probes for near field optical microscopy. The dependence of the light scattering by the gold nanoparticle on the wavelength, the shape, and the surrounding medium dielectric profile are theoretically described and experimentally investigated, demonstrating that the tuning of the particle's size and shape plays a crucial role in the light scattering process. In the case of gold spherical nanostructures, the plasmon resonance occurs at 540 nm in air, and 600 nm in water. A higher surrounding medium refraction index leads to a redshift of the plasmon resonance in the gold particle. Moreover, for elliptical structures, the orientation of the polarization of the incident field, as well as the relative ratio of the ellipse dimensions along its main axis, govern the position of the plasmon resonances. The light transmission spectrum for several probes where a single elliptical gold particle has been grafted exhibits at least one resonance in the range 600-650 nm. Surface plasmon resonances are of importance for the field enhancement at the end of the modified tip, thus leading to improvement of the achievable resolution for near field optical microscopy. An optimized design of the metallic nanostructure deposited at the apex of the near field probe is needed to maximize the resonance and would therefore lead to a high-performance probe for scanning near field optical microscopy. copyright 2002 American Institute of Physics. [J835]

"Influence of cluster-assembly parameters on the field emission properties of nanostructured carbon films"

Supersonic cluster beam deposition has been used to produce films with different nanostructures by controlling the deposition parameters such as the film thickness, substrate temperature and cluster mass distribution. The field emission properties of cluster-assembled carbon films have been characterized and correlated to the evolution of the film nanostructure. Threshold fields ranging between 4 and 10 V/mcm and saturation current densities as high as 0.7 mA have been measured for samples heated during deposition. A series of voltage ramps, i.e., a conditioning process, was found to initiate more stable and reproducible emission. It was found that the presence of graphitic particles (onions, nanotube embryos) in the films substantially enhances the field emission performance. Films patterned on a micrometer scale have been conditioned spot by spot by a ball-tip anode, showing that a relatively high emission site density can be achieved from the cluster-assembled material. copyright 2002 American Institute of Physics. [J836]

"Single domain and vortex state in ferromagnetic circular nanodots"

In this article, we present an analytical approximation for calculating the magnetic energy in circular nanostructures for the vortex phase (closed magnetic flux) and the single domain phase. Comparing these energies in remanent state lead to a magnetic phase boundary between single domain phase and vortex phase, given by a critical thickness, which depends on the radius of the circular nanostructure. Experimental data and micromagnetic simulations have verified the analytical results. copyright 2002 American Institute of Physics. [J837]

"IrMn spin valves using Si layers"

Thin silicon layers can be used to good effect in spin valve sensors. Si underlayers increase the Delta R/R from 7.1% to 8.8% in top spin valves, and 6% to 7.8% for bottom spin valves. This is accompanied by a decrease in sheet resistance and the exchange anisotropy field. These results suggest that films grown on Si have larger grains than those with Ru seed layers. Si atoms are efficient as scattering sites, reducing Delta R/R and increasing the sheet resistance when placed in active layers. This can be used to improve the properties of antiparallel-pinned spin valves. copyright 2002 American Institute of Physics. [J838]

"Phase evolution, structure, and magnetic properties of Nd 8.4 Fe 86 Mo 1.1 B 4.5 nanocomposite magnets"

The relationship between the phase evolution, nanostructure, exchange coupling, and magnetic properties of Nd8.4Fe86Mo1.1B4.5magnets prepared by melt spinning (MS) and mechanical milling (MM) are studied by x-ray diffraction, Mossbauer spectroscopy, positron lifetime measurements, high resolution transmission electron microscopy observations, and magnetization measurements. The maximum magnetic energy product (BH)maxfor MM magnets annealed at 650 °C or below are notably higher than those of the corresponding MS samples due to the larger amount of the Nd(Fe,Mo)7present in the MS samples. copyright 2002 American Institute of Physics. [J839]

"Dynamic simulation of nanoscale lubricant films"

The nanoscale lubricant film on the disk surface of hard disk drive systems is crucial to the durability of the head-disk interface. In an effort to better understand the performance of these lubricant films, the dynamic behavior of nanoscale, perfluoropolyether lubricant films is analyzed via kinetic Monte Carlo techniques. The lattice-based model, which represents lubricant molecules as simple reactive spheres, specifically includes long-range van der Waals, molecule-surface; interlayer, polar endgroup-endgroup coupling; and polar endgroup-surface coupling interactions. The full-blown three dimensional capabilities of the model allow for a detailed nanostructure analysis of the lubricant films. The model is used to investigate the steady-state surface structure of lubricant films, which describes the dewetting phenomenon and is examined via a function of the interaction parameters, surface loading, and initial surface structure. The evolution of the surface structures is monitored to better understand the mechanism for dewetting or "mogul" dynamics. This modeling effort initializes the groundwork for future research with heterogeneous, polar films. Critical endgroup-endgroup and endgroup-surface interaction energies are identified in terms of film dewetting. A layer-by-layer endgroup orientation analysis provides insight into the surface structure and dewetting. copyright 2002 American Institute of Physics. [J840]

"Resistively coupled ferromagnetic single-electron transistors"

We study the operation of resistively coupled ferromagnetic single-electron transistors quantitatively. Control of tunnel magnetoresistance on the drain and gate voltages is predicted. Inelastic macroscopic quantum tunneling of charge plays an important role in the enhancement of tunnel magnetoresistance. This implies that the resistively coupled ferromagnetic single-electron transistors have the possibility as magnetoresistive nanostructure devices. copyright 2002 American Institute of Physics. [J841]

"Nanostructure formation by localized decomposition of Mo (CO)6 on Si (111)-(7Ч7) surfaces"

We report on the fabrication of nanometer-sized structures by scanning tunneling microscope induced decomposition of Mo(CO)6precursor molecules on Si(111)-(7Ч7).Based on the analysis of characteristic properties of these structures in the region of the deposition threshold the mechanism leading to Mo(CO)6fragmentation under these conditions and subsequent formation of nanostructures can be identified. This mechanism consists of an electron induced excitation of the molecule to an antibonding state with subsequent spontaneous separation of a CO ligand. copyright 2002 American Institute of Physics. [J842]

"Nanostructure and magnetic properties of polycrystalline FePdPt/MgO thin films"

Atomic ordering, nanostructure and the magnetic properties of polycrystalline FePdPt thin films deposited with MgO underlayers have been investigated. The film thickness was fixed at 5 nm in all films, a thickness where perpendicular anisotropy is dominant. Films deposited at ambient temperature were postannealed at various temperatures to study the kinetics of atomic ordering. The Pd additions to FePt were effective in reducing the temperature needed for atomic ordering. The mean grain size determined by transmission electron microscopy is about 10 nm in annealed films. Within the limits of our observations, FePdPt films do not show phase separation into more than one phase of the L10structure. The maximum coercivity (Hc)for annealed FePdPt films is about 3000-4000 Oe. In situ ordered FePdPt films at 530 °C show no indication of a lower temperature for atomic ordering. copyright 2002 American Institute of Physics. [J843]

"X-ray photoelectron spectroscopy study of the role of nitrogen in FeSiAl(N) reactive sputtered films"

Nitrogen has a profound effect on the stress, nanostructure, and magnetic properties of FeSiAl(N) reactive sputtered films. X-ray photoelectron spectroscopy is an excellent tool to investigate the role of N in these films, since it provides both compositional and chemical bonding information simultaneously. The N is observed to first

combine with the Al in the films. For increasing amounts of N, increasing amounts of Al as nitride are observed. Then at the point that the Al is all nitride, the N starts to combine with Si. It is in this region that an abrupt change is observed in magnetic properties, stress, and nanostructure. For low N, the films consist of single phase 100-nm-diam bcc grains; after the transition, films consist of a two phase nanostructure of 10-nm-bcc grains in an amorphous matrix. The N content of the films also increases sharply at this point. The addition of N to the sputtering plasma also causes changes in the apparent relative sputtering yields at these higher N levels: Fe content of the films decreases considerably, while Al and Si percentages show modest increases. This can help explain why the saturation magnetization (Ms)has been observed to decrease with increasing N in the plasma, for these higher N levels. copyright 2002 American Institute of Physics. [J844]

"Magnetism, structure and the effects of thermal aging on (Fe1-x Mnx)73.5 Si13.5 B9 Nb3 Cu1 alloys"

Amorphous alloys of (Fe1-xMnx)73.5Si13.5B9 Nb3Cu1, where x=0, 0.05, 0.10, 0.15, were prepared by vacuum melt-spinning. Anneals performed at or above the crystallization temperature led to the formation of a nanostructure where the primary phase is a body centered cubic or DO3FeSi phase embedded within an intergranular amorphous phase. The saturation induction of the x=0.05 alloy is 1.19 T, slightly lower than the parent alloy. Prolonged thermal aging led to an enhancement in the soft magnetic properties. This change occurs at soak times near 6000 s and corresponds to a decrease in the anisotropy and coercivity, and an increase in the remanent magnetization. EXAFS studies suggest that the Mn partitions during crystallization and thermal aging to the grain boundary regions may play an important role in enhancing the exchange coupling of the aged samples by increasing the Curie temperature of the amorphous intergranular phase [J845]

"Fabrication of large area 100 nm pitch grating by spatial frequency doubling and nanoimprint lithography for subwavelength optical applications"

In this article we report on the fabrication of 100 nm pitch gratings over a large area (10 cm2) using a simple, low-cost, fast process. This method includes (1) generation of the grating pattern using interferometric lithography and spatial frequency doubling and (2) pattern replication using nanoimprint lithography. The form birefringence of a 100 nm pitch Si grating was studied using ellipsometry. Measurements show an index difference of Delta n 0.9at a wavelength of 632.8 nm. The experimental data are in good agreement with effective medium theory. This indicates the possibility of using these structures for wave plates and other subwavelength optical devices operating in the visible. copyright 2001 American Vacuum Society. [J846]

"An improved automated anodization apparatus for fabricating nanostructure devices and porous silicon"

This note describes an improved anodization apparatus that provides enhanced safety and efficiency, and is suitable for large-scale volume production. The improved anodization apparatus also provides increased electrolyte temperature control, and allows flexibility in the size and shape of the substrate. Overall, this equipment will find wide applications in the fabrication of template-based semiconductor nanostructures, porous silicon, and other devices that require electrochemical processing. copyright 2001 American Institute of Physics. [J847]

"Impedance of a ferromagnetic sandwich strip"

A theoretical approach for calculating the impedance of a three-layer sandwich, consisting of two metallic ferromagnetic layers separated by a non-magnetic conductive layer, is presented. The Maxwell equations for the electromagnetic field coupled with the Landau-Lifshitz equations for the magnetization dynamics are solved, which enables one to describe the system over a wide frequency range, including the ferromagnetic resonance. Two sandwich strip structures are analyzed, both having thickness much less than the width, and the width much less than the length: a "closed" structure with the magnetic film closing at the edges along the width, and an "open" structure without flux closures where all the layers have the same width. The impedance for the two structures is calculated and analyzed as a function of the physical parameters of the device and frequency. The "closed" structure is more efficient magnetically and exhibits a highly inductive response to much higher frequencies than the "open" structure. The analytical results obtained are directly applicable to practical design of GHz inductive components. copyright 2001 American Institute of Physics. [J848]

"Nanostructure patterns written in polycarbonate by a bent optical fiber probe"

An atomic force microscope operated in tapping mode using a homemade bent optical fiber probe was used to pattern nanometer-scale features. Trenches of different dimensions were written on polycarbonate that was pre-

exposed to an excimer laser. Lines with widths varying from 260 to 600 nm and depths ranging from 30 to 120 nm have been made. The present technique as a complementary tool to other lithographic processes has been demonstrated to be potentially suitable for low-cost and high-precision applications. copyright 2001 American Vacuum Society. [J849]

"Ion beam aperture-array lithography"

We explore a new technique, ion beam aperture-array lithography (AAL), for fabricating low cost, large area nanostructure arrays. In this approach, a broad beam of light ions illuminates a stencil mask containing a periodic array of circular apertures. The array of transmitted beamlets is moved over the substrate, thereby printing an array with the same period but arbitrary unit cell. AAL has several advantages over ion beam proximity lithography: (1) the mask pattern density is lower, (2) the unit cell patterns are defined by software, and (3) dose and shape correction can be applied to compensate for system blur. Dose optimization methods are discussed and experimental results with 150 nm apertures presented. copyright 2001 American Vacuum Society. [J850]

"Lithographically induced self-assembly of microstructures with a liquid-filled gap between the mask and polymer surface"

We have observed that a featureless polymer thin film on a flat plate that is separated from another flat plate by a liquid filled gap can self-assemble into a periodic micropillar array. Moreover, we have observed that if there is a pattern on one of the plates, the boundary of the pillar array will align with the boundary of the pattern resulting in single domain arrays. The phenomenon is believed to be due to the unstable growth of surface waves in the polymer system caused by an attractive Coulombic interaction between the top plate and polymer. A transition temperature has been found below which ordered patterns are not observed in the bilayer system. This self-assembled phenomenon suggests a novel way of controlling flow in microfluidic devices. copyright 2001 American Vacuum Society. [J851]

"Microstructure and properties of giant magnetoresistive granular Au 80 Co 20 alloys"

The relationship between microstructure and giant magnetoresistance (GMR) of granular Au80Co20was investigated. Two different processing routes were explored. With the melt spinning technique the microstructure appeared to be so coarse that it was not expected to exhibit any substantial GMR effect. On the other hand, with the procedure of solid-solution annealing and water quenching afterwards, a suitable nanostructure was prepared that showed a GMR of 29% at 10 K and 50 kOe. Subsequent annealing causes coarsening of Co particles. In additional spinodal decomposition occurred for a certain temperature range and a loss of coherency of the Co particles with respect to the Au was observed with high-resolution transmission energy microscopy. At magnetic fields above 20 kOe, all annealed alloys showed a saturating magnetization, whereas the resistance is still steadily decreasing, challenging the presumed mathematical relationship between GMR and overall magnetization. copyright 2001 American Institute of Physics. [J852]

"Decomposition and nanocrystallization in reactively sputtered amorphous Ta-Si-N thin films"

The nanocrystallization process of reactively sputtered thin amorphous Ta-Si-N films is investigated by anomalous small angle x-ray scattering (ASAXS) and x-ray diffraction (XRD). Changes in the microstructure in Ta40Si14N46films, density variations in the amorphous matrix, decomposition, formation, and growth of nanocrystals after vacuum anneals at different temperatures in the range between 800 and 1000 °C are observed and the results of the different techniques are compared. From a Fourier analysis of ASAXS intensities the nanostructure of the investigated ternary system is derived using a model of hard spheres according to Guinier and Fournet. ASAXS investigations indicate that the noncrystalline samples can be described by a monophase fit and the crystallized samples by a bimodal-phase fit, the latter results being consistent with XRD which identifies TaN and Ta5Si3phases. Detailed analysis shows that TaN nanograins of approximately 2 nm size develop after a decomposition process. Larger grains of Ta5Si3are observed in addition to the TaN grains if annealing is performed at temperatures higher than 950 °C. The aim of these investigations is to give a generally applicable explanation of the barrier failure mechanism for Ta-Si-N diffusion barriers, which is actually observed at temperatures below the crystallization temperature if the films are used in contact with Cu or Al. copyright 2001 American Institute of Physics. [J853]

"Nanostructure of thin amorphous hydrogenated carbon films studied by positron annihilation and photoluminescence"

We deposited polymer-like a-C:H films using the plasma-enhanced chemical vapor deposition technique and

characterized film microstructure by variable-energy positron lifetime spectroscopy, photoluminescence (PL), and UV-visible absorption spectroscopy. It was confirmed that PL occurs from a chromophore in a sp2cluster as a result of fast recombination of a photoexcited electron-hole pair. Positron annihilation lifetime spectroscopy showed that positronium (Ps) formation takes place via electron-positron recombination in the sp3matrix. The lifetime of ortho-positronium (o-Ps) in our a-C:H films was similar to that in polyethylene, indicating their polymer-like nature. The relative PL efficiency increased by about an order of magnitude with increasing film band gap from 1.3 to 3.4 eV, which can be related to the decreasing concentration of nonradiative centers. On the other hand, Ps formation was much less influenced by the band gap and nonradiative centers. Comparison of this result with that for polyethylene mixed with carbon-black nanoparticles, where a considerable reduction in Ps formation was observed, showed that nonradiative centers were of a different nature from the defects on the carbon nanoparticle surface. This work demonstrated the usefulness of positron lifetime spectroscopy combined with optical measurements to study the nanostructure of a-C:H. copyright 2001 American Institute of Physics. [J854]

"Diffusion of chloroaluminum phthalocyanine on MoS 2 surface detected by photoemission electron microscopy and metastable electron emission microscopy"

Diffusion of a large organic semiconductor molecule, chloroaluminum phthalocyanine (ClAlPc), on a cleaved MoS2surface was detected using photoemission electron microscopy (PEEM) and metastable electron emission microscopy (MEEM). The PEEM and MEEM images showed that a micropattern of ClAlPc ultrathin film prepared on the MoS2surface by vacuum deposition shrinks with time and finally disappears even at room temperature at which the molecules do not evaporate. The results indicate that control of molecular diffusion is necessary for the preparation of stable micro or nanostructure of organic thin films. copyright 2001 American Institute of Physics. [J855]

"Simulation of photoluminescence excitation spectra of InGaN epitaxial layers"

We present a numerical study of radiative recombination in InGaN epitaxial layers by using a modified rate equation in which the disorder effect of nanostructures is taken into consideration. The photoluminescence excitation (PLE) spectra of the InGaN layers are simulated numerically. The results show that the disordered nanostructure model can be used to interpret the features of PLE spectra observed in many InGaN epilayers. The present theoretical work supports that the self-formed nanostructures with compositional and structural disorder may exit in some InGaN epitaxial layers. copyright 2001 American Institute of Physics. [J856]

"Comparative anomalous small-angle x-ray scattering study of hotwire and plasma grown amorphous silicon-germanium alloys"

The nanostructure of hydrogenated amorphous silicon-germanium alloys, a-Si1-xGex:H,prepared by the hotwire deposition technique (x=0.06-0.79)and by the plasma enhanced chemical vapor deposition technique (x=0and 0.50) was analyzed by anomalous small-angle x-ray scattering experiments. For all alloys with x 0the Ge component was found to be inhomogeneously distributed with correlation lengths of about 1 nm. A systematic increase of the separated scattering was found due to the increasing Ge concentration. The different preparation techniques show significant differences in the Ge distribution. copyright 2001 American Institute of Physics. [J857]

"Polymorphous Si thin films from radio frequency plasmas of SiH 4 diluted in Ar: A study by transmission electron microscopy and Raman spectroscopy"

In this study, we present a detailed structural characterization by means of transmission electron microscopy and Raman spectroscopy of polymorphous silicon (pm-Si:H) thin films deposited using radio-frequency dust-forming plasmas of SiH4diluted in Ar. Square-wave modulation of the plasma and gas temperature was varied to obtain films with different nanostructures. Transmission electron microscopy and electron diffraction have shown the presence of Si crystallites of around 2 nm in the pm-Si:H films, which are related to the nanoparticles formed in the plasma gas phase coming from their different growth stages, named particle nucleation and coagulation. Raman scattering has proved the role of the film nanostructure in the crystallization process induced "in situ" by laser heating. copyright 2001 American Institute of Physics. [J858]

"Field electron emission from patterned nanostructured carbon films on sodalime glass substrates"

Using the hot filament chemical vapor deposition method, patterned nanostructured carbon films with excellent field emission characteristics have been deposited at the nominal substrate temperatures of 540 °C and 450°C on sodalime glass substrates. These films have demonstrated a good visual emission uniformity and good

current stability during the continuous operation for 140 h. Taking advantage of the poor adhesion of the nanostructure carbon without a chrome interlayer and selective growth on the metal catalyst, the formation of the patterned nanostructured carbon films has been carried out via the prepattering of the chrome electrodes and/or metal catalyst using the conventional photolithography process. An example of the patterned emitter with high complexity is presented to demonstrate the feasibility of practical emitter fabrication using nanostructured carbon films. copyright 2001 American Vacuum Society. [J859]

"Direct three-dimensional patterning using nanoimprint lithography"

We demonstrated that nanoimprint lithography (NIL) can create three-dimensional patterns, sub-40 nm T-gates, and air-bridge structures, in a single step imprint in polymer and metal by lift-off. A method based on electron beam lithography and reactive ion etching was developed to fabricate NIL molds with three-dimensional protrusions. The low-cost and high-throughput nanoimprint lithography for three-dimensional nanostructures has many significant applications such as monolithic microwave integrated circuits and nanoelectromechanical system. copyright 2001 American Institute of Physics. [J860]

"Enhanced thermal stability of silica-encapsulated metal nanoshells"

A silica-encapsulating layer of a 60-70 nm thickness is fabricated around composite nanoparticles consisting of a silica core and a gold shell (metal nanoshells). The outer silica layer provides greatly enhanced thermal stability to the nanoparticle, effectively raising its melting temperature by 300° relative to uncoated nanoshells. Both spectroscopic and microscopic structural evaluations are used to assess changes in the nanostructure when subjected to potentially destructive heating cycles. This encapsulation method may prove valuable in enhancing the thermal stability of other types of assembled nanostructures and nanoscale photonic materials. copyright 2001 American Institute of Physics. [J861]

"Periodic nanostructure array in crossed holographic gratings on silica glass by two interfered infrared-femtosecond laser pulses"

Two cross-superposed holographic gratings were encoded on silica glass by femtosecond laser pulses (wavelength 800 nm). A variety of periodic nanostructures from a one-dimensional wire array to two-dimensional arrays of holes or islands were formed by changing the energy density and the incidence angle of the irradiation laser beams. The smallest dimensions were a width of 15 nm for wires and a diameter of 20 nm for holes. Laser-driven microexplosions occurring within the microcylindrical-lens array created by the first laser pulse are suggested as a mechanism for the formation of these structures. Only two pulses are required to encode these periodic structures, which are applicable to emerging nanostructured devices such as photonic crystals and quantum dot or wire arrays. copyright 2001 American Institute of Physics. [J862]

"Atomic-scale defect control on hydrogen-terminated silicon surface at wafer scale"

We have developed a wet preparation method for an atomically defect-free Si wafer surface. In the conventional atomically smooth treatment using ammonium fluoride aqueous solution, dissolved oxygen has been revealed to form defects on the Si (111) surface. We have been able to create an extremely atomically smooth hydrogen-terminated surface with a good periodic step/terrace structure. Moreover, the ordered surface structure was confirmed to be fabricated all over the wafer surface. The atomic-scale defect-free hydrogen-terminated wafer surface with a periodic step/terrace structure is expected to be highly useful as a well-defined substrate for nanostructure fabrication and high-quality film deposition, and to be useful in many other research fields. copyright 2001 American Institute of Physics. [J863]

"Array of nickel nanowires enveloped in polyaniline nanotubules and its magnetic behavior"

An array of nickel nanowires enveloped in polyaniline nanotubules was prepared by the "second-order-template" method. As the first step, an array of the polyaniline nanotubules was synthesized in the pores of an alumina membrane, then nickel nanowires were fabricated by electrochemical deposition of the nickel into the polyaniline nanotubules. The composite nanostructure was characterized by x-ray powder diffraction, and scanning electron micrography. Its magnetic properties were measured by a vibrating sample magnetometer. The coercivity and remanence are of high anisotropy with a maximum at theta =90° (parallel to the nanowires). copyright 2001 American Institute of Physics. [J864]

"Cavity-quantum electrodynamics using a single InAs quantum dot in a microdisk structure"

We investigate cavity-quantum electrodynamics (QED) effects in an all-semiconductor nanostructure by tuning a single self-assembled InAs quantum dot (QD) into resonance with a high quality factor microdisk whispering

gallery mode (WGM). The stronger temperature dependence of the QD single-exciton (1X) resonance allows us to change the relative energy of the WGM and the 1X transitions by varying the sample temperature. The two coupled resonances exhibit crossing behavior due to the weak coupling cavity-QED regime. We demonstrate exciton lifetime reduction by 6 due to the Purcell effect by tuning the QD into resonance with the WGM. Our experiments also show that single-exciton lifetime is independent of temperature up to 50 K. copyright 2001 American Institute of Physics. [J865]

"Shaping carbon nanostructures by controlling the synthesis process"

The ability to control the nanoscale shape of nanostructures in a large-scale synthesis process is an essential and elusive goal of nanotechnology research. Here, we report significant progress toward that goal. We have developed a technique that enables controlled synthesis of nanoscale carbon structures with conical and cylinder-on-cone shapes and provides the capability to dynamically change the nanostructure shape during the synthesis process. In addition, we present a phenomenological model that explains the formation of these nanostructures and provides insight into methods for precisely engineering their shape. Since the growth process we report is highly deterministic in allowing large-scale synthesis of precisely engineered nanoscale components at defined locations, our approach provides an important tool for a practical nanotechnology. copyright 2001 American Institute of Physics. [J866]

"Self-organized carbon nanotips"

We have developed a carbon nanostructure, which is comprised of high-density carbon nanotips on a graphite layer. These carbon nanotips, with tip diameters of 10 nm,are grown by high-density plasma chemical vapor deposition onto Ni-coated Si using an inductively coupled plasma. The Ni on Si changes into NiSi2by substrate heating. First, a carbon buffer layer and then a graphene sheet are formed on the NiSi2.Then, the carbon nanotips are grown by a C2H2/H2plasma on the graphene sheet. The carbon nanotips show good adhesion to the substrate and are almost aligned, with an average length of 110 nm. They exhibit a turn-on field of 0.1 V/mcm, a field amplification factor of 13 000,a current density of 2 mA/cm2at a field of 2 V/mcm, and uniform electron emission. copyright 2001 American Institute of Physics. [J867]

"Interfacial chemistry of the Ba/SiO x N y /Si (100) nanostructure"

The interfacial chemistry of a barium/silicon oxynitride (SiOxNy)/siliconnanostructure was investigated with x-ray photoelectron spectroscopy (XPS) and secondary ion mass spectroscopy (SIMS) to determine if SiOxNycan serve as a barrier for the barium strontium titanate high-k dielectric. The structure consisted of 17 E of (4 ML) Ba on a 12 E SiOxNybarrier layer on a Si(100) substrate. Both XPS and SIMS results suggest that barium oxide (BaO) and silicon dioxide (SiO2)at the Ba/SiOxNyinterface react to form 10E of multiphase barium silicate even at 300 K. The kinetics of this reaction were accelerated by annealing the structure in a stepwise fashion to 1000 K. During the annealing, the BaO and SiO2XPS chemical states attenuate leaving two silicate states. Below the silicate layer, in the oxygen poor region of the nanostructure, 10 E BaSixformed. Annealing the nanostructure to 1000 K for 5 min tested the barrier capabilities of the 12 E SiOxNylayer. SIMS Ba+,BaSi+,BaSiO+and Si2N+signals reveal that Ba containing species do not significantly penetrate below the N Si3bonds characteristic of SiOxNy.Comparison of 11E SiO2and 12E SiOxNy,confirms that the N Si3bonds are the key to the barrier properties. Without N atom incorporation, the Ba+SIMS signal increased 66% and penetrated 24E deeper into the Si substrate after a 5 min 600 K anneal. copyright 2001 American Vacuum Society. [J868]

"Interfacial chemistry of the Sr/SiO x N y /Si(100) nanostructure"

The interfacial chemistry of a strontium/silicon oxynitride (SiOxNy)/silicon(100)nanostructure was investigated with x-ray photoelectron spectroscopy (XPS) and secondary ion mass spectroscopy (SIMS) to determine if SiOxNycan serve as a barrier for the strontium titanate high-k dielectric. The structure consisted of 19 E (5 ML) of Sr on a 10 E SiOxNybarrier layer on a Si(100) substrate. Both XPS and SIMS results suggest that strontium oxide (SrO) and silicon dioxide (SiO2)at the Sr/SiOxNyinterface form strontium silicate even at 300 K. The kinetics of this reaction were accelerated by heating the structure in a stepwise fashion to 1000 K. After the 500 K anneal, the SrO and SiO2XPS chemical states attenuate leaving predominantly two silicate phases. Annealing the nanostructure to 1000 K tested the barrier capability of the 10 E SiOxNylayer to Sr diffusion. SIMS Sr+,SrSi+,SrSiO+,and Sr2N+signals reveal that Sr containing species do not significantly penetrate below the N Si3bonds characteristic of SiOxNy.Comparison of 10 E-- SiO2and 10 E SiOxNyconfirms that the N Si3bonds are the key to the barrier properties. Without N atoms, the SrSiO+signal increased by a factor of 3.6 and penetrated 26 E deeper into the Si substrate after a 900 K anneal. These results show that N atoms in the barrier layer retard Sr diffusion and silicate formation. Comparison of Ba and Sr on SiOxNysuggests that Ba is more likely to form silicide, whereas Sr is more likely to form silicate. copyright 2001 American Vacuum Society.

[J869]

"Multilevel nanoimprint lithography with submicron alignment over 4 in. Si wafers"

We demonstrate that multilevel nanoimprint lithography (NIL) with submicron alignment over an entire 4 in. Si wafer can be achieved. Average alignment accuracy of 1 mcm with a standard deviation 0.4 mcm in both Xand Ydirections was obtained in ten consecutive tests of multilevel NIL. The multilevel alignment was achieved by aligning the wafer and the mask with an aligner, fixing them with a holder, and imprinting in an imprint machine. The issues that are critical to the alignment accuracy, such as relative movement during the press, relative thermal expansion, wafer bending, and resist, are discussed. The alignment accuracy currently achieved on the system is limited by the aligning accuracy of the aligner, instead of the process of multilevel NIL. copyright 2001 American Institute of Physics. [J870]

"Tailoring detection bands of InAs quantum-dot infrared photodetectors using In x Ga 1-x As strain-relieving quantum wells"

We report on tailoring detection bands of InAs quantum-dot infrared photodetectors (QDIPs) using InxGa1-xAsstrain-relieving capping layers that also act as quantum wells (QWs). QDIPs with InAs QDs capped by a 20 ML In0.15Ga0.85AsQWshow a sharp photoresponse at 9 mcm, while the counterpart QDIPs without QWs show broad photoresponse in the 5-7 mcm range. The excited states involved in the intraband transitions in QDIPs with the In0.15Ga0.85AsQWappear to be coupled QD and QW electron excited states. copyright 2001 American Institute of Physics. [J871]

"Observation of dynamic behavior of lithographically induced self-assembly of supramolecular periodic pillar arrays in a homopolymer film"

The dynamic behavior of lithographically induced self-assembly (LISA), a newly discovered pattern formation phenomenon, was recorded and analyzed with real time video. Two surprising and intriguing phenomena were observed. First, a LISA pillar array was formed in an orderly manner starting under the corners of a mask pattern, then the edges, and later propagating to the center of the mask pattern. Second, the time interval between the formation of two subsequent LISA pillars has a shell structure. The observation presents evidence critical to uncovering the physical origin of this phenomenon, which is believed to be related to the interplay of electrodynamics, fluid hydrodynamics, and polymer chemistry at the nanometer scale.copyright 2001 American Institute of Physics. [J872]

СПИСОК ЛИТЕРАТУРЫ

J1. Nakata Toshihiko. Nanometer-resolution optical probe using a metallic-nanoparticle-intercalated carbon nanotube. / Nakata Toshihiko, Watanabe Masahiro. // Journal of Applied Physics. - 2011. - Vol. 109, No. 1. - P. 013110-013110-5.

J2. Appelbaum Ian. Proposal for a topological plasmon spin rectifier. / Appelbaum Ian, Drew H. D., Fuhrer M. S. // Applied Physics Letters. - 2011. - Vol. 98, No. 2. - P. 023103-023103-3.

J3. Rosenkrantz E. Resonance Frequencies of Electrically Charged Nanoparticles. / Rosenkrantz E., Arnon S. // IEEE Photonics Journal. - 2011. - Vol. 3, No. 1. - P. 82-88.

J4. Volk S. Direct observation of dynamic surface acoustic wave controlled carrier injection into single quantum posts using phase-resolved optical spectroscopy. / Volk S., Knall F., Schulein F. J. R., Truong T. A., Kim H., Petroff P. M., Wixforth A., Krenner H. J. // Applied Physics Letters. - 2011. - Vol. 98, No. 2. - P. 023109-023109-3.

J5. Guo J. Y. Structure evolution of Zn cluster on graphene for ZnO nanostructure growth. / Guo J. Y., Xu C. X., Gu B. X., Sheng F. Y. // Journal of Applied Physics. - 2011. - Vol. 109, No. 2. - P. 024307-024307-4.

J6. Ehresmann Arno. Thermal exchange bias field drift in field cooled Mn 83 Ir 17 /Co 70 Fe 30 thin films after 10 keV He ion bombardment. / Ehresmann Arno, Schmidt Christoph, Weis Tanja, Engel Dieter. // Journal of Applied Physics. - 2011. - Vol. 109, No. 2. - P. 023910-023910-7.

J7. Murphy Jessica K. Control of semiconductor quantum dot nanostructures: Variants of Si x Ge 1-x /Si quantum dot molecules. / Murphy Jessica K., Hull Robert, Pyle Devin, Wang Hao, Gray Jennifer, Floro Jerrold. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2011. - Vol. 29, No. 1. - P. 011029-011029-5.

J8. Lifton V.A. Robust Si-Based Membranes for Fluid Control in Microbatteries Using Superlyophobic Nanostructures. / Lifton V.A., Simon S. // Journal of Microelectromechanical Systems. - 2011. - Vol. 20, No. 1. - P. 73-82.

J9. Vasudev M. Optoelectronic Signatures of DNA-Based Hybrid Nanostructures. / Vasudev M., Tsai-Chin Wu, Biswas S., Dutta M., Stroscio M.A., Guthrie S., Reed M., Burris K.P., Stewart C.N. // IEEE Transactions on Nanotechnology. - 2011. - Vol. 10, No. 1. - P. 35-43.

J10. Hyungoo Lee. Formation of 1-D Nanostructures Using Atomic Force Microscope. / Hyungoo Lee, Cooper R., Yapici M.K., Jun Zou, Hong Liang. // IEEE Transactions on Nanotechnology. - 2011. - Vol. 10, No. 2. - P. 310-318.

J11. Pan J. B. The transport properties of D- sigma -A molecules: A strikingly opposite directional rectification. / Pan J. B., Zhang Z. H., Deng X. Q., Qiu M., Guo C. // Applied Physics Letters. - 2011. - Vol. 98, No. 1. - P. 013503-013503-3.

J12. Kang Yuji. Nanoimprint replication of nonplanar nanostructure fabricated by focused-ion-beam chemical vapor deposition. / Kang Yuji, Omoto Shinya, Nakai Yasuki, Okada Makoto, Kanda Kazuhiro, Haruyama Yuichi, Matsui Shinji. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2011. - Vol. 29, No. 1. - P. 011005-011005-5.

J13. Essone Mezeme M. Electromagnetic properties of resonant magnetoplasmonic core-shell nanostructures. / Essone Mezeme M., Lasquellec S., Brosseau C. // Journal of Applied Physics. - 2011. - Vol. 109, No. 1. - P. 014302-014302-11.

J14. Ishino Masahiko. Nanoscale surface modifications and formation of conical structures at aluminum surface induced by single shot exposure of soft x-ray laser pulse. / Ishino Masahiko, Faenov Anatoly Ya., Tanaka Momoko, Hasegawa Noboru, Nishikino Masaharu, Tamotsu Satoshi, Pikuz Tatiana A., Inogamov Nail A., Zhakhovsky Vasily V., Skobelev Igor Yu., Fortov Vladimir E., Khohlov Viktor A., Shepelev Vadim V., Ohba Toshiyuki, Kaihori Takeshi, Ochi Yoshihiro, Imazono Takashi, Kawachi Tetsuya. // Journal of Applied Physics. - 2011. - Vol. 109, No. 1. - P. 013504-013504-6.

J15. Pan J. B. Current rectification induced by asymmetrical electrode materials in a molecular device. / Pan J. B., Zhang Z. H., Ding K. H., Deng X. Q., Guo C. // Applied Physics Letters. - 2011. - Vol. 98, No. 9. - P. 092102-092102-3.

J16. Chen Chen. Silicon nanostructure solar cells with excellent photon harvesting. / Chen Chen, Jia Rui, Yue Huihui, Li Haofeng, Liu Xinyu, Ye Tianchun, Kasai Seiya, Tamotsu Hashizume, Wu Nanjian, Wang Shanli, Chu Junhao, Xu Bingshe. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2011. - Vol. 29, No. 2. - P. 021014-021014-6.

J17. Reichert Thomas. Photoinduced magnetoresistance in organic field-effect transistors. / Reichert Thomas, Saragi Tobat P. I. // Applied Physics Letters. - 2011. - Vol. 98, No. 6. - P. 063307-063307-3.

J18. Lang Xingyou. Localized surface plasmon resonance of nanoporous gold. / Lang Xingyou, Qian Lihua, Guan Pengfei, Zi Jian, Chen Mingwei. // Applied Physics Letters. - 2011. - Vol. 98, No. 9. - P. 093701-093701-3.

J19. Wang Jer-Chyi. CF4 plasma treatment on nanostructure band engineered Gd2 O3 -nanocrystal nonvolatile memory. / Wang Jer-Chyi, Lin Chih-Ting. // Journal of Applied Physics. - 2011. - Vol. 109, No. 6. - P. 064506-064506-7.

J20. Acosta Juan Camilo. A tuning fork based wide range mechanical characterization tool with nanorobotic manipulators inside a scanning electron microscope. / Acosta Juan Camilo, Hwang Gilgueng, Polesel-Maris Jerome, Regnier Stephane. // Review of Scientific Instruments. - 2011. - Vol. 82, No. 3. - P. 035116-035116-8.

J21. Jiang Xiang-Wei. Quantum mechanical simulation of electronic transport in nanostructured devices by efficient self-consistent pseudopotential calculation. / Jiang Xiang-Wei, Li Shu-Shen, Xia Jian-Bai, Wang Lin-Wang. // Journal of Applied Physics. - 2011. - Vol. 109, No. 5. - P. 054503-054503-10.

J22. Lew Yan Voon L. C. Electromechanical phenomena in semiconductor nanostructures. / Lew Yan Voon L. C., Willatzen M. // Journal of Applied Physics. - 2011. - Vol. 109, No. 3. - P. 031101-031101-24.

J23. Anchala. Photoabsorption and photoelectric process in Si nanocrystallites. / Anchala, Purohit S. P., Mathur K. C. // Applied Physics Letters. - 2011. - Vol. 98, No. 4. - P. 043106-043106-3.

J24. Nzoghe-Mendome Leny. Magnetic properties of nanocrystallized nickel films on gold substrate deposited by cathodic voltammetry: Scan rate induced effects. / Nzoghe-Mendome Leny, Ebothe Jean, Molinari Michael. // Journal of Applied Physics. - 2011. - Vol. 109, No. 2. - P. 024904-024904-7.

J25. Kawasaki Jason K. Cross-sectional scanning tunneling microscopy and spectroscopy of semimetallic ErAs nanostructures embedded in GaAs. / Kawasaki Jason K., Timm Rainer, Buehl Trevor E., Lundgren Edvin, Mikkelsen Anders, Gossard Arthur C., Palmstrш,m Chris J. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2011. - Vol. 29, No. 3. - P. 03C104-03C104-5.

J26. Capua A. Ultrafast cross saturation dynamics in inhomogeneously broadened InAs/InP quantum dash optical amplifiers. / Capua A., Eisenstein G., Reithmaier J. P. // Applied Physics Letters. - 2011. - Vol. 98, No. 10. - P. 101108-101108-3.

J27. Saidi I. Electron and hole energy levels in InAs/GaAs quantum dots: Size and magnetic field effects. / Saidi I., Sellami K., Yahyaoui M., Testelin C., Boujdaria K. // Journal of Applied Physics. - 2011. - Vol. 109, No. 3. - P. 033703-033703-7.

J28. Liao M. Tellurite Photonic Nanostructured Fiber. / Liao M., Yan X., Duan Z., Suzuki T., Ohishi Y. // Journal of Lightwave Technology. - 2011. - Vol. 29, No. 7. - P. 1018-1025.

J29. Zhong Chun Li. Potassium iodide-assisted polyol route synthesis of monodisperse silver nanospheres. / Zhong Chun Li, Quan Fa Zhou, Jian Hua Sun. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 3. - P. 175-`77.

J30. Wei Tan. Evaluation of Nanostructural, Mechanical, and Biological Properties of Collagen-Nanotube Composites. / Wei Tan, Twomey J., Dongjie Guo, Madhavan K., Min Li. // IEEE Transactions on NanoBioscience. - 2010. - Vol. 9, No. 2. - P. 111-120.

J31. Chou Wei-Yang. Application of nanoimprinting technology to organic field-effect transistors. / Chou Wei-Yang, Chang Ming-Hua, Cheng Horng-Long, Yu Shih-Po, Lee Yung-Chun, Chiu Cheng-Yu, Lee Chung-Yi, Shu Dun-Ying. // Applied Physics Letters. - 2010. - Vol. 96, No. 8. - P. 083305-083305-3.

J32. Dhawan A. Methodologies for Developing Surface-Enhanced Raman Scattering (SERS) Substrates for Detection of Chemical and Biological Molecules. / Dhawan A., Yan Du, Fei Yan, Gerhold M.D., Misra V., Tuan Vo-Dinh. // IEEE Sensors Journal. - 2010. - Vol. 10, No. 3. - P. 608-616.

J33. Wegrowe J.-E. Measuring Entropy Generated by Spin-Transfer. / Wegrowe J.-E., Nguyen Q.A., Wade T.L. // IEEE Transactions on Magnetics. - 2010. - Vol. 46, No. 3. - P. 866-874.

J34. Zorba Vassilia. Superhydrophilic TiO 2 surface without photocatalytic activation. / Zorba Vassilia, Chen Xiaobo, Mao Samuel S. // Applied Physics Letters. - 2010. - Vol. 96, No. 9. - P. 093702-093702-3.

J35. Kukushkin V. Proposal for an Inversionless Tunable Far-Infrared and THz Room-Temperature Laser on a Quantum Well Semiconductor Nanostructure. IEEE Journal of Quantum Electronics. - 2010. - Vol. 46, No. 5. - P. 666-673.

J36. Changsong Ding. A Flat Heat Pipe Architecture Based on Nanostructured Titania. / Changsong Ding, Soni G., Bozorgi P., Piorek B.D., Meinhart C.D., MacDonald N.C. // Journal of Microelectromechanical Systems. - 2010. - Vol. 19, No. 4. - P. 878-884.

J37. Howlader M.M.R. Sequential Plasma-Activated Bonding Mechanism of Silicon/Silicon Wafers. / Howlader M.M.R., Kagami G., Sang Ho Lee, Wang J.G., Kim M.J., Yamauchi A. // Journal of Microelectromechanical Systems. - 2010. - Vol. 19, No. 4. - P. 840-848.

J38. Chen Chao-Kuang. Molecular dynamics simulations of the internal temperature dependent diffusing and epitaxial behaviors of Pd-Ag cluster beam deposition. / Chen Chao-Kuang, Chang Shing-Cheng, Chen Chieh-Li. // Journal of Applied Physics. - 2010. - Vol. 107, No. 12. - P. 124309-124309-9.

J39. Ramana C. V. Electron microscopy characterization of hexagonal molybdenum trioxide (MoO 3) nanorods. / Ramana C. V., Troitskaia I. B., Atuchin V. V., Ramos M., Ferrer D. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2010. - Vol. 28, No. 4. - P. 726-729.

J40. Steeves M. M. Influence of nanostructure on charge transport in Ru O 2 thin films. / Steeves M. M., Lad R. J. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2010. - Vol. 28, No. 4. - P. 906-911.

J41. Word R. C. Photoemission from localized surface plasmons in fractal metal nanostructures. / Word R. C., Dornan T., Konenkamp R. // Applied Physics Letters. - 2010. - Vol. 96, No. 25. - P. 251110-251110-3.

J42. Komarala Vamsi K. Surface plasmon density of states at the metal-dielectric interface: Dependence of metal layer thickness and dielectric material. / Komarala Vamsi K., Guo Wei-Hua, Xiao Min. // Journal of Applied Physics. - 2010. - Vol. 107, No. 1. - P. 014309-014309-5.

J43. Netzer Falko P. Low-dimensional oxide nanostructures on metals: Hybrid systems with novel properties. / Netzer Falko P., Allegretti Francesco, Surnev Svetlozar. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 1. - P. 1-16.

J44. Kyungjae Ma. Target-Localized Nanograting-Based Surface Plasmon Resonance Detection toward Label-free Molecular Biosensing. / Kyungjae Ma, Dong Jun Kim, Kyujung Kim, Seyoung Moon, Donghyun Kim. // IEEE Journal of Selected Topics in Quantum Electronics. - 2010. - Vol. 16, No. 4. - P. 1004-1014.

J45. Huang Wan-xia. Optical switching of a metamaterial by temperature controlling. / Huang Wan-xia, Yin Xiao-gang, Huang Cheng-ping, Wang Qian-jin, Miao Teng-fei, Zhu Yong-yuan. // Applied Physics Letters. - 2010. - Vol. 96, No. 26. - P. 261908-261908-3.

J46. Jing Chen. Cosensitized Solar Cells Based on a Flower-Like ZnO Nanorod Structure. / Jing Chen, De Wei Zhao, Wei Lei, Xiao Wei Sun. // IEEE Journal of Selected Topics in Quantum Electronics. - 2010. - Vol. 16, No. 6. - P. 1607-1610.

J47. Liu W. Investigation of Sub-10-nm Diameter, Gate-All-Around Nanowire Field-Effect Transistors for Electrostatic Discharge Applications. / Liu W., Liou J.J., Jiang Y., Singh N., Lo G.Q., Chung J., Jeong Y.H. // IEEE Transactions on Nanotechnology. - 2010. - Vol. 9, No. 3. - P. 352-354.

J48. Ong Pang-Leen. Carbon nanotube-Si diode as a detector of mid-infrared illumination. / Ong Pang-Leen, Euler William B., Levitsky Igor A. // Applied Physics Letters. - 2010. - Vol. 96, No. 3. - P. 033106-033106-3.

J49. Vasudev M. Integrated Nanostructure-Semiconductor Molecular Complexes as Tools for THz Spectral Studies of DNA. / Vasudev M., Jianyong Yang, Hye-Son Jung, Stroscio M.A., Dutta M. // IEEE Sensors Journal. - 2010. - Vol. 10, No. 3. - P. 524-530.

J50. Huang Lina. Distance-controlled scattering in a plasmonic trap. / Huang Lina, Martin Olivier J. F. // Applied Physics Letters. - 2010. - Vol. 96, No. 7. - P. 073104-073104-3.

J51. Hui-Hsin Lu. Optical Characterization of a 1-D Nanostructure by Dark-Field Microscopy and Surface Plasmon Resonance to Determine Biomolecular Interactions. / Hui-Hsin Lu, Tzu-Chien Hsiao, Su-Ming Hsu, Chii-Wann Lin. // IEEE Sensors Journal. - 2010. - Vol. 10, No. 3. - P. 712-719.

J52. Kao T. S. Metamaterial as a controllable template for nanoscale field localization. / Kao T. S., Huang F. M., Chen Y., Rogers E. T. F., Zheludev N. I. // Applied Physics Letters. - 2010. - Vol. 96, No. 4. - P. 041103-041103-3.

J53. Park Sung Hoon. The influence of coiled nanostructure on the enhancement of dielectric constants and electromagnetic shielding efficiency in polymer composites. / Park Sung Hoon, Theilmann Paul, Yang Keqin, Rao Apparao M., Bandaru Prabhakar R. // Applied Physics Letters. - 2010. - Vol. 96, No. 4. - P. 043115-043115-3.

J54. Hwang Inrok. Direct investigation on conducting nanofilaments in single-crystalline Ni/NiO core/shell

nanodisk arrays. / Hwang Inrok, Choi Jinsik, Hong Sahwan, Kim Jin-Soo, Byun Ik-Su, Bahng Jae Ho, Koo Ja-Yong, Kang Sung-Oong, Park Bae Ho. // Applied Physics Letters. - 2010. - Vol. 96, No. 5. - P. 053112-053112-3.

J55. Yan Li. Magnetoelectric and multiferroic properties of variously oriented epitaxial BiFeO 3 -CoFe 2 O 4 nanostructured thin films. / Yan Li, Wang Zhiguang, Xing Zengping, Li Jiefang, Viehland D. // Journal of Applied Physics. - 2010. - Vol. 107, No. 6. - P. 064106-064106-5.

J56. Wolter Matthias. Hydrogen in plasma-nanofabrication: Selective control of nanostructure heating and passivation. / Wolter Matthias, Levchenko Igor, Kersten Holger, Ostrikov Kostya (Ken). // Applied Physics Letters. - 2010. - Vol. 96, No. 13. - P. 133105-133105-3.

J57. Xie Hui. In situ peeling of one-dimensional nanostructures using a dual-probe nanotweezer. / Xie Hui, Regnier Stephane. // Review of Scientific Instruments. - 2010. - Vol. 81, No. 3. - P. 035112-035112-4.

J58. Dongfeng Zhang. In Situ Electron Microscopy Mechanical Testing of Silicon Nanowires Using Electrostatically Actuated Tensile Stages. / Dongfeng Zhang, Breguet J.-M., Clavel R., Sivakov V., Christiansen S., Michler J. // Journal of Microelectromechanical Systems. - 2010. - Vol. 19, No. 3. - P. 663-674.

J59. Keten Sinan. Atomistic model of the spider silk nanostructure. / Keten Sinan, Buehler Markus J. // Applied Physics Letters. - 2010. - Vol. 96, No. 15. - P. 153701-153701-3.

J60. Xu Bo. Distinct C 60 growth modes on anthracene carboxylic acid templates. / Xu Bo, Zhu Erkuang, Lu Chao, Liu Yadi, Liu Zhongyuan, Yu Dongli, He Julong, Tian Yongjun. // Applied Physics Letters. - 2010. - Vol. 96, No. 14. - P. 143115-143115-3.

J61. Zong Zhaocun. Synthesis of PbTe/Pb quasi-one-dimensional nanostructure material arrays by electrodeposition. / Zong Zhaocun, Zhang Mingzhe, Lu Hongliang, Xu Dan, Wang Suangming, Tian Huifang, Liu Chang, Guo Haiming, Gao Hongjun, Zou Guangtian. // Applied Physics Letters. - 2010. - Vol. 96, No. 14. - P. 143113-143113-3.

J62. Zhuo Shujuan. Surface-enhanced fluorescence of praseodymium ions (Pr 3+) on silver/silicon nanostructure. / Zhuo Shujuan, Shao Mingwang, Cheng Liang, Que Ronghui, Duo Ma Dorthy Duo, Lee Shuit-Tong. // Applied Physics Letters. - 2010. - Vol. 96, No. 10. - P. 103108-103108-3.

J63. Xu Zheng. Localized exciton emission from ZnO nanocrystalline films. / Xu Zheng, He Haiping, Sun Luwei, Jin Yizheng, Zhao Binghui, Ye Zhizhen. // Journal of Applied Physics. - 2010. - Vol. 107, No. 5. - P. 053524-053524-5.

J64. Sosnowchik Brian D. Localized heating induced chemical vapor deposition for one-dimensional nanostructure synthesis. / Sosnowchik Brian D., Lin Liwei, Englander Ongi. // Journal of Applied Physics. - 2010. - Vol. 107, No. 5. - P. 051101-051101-14.

J65. Pochet M. Tunable Photonic Oscillators Using Optically Injected Quantum-Dash Diode Lasers. / Pochet M., Naderi N.A., Yan Li, Kovanis V., Lester L.F. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 11. - P. 763-765.

J66. Fedorchenko A. I. Radiation emission from wrinkled SiGe/SiGe nanostructure. / Fedorchenko A. I., Cheng H. H., Sun G., Soref R. A. // Applied Physics Letters. - 2010. - Vol. 96, No. 11. - P. 113104-113104-3.

J67. Pantsyrny V. The Nanostructured High Strength High Conductivity Cu Matrix Composites With Different BCC Metals Strengthening Filaments. / Pantsyrny V., Shikov A., Khlebova N., Drobishev V., Kozlenkova N., Polikarpova M., Belyakov N., Kukina O., Dmitriev V. // IEEE Transactions on Applied Superconductivity. - 2010. - Vol. 20, No. 3. - P. 1614-1618.

J68. Yunkang Cui. Evaporation of Tetrapod ZnO Nanostructures and Its Influence on the Field-Emission Performance. / Yunkang Cui, Xiaobing Zhang, Wei Lei, Yunsong Di, Mei Xiao, Xiaxi Yang, Zhiwei Zhao. // IEEE Electron Device Letters. - 2010. - Vol. 31, No. 5. - P. 479-481.

J69. Klimov A. Ferromagnetic resonance and magnetoelastic demodulation in thin active films with an uniaxial anisotropy. / Klimov A., Ignatov Yu., Tiercelin N., Preobrazhensky V., Pernod P., Nikitov S. // Journal of Applied Physics. - 2010. - Vol. 107, No. 9. - P. 093916-093916-6.

J70. Ojzgujr U. ZnO Devices and Applications: A Review of Current Status and Future Prospects. / Ojzgujr U., Hofstetter D., Morkoз, H. // Proceedings of the IEEE. - 2010. - Vol. 98, No. 7. - P. 1255-1268.

J71. Myung-Gyu Kang. Toward Low-Cost, High-Efficiency, and Scalable Organic Solar Cells with Transparent Metal Electrode and Improved Domain Morphology. / Myung-Gyu Kang, Hui Joon Park, Se Hyun Ahn, Ting Xu, Guo L.J. // IEEE Journal of Selected Topics in Quantum Electronics. - 2010. - Vol. 16, No. 6. - P. 1807-1820.

J72. Gilfert C. Influence of the As 2 /As 4 growth modes on the formation of quantum dot-like InAs islands grown on InAlGaAs/InP (100). / Gilfert C., Pavelescu E.-M., Reithmaier J. P. // Applied Physics Letters. - 2010. - Vol. 96, No. 19. - P. 191903-191903-3.

J73. George T.A. Control of Coercivity in Exchange-Coupled Graded (001) Nanocomposite Films. / George T.A., Yongsheng Yu, Lanping Yue, Skomski R., Sellmyer D.J. // IEEE Transactions on Magnetics. - 2010. - Vol. 46, No. 6. - P. 2435-2437.

J74. Mehran M. Nanograss and nanostructure formation on silicon using a modified deep reactive ion etching. / Mehran M., Mohajerzadeh S., Sanaee Z., Abdi Y. // Applied Physics Letters. - 2010. - Vol. 96, No. 20. - P. 203101-203101-3.

J75. Fa-Jun Ma. Modeling of Stress-Retarded Thermal Oxidation of Nonplanar Silicon Structures for Realization of Nanoscale Devices. / Fa-Jun Ma, Rustagi S.C., Samudra G.S., Hui Zhao, Singh N., Guo-Qiang Lo, Dim-Lee Kwong. // IEEE Electron Device Letters. - 2010. - Vol. 31, No. 7. - P. 719-721.

J76. Kura Hiroaki. Synthesis and growth mechanism of long ultrafine gold nanowires with uniform diameter. / Kura Hiroaki, Ogawa Tomoyuki. // Journal of Applied Physics. - 2010. - Vol. 107, No. 7. - P. 074310-074310-5.

J77. Park C. Y. Structural and antireflective characteristics of catalyst-free GaN nanostructures on GaN/sapphire template for solar cell applications. / Park C. Y., Lim J. M., Yu J. S., Lee Y. T. // Applied Physics Letters. - 2010. - Vol. 96, No. 15. - P. 151909-151909-3.

J78. Asano Tetsuya. Deep levels in GaAs(001)/InAs/InGaAs/GaAs self-assembled quantum dot structures and their effect on quantum dot devices. / Asano Tetsuya, Fang Zhaoqiang, Madhukar Anupam. // Journal of Applied Physics. - 2010. - Vol. 107, No. 7. - P. 073111-073111-8.

J79. Cui B. Z. Anisotropic SmCo 5 nanoflakes by surfactant-assisted high energy ball milling. / Cui B. Z., Gabay A. M., Li W. F., Marinescu M., Liu J. F., Hadjipanayis G. C. // Journal of Applied Physics. - 2010. - Vol. 107, No. 9. - P. 09A721-09A721-3.

J80. Coe J. P. Geometry induced entanglement transitions in nanostructures. / Coe J. P., Abdullah S., DAmico I. // Journal of Applied Physics. - 2010. - Vol. 107, No. 9. - P. 09E110-09E110-3.

J81. 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.

J82. Andersson S. Exchange coupling and magnetoresistance in CoFe/NiCu/CoFe spin valves near the Curie point of the spacer. / Andersson S., Korenivski V. // Journal of Applied Physics. - 2010. - Vol. 107, No. 9. - P. 09D711-09D711-3.

J83. Mahmood Abdul Salam. Effect of laser parameters and assist gas on spectral response of silicon fibrous nanostructure. / Mahmood Abdul Salam, Venkatakrishnan Krishnan, Tan Bo, Alubiady M. // Journal of Applied Physics. - 2010. - Vol. 108, No. 9. - P. 094327-094327-6.

J84. Yang Zhenling. Competition between surface trapping and nonradiative energy transfer to gold nanofilm. / Yang Zhenling, Liu Yuqiang, He Xing, Wen Yanan, Yang Yanqiang. // Journal of Applied Physics. - 2010. - Vol. 108, No. 9. - P. 094309-094309-5.

J85. Chang Chung-Chieh. Magnetodielectric study in SiO 2 -coated Fe 3 O 4 nanoparticle compacts. / Chang Chung-Chieh, Zhao Li, Wu Maw-Kuen. // Journal of Applied Physics. - 2010. - Vol. 108, No. 9. - P. 094105-094105-5.

J86. Xiao Xianbo. Spin-polarized current separator based on a fork-shaped Rashba nanostructure. / Xiao Xianbo, Chen Yuguang. // Journal of Applied Physics. - 2010. - Vol. 108, No. 9. - P. 093717-093717-4.

J87. Cuony P. Mixed-phase p-type silicon oxide containing silicon nanocrystals and its role in thin-film silicon solar cells. / Cuony P., Marending M., Alexander D. T. L., Boccard M., Bugnon G., Despeisse M., Ballif C. // Applied Physics Letters. - 2010. - Vol. 97, No. 21. - P. 213502-213502-3.

J88. Chang You Min. Multilayered graphene efficiently formed by mechanical exfoliation for nonlinear saturable absorbers in fiber mode-locked lasers. / Chang You Min, Kim Hyungseok, Lee Ju Han, Song Yong-Won. // Applied Physics Letters. - 2010. - Vol. 97, No. 21. - P. 211102-211102-3.

J89. Somaschini C. Shape control via surface reconstruction kinetics of droplet epitaxy nanostructures. / Somaschini C., Bietti S., Koguchi N., Sanguinetti S. // Applied Physics Letters. - 2010. - Vol. 97, No. 20. - P. 203109-203109-3.

J90. Cui H. Reversible ultraviolet light-manipulated superhydrophobic-to-superhydrophilic transition on a tubular SiC nanostructure film. / Cui H., Yang G. Z., Sun Y., Wang C. X. // Applied Physics Letters. - 2010. - Vol. 97, No. 18. - P. 183112-183112-3.

J91. Uppireddi Kishore. Field emission stability and properties of simultaneously grown microcrystalline diamond and carbon nanostructure films. / Uppireddi Kishore, Weiner Brad R., Morell Gerardo. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. 1202-1205.

J92. Wang Xuan-Yu. Defect-free etching process for GaAs/AlGaAs hetero-nanostructure using chlorine/argon mixed neutral beam. / Wang Xuan-Yu, Huang Chi-Hsien, Ohno Yuzo, Igarashi Mokoto, Murayama Akihiro, Samukawa Seiji. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. 1138-1142.

J93. de Zevallos-Marquez Angela M. O. Effect of TiO 2 nanoparticles on the thermal properties of decorated multiwall carbon nanotubes: A Raman investigation. / de Zevallos-Marquez Angela M. O., Brasil Maria Jose S. P., Iikawa Fernando, Abbaspourrad Alireza, Verissimo Carla, Moshkalev Stanislav A., Alves Oswaldo L. // Journal of Applied Physics. - 2010. - Vol. 108, No. 8. - P. 083501-083501-6.

J94. Reid Obadiah G. Nanostructure determines the intensity-dependence of open-circuit voltage in plastic solar cells. / Reid Obadiah G., Xin Hao, Jenekhe Samson A., Ginger David S. // Journal of Applied Physics. - 2010. - Vol. 108, No. 8. - P. 084320-084320-8.

J95. Adisa O.O. Encapsulation of methane in nanotube bundles. / Adisa O.O., Cox B.J., Hill J.M. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 5. - P. 291-295.

J96. 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.

J97. Zhang Z. H. Examinations into the contaminant-induced transport instabilities in a molecular device. / Zhang Z. H., Deng X. Q., Tan X. Q., Qiu M., Pan J. B. // Applied Physics Letters. - 2010. - Vol. 97, No. 18. - P. 183105-183105-3.

J98. Cojoc Dan. Local x-ray structure analysis of optically manipulated biological micro-objects. / Cojoc Dan, Amenitsch Heinz, Ferrari Enrico, Santucci Silvia C., Sartori Barbara, Rappolt Michael, Marmiroli Benedetta, Burghammer Manfred, Riekel Christian. // Applied Physics Letters. - 2010. - Vol. 97, No. 24. - P. 244101-244101-3.

J99. Yamane H. Structural characterization for L10 -ordered FePt films with (001) texture by x-ray diffraction. / Yamane H., Narisawa T., Hasegawa T., Ishio S. // Journal of Applied Physics. - 2010. - Vol. 108, No. 11. - P. 113923-113923-8.

J100. Li Zhirong. Closed-air induced composite wetting on hydrophilic ordered nanoporous anodic alumina. / Li Zhirong, Wang Jingxia, Zhang Youzhuan, Wang Jianjun, Jiang Lei, Song Yanlin. // Applied Physics Letters. - 2010. - Vol. 97, No. 23. - P. 233107-233107-3.

J101. Gomez-Campos F. M. Intraband photon absorption in edge-defined nanowire superlattices for optoelectronic applications. / Gomez-Campos F. M., Rodriguez-Bolivar S., Luque-Rodriguez A., Lopez-Villanueva J. A., Carceller J. E. // Journal of Applied Physics. - 2010. - Vol. 108, No. 12. - P. 124307-124307-6.

J102. Cunningham J. On-chip terahertz systems for spectroscopy and imaging. / Cunningham J., Byrne M.B., Wood C.D., Dazhang L. // Electronics Letters. - 2010. - Vol. 46, No. 26. - P. s34-s37.

J103. Hanson G.W. Drift-Diffusion: A Model for Teaching Spatial-Dispersion Concepts and the Importance of Screening in Nanoscale Structures. IEEE Antennas and Propagation Magazine. - 2010. - Vol. 52, No. 5. - P. 198-207.

J104. Cibert C. Piezoelectric characteristic of nanocrystalline AlN films obtained by pulsed laser deposition at room temperature. / Cibert C., Dutheil P., Champeaux C., Masson O., Trolliard G., Tetard F., Catherinot A. // Applied Physics Letters. - 2010. - Vol. 97, No. 25. - P. 251906-251906-3.

J105. Sikora A. Structure of diamondlike carbon films deposited by femtosecond and nanosecond pulsed laser ablation. / Sikora A., Garrelie F., Donnet C., Loir A. S., Fontaine J., Sanchez-Lopez J. C., Rojas T. C. // Journal of Applied Physics. - 2010. - Vol. 108, No. 11. - P. 113516-113516-9.

J106. Nakamura Toshihiro. Properties of silver/porous-silicon nanocomposite powders prepared by metal assisted electroless chemical etching. / Nakamura Toshihiro, Hosoya Naoki, Tiwari Bishnu P., Adachi Sadao. // Journal of Applied Physics. - 2010. - Vol. 108, No. 10. - P. 104315-104315-6.

J107. Okada Makoto. Evaluation of oxygen inhibition for UV-curable resins by adhesion force measurement using scanning probe microscope. / Okada Makoto, Iwasa Masayuki, Miyake Hiroto, Ohsaki Takeshi, Haruyama Yuichi, Kanda Kazuhiro, Matsui Shinji. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. C6M17-C6M22.

J108. Mino Hiroyuki. Nanostructure fabrication by self-assembly of block copolymers on three-dimensional diamondlike carbon structures. / Mino Hiroyuki, Kometani Reo, Warisawa Shin-ichi, Ishihara Sunao. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 6. - P. C6B20-C6B23.

J109. Liang Zhiwen. Publisher's Note: "GaN nanostructure design for optimal dislocation filtering" [J. Appl. Phys. 108, 074313 (2010)]. / Liang Zhiwen, Colby Robert, Wildeson Isaac H., Ewoldt David A., Sands Timothy D., Stach Eric A., Garcia R. Edwin. // Journal of Applied Physics. - 2010. - Vol. 108, No. 10. - P. 109901-109901-1.

J110. 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.

J111. Xia Deying. Titania nanostructure arrays from lithographically defined templates. / Xia Deying, Jiang Ying-Bing, He Xiang, Brueck S. R. J. // Applied Physics Letters. - 2010. - Vol. 97, No. 22. - P. 223106-223106-3.

J112. Briggs Benjamin D. Electromechanical robustness of monolayer graphene with extreme bending. / Briggs Benjamin D., Nagabhirava Bhaskar, Rao Gayathri, Geer Robert, Gao Haiyuan, Xu Yang, Yu Bin. // Applied Physics Letters. - 2010. - Vol. 97, No. 22. - P. 223102-223102-3.

J113. Liang Zhiwen. GaN nanostructure design for optimal dislocation filtering. / Liang Zhiwen, Colby Robert, Wildeson Isaac H., Ewoldt David A., Sands Timothy D., Stach Eric A., Garcia R. Edwin. // Journal of Applied Physics. - 2010. - Vol. 108, No. 7. - P. 074313-074313-8.

J114. Pei-Hsuan Lin. Investigation of Carrier Transient Response of Nanopatterned n-ZnO/a-Si(i)/p -Si Photodiodes. / Pei-Hsuan Lin, Cheng-Pin Chen, Yen-Jen Hung, Shao-Sun Hsu, Liang-Yi Chen, Yun-Wei Cheng, Min-Yung Ke, Ching Hua Chiu, Hao-Chung Kuo, Jian Jang Huang. // IEEE Photonics Technology Letters. - 2010. - Vol. 22, No. 21. - P. 1589-1591.

J115. Laracuente A. R. Reversible electron-induced conductance in polymer nanostructures. / Laracuente A. R., Yang M., Lee W. K., Senapati L., Baldwin J. W., Sheehan P. E., King W. P., Erwin S. C., Whitman L. J. //

Journal of Applied Physics. - 2010. - Vol. 107, No. 10. - P. 103723-103723-6.

J116. S. Compact nanostructure integrated pool boiler for microscale cooling applications. / S,es,en M., Khudhayer W., Karabacak T., Kos,ar A. // IET Micro & Nano Letters. - 2010. - Vol. 5, No. 4. - P. 203-206.

J117. Nagato Keisuke. Fabrication of antireflection-structured surface using vertical nanowires as an initial structure. / Nagato Keisuke, Moritani Hiroki, Hamaguchi Tetsuya, Nakao Masayuki. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 5. - P. L39-L42.

J118. Popescu A. Enhanced thermoelectricity in composites by electronic structure modifications and nanostructuring. / Popescu A., Woods L. M. // Applied Physics Letters. - 2010. - Vol. 97, No. 5. - P. 052102-052102-3.

J119. Li Juntao. Interfacial mixing and internal structure of Pt-containing nanocomposites grown by room temperature electron beam induced deposition. / Li Juntao, Toth Milos, Dunn Kathleen A., Thiel Bradley L. // Journal of Applied Physics. - 2010. - Vol. 107, No. 10. - P. 103540-103540-6.

J120. Liu M. Effect of Ti incorporation on the interfacial and optical properties of HfTiO thin films. / Liu M., Zhang L. D., He G., Wang X. J., Fang M. // Journal of Applied Physics. - 2010. - Vol. 108, No. 2. - P. 024102-024102-4.

J121. Kim Kyoung Sun. Phase separation and microstructure of BaTiO 3 -CoFe 2 O 4 epitaxial nanocomposite films deposited under low working pressure. / Kim Kyoung Sun, Han Seung Ho, Kim Ho Gi, Kim Jeong Seog, Cheon Chae Il. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 4. - P. C5A14-C5A19.

J122. Wang Jer-Chyi. Nanostructure band engineering of gadolinium oxide nanocrystal memory by CF 4 plasma treatment. / Wang Jer-Chyi, Lin Chih-Ting, Lai Chao-Sung, Hsu Jui-Lin. // Applied Physics Letters. - 2010. - Vol. 97, No. 2. - P. 023513-023513-3.

J123. Yang F. Picosecond ultrasonic experiments with water and its application to the measurement of nanostructures. / Yang F., Grimsley T. J., Che S., Antonelli G. A., Maris H. J., Nurmikko A. V. // Journal of Applied Physics. - 2010. - Vol. 107, No. 10. - P. 103537-103537-8.

J124. Evtukh A. Electron field emission from the Si nanostructures formed by laser irradiation. / Evtukh A., Medvid A., Onufrijevs P., Okada M., Mimura H. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2010. - Vol. 28, No. 2. - P. C2B11-C2B13.

J125. Pa P.S. Design of a Reverse-Connected Module for Nanostructure Removal From Display Color Filters. IEEE Transactions on Electron Devices. - 2010. - Vol. 57, No. 12. - P. 3388-3394.

J126. Xiao X. Stress-induced Sn Nanowires from Si-Sn Nanocomposite Coatings. / Xiao X., Sachdev A. K., Haddad D., Li Y., Sheldon B. W., Soni S. K. // Applied Physics Letters. - 2010. - Vol. 97, No. 14. - P. 141904-141904-3.

J127. Loeschner K. Self-organized, gratinglike nanostructures in polymer films with embedded metal nanoparticles induced by femtosecond laser irradiation. / Loeschner K., Seifert G., Heilmann A. // Journal of Applied Physics. - 2010. - Vol. 108, No. 7. - P. 073114-073114-10.

J128. Hwang Taek Yong. Angular effects of nanostructure-covered femtosecond laser induced periodic surface structures on metals. / Hwang Taek Yong, Guo Chunlei. // Journal of Applied Physics. - 2010. - Vol. 108, No. 7. - P. 073523-073523-4.

J129. Tabata O. A Closer Look at DNA Nanotechnology. IEEE Nanotechnology Magazine. - 2010. - Vol. 4, No. 4. - P. 13-17.

J130. MacLaren Ian. Domain structures and nanostructures in incommensurate antiferroelectric Pb x La 1-x (Zr 0.9 Ti 0.1)O 3. / MacLaren Ian, Villaurrutia Rafael, Pelaiz-Barranco Aime. // Journal of Applied Physics. - 2010. - Vol. 108, No. 3. - P. 034109-034109-7.

J131. Zhuo Shu-Juan. Silver/silicon nanostructure for surface-enhanced fluorescence of Ln 3+ (Ln Nd, Ho, and Er). / Zhuo Shu-Juan, Shao Ming-Wang, Cheng Liang, Que Rong-Hui, Ma Dorthy Duo Duo, Lee Shuit-

Tong. // Journal of Applied Physics. - 2010. - Vol. 108, No. 3. - P. 034305-034305-4.

J132. Burnett T. L. Correlation of electron backscatter diffraction and piezoresponse force microscopy for the nanoscale characterization of ferroelectric domains in polycrystalline lead zirconate titanate. / Burnett T. L., Weaver P. M., Blackburn J. F., Stewart M., Cain M. G. // Journal of Applied Physics. - 2010. - Vol. 108, No. 4. - P. 042001-042001-7.

J133. Zeng J. Z. Field-induced hot-electron emission model for wide-band-gap semiconductor nanostructures. / Zeng J. Z., Deng S. Z., She J. C., He H., Xu N. S. // Journal of Applied Physics. - 2010. - Vol. 108, No. 5. - P. 054305-054305-6.

J134. Shimpi Paresh. Annealing induced nanostructure and photoluminescence property evolution in solution-processed Mg-alloyed ZnO nanowires. / Shimpi Paresh, Ding Yong, Suarez Ernesto, Ayers John, Gao Pu-Xian. // Applied Physics Letters. - 2010. - Vol. 97, No. 10. - P. 103104-103104-3.

J135. Yang Jinghai. Fabrication and photoluminescence of ZnS :Mn 2+ nanowires/ZnO quantum dots/SiO 2 heterostructure. / Yang Jinghai, Cao Jian, Yang Lili, Zhang Yongjun, Wang Yaxin, Liu Xiaoyan, Wang Dandan, Wei Maobin, Gao Ming, Lang Jihui. // Journal of Applied Physics. - 2010. - Vol. 108, No. 4. - P. 044304-044304-7.

J136. Zhang Feng. An algorithm to sculpt photon dispersion in a subwavelength nanostructure. / Zhang Feng, Holliday Kito S., Lammert Paul E., Crespi Vincent H. // Applied Physics Letters. - 2009. - Vol. 94, No. 4. - P. 041115-041115-3.

J137. Hong Young Ki. Effects of electron-beam irradiation on conducting polypyrrole nanowires. / Hong Young Ki, Park Dong Hyuk, Park Se Hee, Park Soung Kyu, Joo Jinsoo. // Applied Physics Letters. - 2009. - Vol. 94, No. 5. - P. 053111-053111-3.

J138. Oates T. W. H. Thickness-gradient dependent Raman enhancement in silver island films. / Oates T. W. H., Noda S. // Applied Physics Letters. - 2009. - Vol. 94, No. 5. - P. 053106-053106-3.

J139. Zhang Xuhuai. A subwavelength near-infrared negative index material. / Zhang Xuhuai, Davanco Marcelo, Urzhumov Yaroslav, Shvets Gennady, Forrest Stephen R. // Applied Physics Letters. - 2009. - Vol. 94, No. 13. - P. 131107-131107-3.

J140. Oden M. In situ small-angle x-ray scattering study of nanostructure evolution during decomposition of arc evaporated TiAlN coatings. / Oden M., Rogstrom L., Knutsson A., Terner M. R., Hedstrom P., Almer J., Ilavsky J. // Applied Physics Letters. - 2009. - Vol. 94, No. 5. - P. 053114-053114-3.

J141. Yamamoto A. Small anisotropy, weak thermal fluctuations, and high field superconductivity in Co-doped iron pnictide Ba (Fe 1-x Co x)2 As 2. / Yamamoto A., Jaroszynski J., Tarantini C., Balicas L., Jiang J., Gurevich A., Larbalestier D. C., Jin R., Sefat A. S., McGuire M. A., Sales B. C., Christen D. K., Mandrus D. // Applied Physics Letters. - 2009. - Vol. 94, No. 6. - P. 062511-062511-3.

J142. Pascual Winter M. F. Optimized optical generation and detection of superlattice acoustic phonons. / Pascual Winter M. F., Fainstein A., Jusserand B., Perrin B., Lemaitre A. // Applied Physics Letters. - 2009. - Vol. 94, No. 10. - P. 103103-103103-3.

J143. Richard M.-I. Multiple scattering effects in strain and composition analysis of nanoislands by grazing incidence x rays. / Richard M.-I., Favre-Nicolin V., Renaud G., Schulli T. U., Priester C., Zhong Z., Metzger T.-H. // Applied Physics Letters. - 2009. - Vol. 94, No. 1. - P. 013112-013112-3.

J144. Xie Wenjie. High thermoelectric performance BiSbTe alloy with unique low-dimensional structure. / Xie Wenjie, Tang Xinfeng, Yan Yonggao, Zhang Qingjie, Tritt Terry M. // Journal of Applied Physics. - 2009. - Vol. 105, No. 11. - P. 113713-113713-8.

J145. Al Ahmad M. Multiple negative differential resistances in crossed carbon nanotubes. / Al Ahmad M., Dragoman D., Dragoman M., Plana R., Ting J.-H., Huang F.-Y., Li T.-L. // Journal of Applied Physics. - 2009. - Vol. 105, No. 11. - P. 114303-114303-4.

J146. Chou J. Y. Vanadium oxide nanowire phase and orientation analyzed by Raman spectroscopy. / Chou J. Y., Lensch-Falk J. L., Hemesath E. R., Lauhon L. J. // Journal of Applied Physics. - 2009. - Vol. 105, No. 3. - P.

034310-034310-6.

J147. Ji Li. Effects of pulse bias duty cycle on fullerenelike nanostructure and mechanical properties of hydrogenated carbon films prepared by plasma enhanced chemical vapor deposition method. / Ji Li, Li Hongxuan, Zhao Fei, Quan Weilong, Chen Jianmin, Zhou Huidi. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 106113-106113-3.

J148. Zhang Yongliang. Directional light emission through a metallic nanostructure. / Zhang Yongliang, Zhao Deyin, Zhou Chuanhong, Jiang Xunya. // Journal of Applied Physics. - 2009. - Vol. 105, No. 11. - P. 113124-113124-6.

J149. Schmidt D. Optical, structural, and magnetic properties of cobalt nanostructure thin films. / Schmidt D., Kjerstad A. C., Hofmann T., Skomski R., Schubert E., Schubert M. // Journal of Applied Physics. - 2009. - Vol. 105, No. 11. - P. 113508-113508-7.

J150. Zhang Y. J. Exchange bias of NiO/FeNi ordered nanocaps on curved substrate. / Zhang Y. J., Wang Y. X., Meng X. D., Liu Y., Ding X., Yang J. H. // Journal of Applied Physics. - 2009. - Vol. 105, No. 8. - P. 083910-083910-5.

J151. Nishidate Y. Curvature estimate for multilayer rolled-up nanostructures with cubic crystal anisotropy under initial strains. / Nishidate Y., Nikishkov G. P. // Journal of Applied Physics. - 2009. - Vol. 105, No. 9. - P. 093536-093536-6.

J152. Timm R. Contrast mechanisms in cross-sectional scanning tunneling microscopy of GaSb/GaAs type-II nanostructures. / Timm R., Feenstra R. M., Eisele H., Lenz A., Ivanova L., Lenz E., Dahne M. // Journal of Applied Physics. - 2009. - Vol. 105, No. 9. - P. 093718-093718-7.

J153. Qiao Liang. Microwave absorption properties of the hierarchically branched Ni nanowire composites. / Qiao Liang, Han Xianghua, Gao Bo, Wang Jianbo, Wen Fusheng, Li Fashen. // Journal of Applied Physics. - 2009. - Vol. 105, No. 5. - P. 053911-053911-4.

J154. Tan Zhuopeng. Epitaxial self-assembly of multiferroic nanostructures. / Tan Zhuopeng, Slutsker Julia, Roytburd Alexander L. // Journal of Applied Physics. - 2009. - Vol. 105, No. 6. - P. 061615-061615-5.

J155. Goto Kazuya. Fabrication of (Fe ,Mn)3 O 4 ferromagnetic oxide nanostructure using molybdenum nanomask atomic force microscope lithography. / Goto Kazuya, Tanaka Hidekazu, Kawai Tomoji. // Journal of Applied Physics. - 2009. - Vol. 105, No. 6. - P. 064301-064301-3.

J156. Zhao H. Size and surface orientation effects on thermal expansion coefficient of one-dimensional silicon nanostructures. / Zhao H., Aluru N. R. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 104309-104309-6.

J157. Fazleev N. G. Proximity effects in asymmetric layered ferromagnet/superconductor nanostructures. / Fazleev N. G., Proshin Y. N., Khusainov M. G. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07E128-07E128-3.

J158. Hua Yi-Lei. Analytic modal solution to transmission and collimation of light by one-dimensional nanostructured subwavelength metallic slits. / Hua Yi-Lei, Li Zhi-Yuan. // Journal of Applied Physics. - 2009. - Vol. 105, No. 1. - P. 013104-013104-8.

J159. Roy Debdulal. Novel methodology for estimating the enhancement factor for tip-enhanced Raman spectroscopy. / Roy Debdulal, Wang Jian, Williams Craig. // Journal of Applied Physics. - 2009. - Vol. 105, No. 1. - P. 013530-013530-6.

J160. Wang Juan. The dielectric response of the H 2 Ti 3 O 7 nanotube investigated by valence electron energy loss spectroscopy. / Wang Juan, Li Quan, Peng L.-M., Malac Marek. // Applied Physics Letters. - 2009. - Vol. 94, No. 1. - P. 011915-011915-3.

J161. Postava K. Magneto-optic material selectivity in self-assembled BiFeO 3 -CoFe 2 O 4 biferroic nanostructures. / Postava K., Hrabovsky D., Zivotsky O., Pistora J., Dix N., Muralidharan R., Caicedo J. M., Sanchez F., Fontcuberta J. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07C124-07C124-3.

J162. Shams Nazmun N. Defect mediated tuning of exchange bias in IrMn/CoFe nanostructure. / Shams Nazmun N., Rahman M. Tofizur, Lai Chih-Huang. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07D722-07D722-3.

J163. Li X. L. On the physical understanding of quantum rings self-assembly upon droplet epitaxy. / Li X. L., Yang G. W. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 103507-103507-5.

J164. Green M. L. Annealing behavior of atomic layer deposited HfO 2 films studied by synchrotron x-ray reflectivity and grazing incidence small angle scattering. / Green M. L., Allen A. J., Jordan-Sweet J. L., Ilavsky J. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 103522-103522-11.

J165. Ye Gangfeng. Self-assembled Gd silicide nanostructures grown on Si(001). / Ye Gangfeng, Crimp Martin A., Nogami Jun. // Journal of Applied Physics. - 2009. - Vol. 105, No. 10. - P. 104304-104304-9.

J166. Wang Y. Ballistic electron transport in hybrid ferromagnet/two-dimensional electron gas sandwich nanostructure: Spin polarization and magnetoresistance effect. / Wang Y., Chen N. F., Jiang Y., Zhang X. W. // Journal of Applied Physics. - 2009. - Vol. 105, No. 1. - P. 013708-013708-5.

J167. He G. Thickness-modulated optical dielectric constants and band alignments of HfO x N y gate dielectrics. / He G., Zhang L. D., Liu M., Zhang J. P., Wang X. J., Zhen C. M. // Journal of Applied Physics. - 2009. - Vol. 105, No. 1. - P. 014109-014109-4.

J168. Cheng Baochang. Enhanced effect of electron-hole plasma emission in Dy, Li codoped ZnO nanostructures. / Cheng Baochang, Yu Xiaoming, Liu Hongjuan, Fang Ming, Zhang Lide. // Journal of Applied Physics. - 2009. - Vol. 105, No. 1. - P. 014311-014311-7.

J169. Fang Zheyu. Focusing surface plasmon polariton trapping of colloidal particles. / Fang Zheyu, Lin Feng, Huang Shan, Song Wentao, Zhu Xing. // Applied Physics Letters. - 2009. - Vol. 94, No. 6. - P. 063306-063306-3.

J170. Tsybeskov L. Silicon-Germanium Nanostructures for Light Emitters and On-Chip Optical Interconnects. / Tsybeskov L., Lockwood D.J. // Proceedings of the IEEE. - 2009. - Vol. 97, No. 7. - P. 1284-1303.

J171. Wu Wen. Contact resistance in carbon nanostructure via interconnects. / Wu Wen, Krishnan Shoba, Yamada Toshishige, Sun Xuhui, Wilhite Patrick, Wu Raymond, Li Ke, Yang Cary Y. // Applied Physics Letters. - 2009. - Vol. 94, No. 16. - P. 163113-163113-3.

J172. Xianping Zhang. Co-Doping Effect of Nanoscale C and SiC on Superconductor. / Xianping Zhang, Yanwei Ma, Dongliang Wang, Zhaoshun Gao, Lei Wang, Yanpeng Qi, Awaji S., Watanabe K., Dongning Zheng. // IEEE Transactions on Applied Superconductivity. - 2009. - Vol. 19, No. 3. - P. 2694-2697.

J173. Giannetti C. Ultrafast Laser Pulses to Detect and Generate Fast Thermomechanical Transients in Matter. / Giannetti C., Banfi F., Nardi D., Ferrini G., Parmigiani F. // IEEE Photonics Journal. - 2009. - Vol. 1, No. 1. - P. 21-32.

J174. Karpov E. G. Solid-state electric generator based on chemically induced internal electron emission in metal-semiconductor heterojunction nanostructures. / Karpov E. G., Nedrygailov I. I. // Applied Physics Letters. - 2009. - Vol. 94, No. 21. - P. 214101-214101-3.

J175. Ingole S. Assembly and magnetic properties of nickel nanoparticles on silicon nanowires. / Ingole S., Manandhar P., Wright J. A., Nazaretski E., Thompson J. D., Picraux S. T. // Applied Physics Letters. - 2009. - Vol. 94, No. 22. - P. 223118-223118-3.

J176. Cvelbar U. Control of morphology and nucleation density of iron oxide nanostructures by electric conditions on iron surfaces exposed to reactive oxygen plasmas. / Cvelbar U., Ostrikov K., Levchenko I., Mozetic M., Sunkara M. K. // Applied Physics Letters. - 2009. - Vol. 94, No. 21. - P. 211502-211502-3.

J177. Lang X. Y. Geometric effect on surface enhanced Raman scattering of nanoporous gold: Improving Raman scattering by tailoring ligament and nanopore ratios. / Lang X. Y., Chen L. Y., Guan P. F., Fujita T., Chen M. W. // Applied Physics Letters. - 2009. - Vol. 94, No. 21. - P. 213109-213109-3.

J178. Sharma R. Evaluation of Atmospheric-Pressure Plasma for Improving Photoelectrochemical Response of

Titania Photoanodes. / Sharma R., Bock J.P., Biris A.S., Mazumder M.K., Das P.P., Misra M., Mahajan V.K. // IEEE Transactions on Industry Applications. - 2009. - Vol. 45, No. 4. - P. 1524-1529.

J179. Taeil Jung. Novel Epitaxial Nanostructures for the Improvement of InGaN LEDs Efficiency. / Taeil Jung, Lee L.K., Ku P.-C. // IEEE Journal of Selected Topics in Quantum Electronics. - 2009. - Vol. 15, No. 4. - P. 1073-1079.

J180. Xia Yu. Nanostructure Core Fiber With Enhanced Performances: Design, Fabrication and Devices. / Xia Yu, Min Yan, Guobin Ren, Weijun Tong, Xueping Cheng, Junqiang Zhou, Shum P.P., Nam Quoc Ngo. // Journal of Lightwave Technology. - 2009. - Vol. 27, No. 11. - P. 1548-1555.

J181. Cahay M. An electron's spin---Part I. / Cahay M., Bandyopadhyay S. // IEEE Potentials. - 2009. - Vol. 28, No. 3. - P. 31-35.

J182. Li M.-J. Guest Editorial on Microstructured Fibers. / Li M.-J., Monro T., Saitoh K., Knight J. // Journal of Lightwave Technology. - 2009. - Vol. 27, No. 11. - P. 1546-1547.

J183. Tarigan K. Local Ordering Study of Nanostructure FeMnAl Alloys. / Tarigan K., Yong-Goo Yoo, Dong-Seok Yang, Greneche J.M., Seong-Cho Yu. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 6. - P. 2492-2495.

J184. Tsukano Y. Fabrication of Multilayered Thin Films and Their Flux Pinning Properties. / Tsukano Y., Doi T., Yamashita H., Tanaka A., Iwasaki I., Hakuraku Y., Kitaguchi H., Takahashi K.-i., Sosiati H., Hata S., Ikeda K.-i., Nakashima H. // IEEE Transactions on Applied Superconductivity. - 2009. - Vol. 19, No. 3. - P. 2807-2810.

J185. Seung Woo Ko. Magnetorheological Characteristics of Polymer Coated Magnetite Particle Composites With Carbon Nanotube Nanohybrid. / Seung Woo Ko, Min Ki Hong, Hyoung Jin Choi, Beyong Hwan Ryu. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 6. - P. 2503-2506.

J186. Salemizadeh S. Magnetic Properties of Nanocrystalline Barium Hexaferrite Thin Films Prepared by Sol-Gel Method. / Salemizadeh S., Ebrahimi S.A. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 6. - P. 2538-2540.

J187. Perez N. Nanostructural origin of the spin and orbital contribution to the magnetic moment in Fe 3-x O 4 magnetite nanoparticles. / Perez N., Bartolome F., Garcia L. M., Bartolome J., Morales M. P., Serna C. J., Labarta A., Batlle X. // Applied Physics Letters. - 2009. - Vol. 94, No. 9. - P. 093108-093108-3.

J188. Siemens Mark E. High-frequency surface acoustic wave propagation in nanostructures characterized by coherent extreme ultraviolet beams. / Siemens Mark E., Li Qing, Murnane Margaret M., Kapteyn Henry C., Yang Ronggui, Anderson Erik H., Nelson Keith A. // Applied Physics Letters. - 2009. - Vol. 94, No. 9. - P. 093103-093103-3.

J189. George T. A. Magnetic correlations in nanocomposite FePt:Au and FePt:C films. / George T. A., Skomski R., Sellmyer D. J. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07B736-07B736-3.

J190. Rosa W. O. Co nanostructure arrays in patterned polymeric template. / Rosa W. O., Jaafar M., Asenjo A., Vazquez M. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07C108-07C108-3.

J191. Rahman M. Tofizur. Enhanced exchange bias in sub-50-nm IrMn/CoFe nanostructure. / Rahman M. Tofizur, Shams Nazmun N., Wang Ding Shuo, Lai Chih-Huang. // Applied Physics Letters. - 2009. - Vol. 94, No. 8. - P. 082503-082503-3.

J192. Chen Haiping Matthew. Three-dimensional composite metallodielectric nanostructure for enhanced surface plasmon resonance sensing. / Chen Haiping Matthew, Pang Lin, Kher Aditya, Fainman Yeshaiahu. // Applied Physics Letters. - 2009. - Vol. 94, No. 7. - P. 073117-073117-3.

J193. Sivaramakrishnan Sankaran. Optical modeling of the plasmon band of monolayer-protected nanometal clusters in pure and in polymer matrix thin films as a function of heat treatment. / Sivaramakrishnan Sankaran, Anto Bibin T., Ho Peter K.-H. // Applied Physics Letters. - 2009. - Vol. 94, No. 9. - P. 091909-091909-3.

J194. Qiu Dong. Crystallography of self-assembled DySi 2 nanowires on a Si substrate. / Qiu Dong, Zhang Ming-Xing, Kelly Patrick M. // Applied Physics Letters. - 2009. - Vol. 94, No. 8. - P. 083105-083105-3.

J195. Min Ji Hyun. Synthesis and magnetic properties of multifunctional CoPtAu nanoparticles. / Min Ji Hyun, Wu Jun Hua, Song Ah Young, Jeon In Tak, Ju Jae-Seon, Kim Young Keun. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07B527-07B527-3.

J196. Cao Yongzhi. Nanostructure and optical properties of Si O 2 films prepared by reactive midfrenquency magnetron sputtering. / Cao Yongzhi, Dong Shen, Sun Tao, Yan Yongda, Zhao Qingliang. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1378-1380.

J197. Fu Y. Q. Deep reactive ion etching as a tool for nanostructure fabrication. / Fu Y. Q., Colli A., Fasoli A., Luo J. K., Flewitt A. J., Ferrari A. C., Milne W. I. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1520-1526.

J198. Madriz F.R. Circuit Modeling of High-Frequency Electrical Conduction in Carbon Nanofibers. / Madriz F.R., Jameson J.R., Krishnan S., Xuhui Sun, Yang C.Y. // IEEE Transactions on Electron Devices. - 2009. - Vol. 56, No. 8. - P. 1557-1561.

J199. Watanabe Y. Nanostructure fabrication on an Al surface by chemical and electrochemical multiprocess and nanoscale molecular patterning on the nanostructured Al surface. / Watanabe Y., Kato H., Takemura S., Kusama S., Iimura G., Sugiyama T., Hiramatsu T., Nanba N., Nishikawa O., Taniguchi M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 2. - P. 874-881.

J200. Zhou P. H. Bounds on the dynamic magnetic properties of multiresonant nanostructure composites in exchange resonance model. / Zhou P. H., Deng L. J. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07A509-07A509-3.

J201. Wu Y. Q. Correlation of the energy product with evolution of the nanostructure in the Y,Dy,Nd-(Fe, Co)-B magnetic alloy. / Wu Y. Q., Tang W., Kramer M. J., Dennis K. W., Oster N., McCallum R. W., Anderson I. E. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07A720-07A720-3.

J202. Liang Ying-Chun. Three-dimensional molecular dynamics simulation of nanostructure for reciprocating nanomachining process. / Liang Ying-Chun, Chen Jia-Xuan, Chen Ming-Jun, Song Dai-Ping, Bai Qing-Shun. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 3. - P. 1536-1542.

J203. Urata A. High Bs nanocrystalline alloys with high amorphous-forming ability. / Urata A., Matsumoto H., Sato S., Makino A. // Journal of Applied Physics. - 2009. - Vol. 105, No. 7. - P. 07A324-07A324-3.

J204. Biswas M. Carbothermal reduction vapor phase transport growth of ZnO nanostructures: Effects of various carbon sources. / Biswas M., McGlynn E., Henry M. O., McCann M., Rafferty A. // Journal of Applied Physics. - 2009. - Vol. 105, No. 9. - P. 094306-094306-6.

J205. Suck S. Y. Magnetic force microscopy analysis of magnetization reversal in exchange-biased Co/CoO nanostructure arrays. / Suck S. Y., Neu V., Wolff U., Bahr S., Bourgeois O., Givord D. // Applied Physics Letters. - 2009. - Vol. 95, No. 16. - P. 162503-162503-3.

J206. Fernandez R. E. MEMS Composite Porous Silicon/Polysilicon Cantilever Sensor for Enhanced Triglycerides Biosensing. / Fernandez R. E., Stolyarova S., Chadha A., Bhattacharya E., Nemirovsky Y. // IEEE Sensors Journal. - 2009. - Vol. 9, No. 12. - P. 1660-1666.

J207. Klemmer T. Materials Processing for High Anisotropy Granular Media. / Klemmer T., Yingguo Peng, Xiaowei Wu, Ganping Ju. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 2. - P. 845-849.

J208. Mariotti D. Atmospheric-Microplasma-Assisted Nanofabrication: Metal and Metal-Oxide Nanostructures and Nanoarchitectures. / Mariotti D., Bose A.C., Ostrikov K. // IEEE Transactions on Plasma Science. - 2009. - Vol. 37, No. 6. - P. 1027-1033.

J209. Maegawa T. Strain Effects on Electronic Bandstructures in Nanoscaled Silicon: From Bulk to Nanowire. / Maegawa T., Yamauchi T., Hara T., Tsuchiya H., Ogawa M. // IEEE Transactions on Electron Devices. - 2009. - Vol. 56, No. 4. - P. 553-559.

J210. Kovylina M. Tuning exchange bias in Ni /FeF 2 heterostructures using antidot arrays. / Kovylina M.,

Erekhinsky M., Morales R., Villegas J. E., Schuller I. K., Labarta A., Batlle X. // Applied Physics Letters. - 2009. - Vol. 95, No. 15. - P. 152507-152507-3.

J211. Wang Pangpang. Enhancement of light transmission by coupling to surface plasmon polaritons of a layer-plus-islands silver layer. / Wang Pangpang, Zhang Dongyan, Kim Dong Hun, Qiu Zhiyong, Gao Lumei, Murakami Ri-ichi, Song Xiaoping. // Journal of Applied Physics. - 2009. - Vol. 106, No. 10. - P. 103104-103104-5.

J212. Masuo Sadahiro. Photon statistics in enhanced fluorescence from a single CdSe/ZnS quantum dot in the vicinity of silver nanoparticles. / Masuo Sadahiro, Naiki Hiroyuki, Machida Shinjiro, Itaya Akira. // Applied Physics Letters. - 2009. - Vol. 95, No. 19. - P. 193106-193106-3.

J213. Chung Tien-Kan. Electrical control of magnetic remanent states in a magnetoelectric layered nanostructure. / Chung Tien-Kan, Wong Kin, Keller Scott, Wang Kang L., Carman Gregory P. // Journal of Applied Physics. - 2009. - Vol. 106, No. 10. - P. 103914-103914-5.

J214. Bari M. R. Conductive atomic force microscopy study of self-assembled silicon nanostructures. / Bari M. R., Blaikie R. J., Fang F., Markwitz A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 3051-3054.

J215. Wang Chao. Self-aligned fabrication of 10 nm wide asymmetric trenches for Si/SiGe heterojunction tunneling field effect transistors using nanoimprint lithography, shadow evaporation, and etching. / Wang Chao, Chou Stephen Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 6. - P. 2790-2794.

J216. Slavin A. Nonlinear Auto-Oscillator Theory of Microwave Generation by Spin-Polarized Current. / Slavin A., Tiberkevich V. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 4. - P. 1875-1918.

J217. Pfau T. J. Site-controlled InAs quantum dots grown on a 55 nm thick GaAs buffer layer. / Pfau T. J., Gushterov A., Reithmaier J. P., Cestier I., Eisenstein G., Linder E., Gershoni D. // Applied Physics Letters. - 2009. - Vol. 95, No. 24. - P. 243106-243106-3.

J218. Xu Hu. An energetic stability predictor of hydrogen-terminated Si nanostructures. / Xu Hu, Yang X. B., Guo C. S., Zhang R. Q. // Applied Physics Letters. - 2009. - Vol. 95, No. 25. - P. 253106-253106-3.

J219. Uppireddi Kishore. Study of temporal current stability and fluctuations of field emitted electrons from ZnO nanostructure films. / Uppireddi Kishore, Yang Boqian, Feng Peter Xian, Morell Gerardo. // Applied Physics Letters. - 2009. - Vol. 95, No. 24. - P. 242103-242103-3.

J220. Xia J. H. The size effect of catalyst on the growth of helical carbon nanofibers. / Xia J. H., Jiang X., Jia C. L. // Applied Physics Letters. - 2009. - Vol. 95, No. 22. - P. 223110-223110-3.

J221. Bietti S. Fabrication of high efficiency III-V quantum nanostructures at low thermal budget on Si. / Bietti S., Somaschini C., Sanguinetti S., Koguchi N., Isella G., Chrastina D. // Applied Physics Letters. - 2009. - Vol. 95, No. 24. - P. 241102-241102-3.

J222. Bevilacqua Mose. The influence of ammonia on the electrical properties of detonation nanodiamond. / Bevilacqua Mose, Chaudhary Aysha, Jackman Richard B. // Journal of Applied Physics. - 2009. - Vol. 106, No. 12. - P. 123704-123704-7.

J223. Huang Han. Nanoscale phase separation of a binary molecular system of copper phthalocyanine and di-indenoperylene on Ag(111). / Huang Han, Huang Yuli, Pflaum Jens, Wee Andrew Thye Shen, Chen Wei. // Applied Physics Letters. - 2009. - Vol. 95, No. 26. - P. 263309-263309-3.

J224. 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.

J225. Mao V. Connecting fabrication defects to fault models and SPICE simulations for DNA self-assembled nanoelectronics. / Mao V., Thusu V., Dwyer C., Chakrabarty K. // IET Computers & Digital Techniques. - 2009. - Vol. 3, No. 6. - P. 553-569.

J226. Leong Hai-Sheng. Surface plasmon resonance in nanostructured metal films under the Kretschmann

configuration. / Leong Hai-Sheng, Guo Junpeng, Lindquist Robert G., Liu Qing H. // Journal of Applied Physics. - 2009. - Vol. 106, No. 12. - P. 124314-124314-5.

J227. Jindal Vibhu. Theoretical prediction of GaN nanostructure equilibrium and nonequilibrium shapes. / Jindal Vibhu, Shahedipour-Sandvik Fatemeh. // Journal of Applied Physics. - 2009. - Vol. 106, No. 8. - P. 083115-083115-7.

J228. He G. Thermal nitridation passivation dependent band offset and electrical properties of AlO x N y /GaAs gate stacks. / He G., Zhang L. D., Liu M. // Applied Physics Letters. - 2009. - Vol. 95, No. 11. - P. 112905-112905-3.

J229. Han Sang Youn. Characteristics of SiC pillar-shaped nanostructure Schottky diode. / Han Sang Youn, Lee Jong-Lam. // Journal of Applied Physics. - 2009. - Vol. 106, No. 2. - P. 023709-023709-4.

J230. Ahn Sung Il. Injection of carriers from a ZnO nanostructured shell to a ZnS based microsphere core. / Ahn Sung Il, Lee Seong Eui, Cho Yong-Hoon, Kim Gi Ryoung, Li Song-Mei, Choi Kyung Cheol, Lee Won Hee. // Applied Physics Letters. - 2009. - Vol. 95, No. 2. - P. 022108-022108-3.

J231. Mahmood Abdul Salam. Enhancement in optical absorption of silicon fibrous nanostructure produced using femtosecond laser ablation. / Mahmood Abdul Salam, Sivakumar M., Venkatakrishnan Krishnan, Tan Bo. // Applied Physics Letters. - 2009. - Vol. 95, No. 3. - P. 034107-034107-3.

J232. Yamada T. Inductance in One-Dimensional Nanostructures. / Yamada T., Madriz F.R., Yang C.Y. // IEEE Transactions on Electron Devices. - 2009. - Vol. 56, No. 9. - P. 1834-1839.

J233. 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.

J234. Xiao Z. M. Oscillating current observed in field emission from a single zinc oxide nanostructure and the physical mechanism. / Xiao Z. M., She J. C., Li Z. B., Yang Y. H., Yang G. W., Deng S. Z., Chen Jun, Xu N. S. // Journal of Applied Physics. - 2009. - Vol. 106, No. 1. - P. 014310-014310-7.

J235. Zhou Xin. Carrier transport by field enhanced thermal detrapping in Si nanocrystals thin films. / Zhou Xin, Uchida Ken, Mizuta Hiroshi, Oda Shunri. // Journal of Applied Physics. - 2009. - Vol. 105, No. 12. - P. 124518-124518-5.

J236. Grigorenko Ilya. Optimal control of the local electromagnetic response of nanostructured materials: Optimal detectors and quantum disguises.. / Grigorenko Ilya, Rabitz Herschel. // Applied Physics Letters. - 2009. - Vol. 94, No. 25. - P. 253107-253107-3.

J237. Kniprath Rolf. Nanostructured solid-state hybrid photovoltaic cells fabricated by electrostatic layer-by-layer deposition. / Kniprath Rolf, McLeskey James T., Rabe Jurgen P., Kirstein Stefan. // Journal of Applied Physics. - 2009. - Vol. 105, No. 12. - P. 124313-124313-7.

J238. Arjmandi Nima. Enhanced resolution of poly(methyl methacrylate) electron resist by thermal processing. / Arjmandi Nima, Lagae Liesbet, Borghs Gustaaf. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2009. - Vol. 27, No. 4. - P. 1915-1918.

J239. Shahjahan M. Structural, optical, and photocatalytic properties of ZnO:Al nanowall structure deposited on glass substrate by spray pyrolysis. / Shahjahan M., Khan M. K. R., Hossain M. F., Biswas S., Takahashi T. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2009. - Vol. 27, No. 4. - P. 885-888.

J240. Hubenthal F. Parallel generation of nanochannels in fused silica with a single femtosecond laser pulse: Exploiting the optical near fields of triangular nanoparticles. / Hubenthal F., Morarescu R., Englert L., Haag L., Baumert T., Trager F. // Applied Physics Letters. - 2009. - Vol. 95, No. 6. - P. 063101-063101-3.

J241. Gao Yaohui. Analysis of terahertz generation via nanostructure enhanced plasmonic excitations. / Gao Yaohui, Chen Meng-Ku, Yang Chia-En, Chang Yun-Ching, Yin Stuart, Hui Rongqing, Ruffin Paul, Brantley Christina, Edwards Eugene, Luo Claire. // Journal of Applied Physics. - 2009. - Vol. 106, No. 7. - P. 074302-

074302-7.

J242. Makino A. New Excellent Soft Magnetic FeSiBPCu Nanocrystallized Alloys With High of 1.9 T From Nanohetero-Amorphous Phase. / Makino A., He Men, Kubota T., Yubuta K., Inoue A. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 10. - P. 4302-4305.

J243. Wang Juan. From nanoparticle to nanocable: Impact of size and geometrical constraints on the optical modes of Si /SiO 2 core/shell nanostructures. / Wang Juan, Wang Xiao-Jing, Jiao Yang, Li Quan, Chu Ming-Wen, Malac Marek. // Applied Physics Letters. - 2009. - Vol. 95, No. 13. - P. 133102-133102-3.

J244. Xu S. Self-organized vertically aligned single-crystal silicon nanostructures with controlled shape and aspect ratio by reactive plasma etching. / Xu S., Levchenko I., Huang S. Y., Ostrikov K. // Applied Physics Letters. - 2009. - Vol. 95, No. 11. - P. 111505-111505-3.

J245. Hwang Taek Yong. Ultrafast dynamics of femtosecond laser-induced nanostructure formation on metals. / Hwang Taek Yong, Vorobyev A. Y., Guo Chunlei. // Applied Physics Letters. - 2009. - Vol. 95, No. 12. - P. 123111-123111-3.

J246. Wen-Chin Lin. Dimensionality Control and Magnetism of Fe on Nanopatterned Au(111) Surface. / Wen-Chin Lin, Hung-Yu Chang, Yu-Cheng Hu, Chien-Cheng Kuo. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 10. - P. 4037-4040.

J247. Reyes P.I. A ZnO Nanostructure-Based Quartz Crystal Microbalance Device for Biochemical Sensing. / Reyes P.I., Zheng Zhang, Hanhong Chen, Ziqing Duan, Jian Zhong, Saraf G., Yicheng Lu, Taratula O., Galoppini E., Boustany N.N. // IEEE Sensors Journal. - 2009. - Vol. 9, No. 10. - P. 1302-1307.

J248. Voldman S. Nano electrostatic discharge. IEEE Nanotechnology Magazine. - 2009. - Vol. 3, No. 3. - P. 12-15.

J249. Lixin Dong. Dual-Chirality Helical Nanobelts: Linear-to-Rotary Motion Converters for Three-Dimensional Microscopy. / Lixin Dong, Li Zhang, Kratochvil B.E., Kaiyu Shou, Nelson B.J. // Journal of Microelectromechanical Systems. - 2009. - Vol. 18, No. 5. - P. 1047-1053.

J250. Smith D.T. Size Distribution and Anisotropy Effects on the Switching Field Distribution of Co/Pd Multilayered Nanostructure Arrays. / Smith D.T., Long Chang, Rantschler J.O., Kalatsky V., Ruchhoeft P., Khizroev S., Litvinov D. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 10. - P. 3554-3557.

J251. Ah-Young Song. Synthesis and Magnetic Properties of Multifunctional Fe O -AuPt Core-Shell Nanoparticles. / Ah-Young Song, Jun Hua Wu, Ji Hyun Min, Tan R.P., Ji Sung Lee, Young Keun Kim. // IEEE Transactions on Magnetics. - 2009. - Vol. 45, No. 10. - P. 4041-4044.

J252. Wu J. Degradation assessment of nanostructured superhydrophobic insulating surfaces using multi-stress methods. / Wu J., Schnettler A. // IEEE Transactions on Dielectrics and Electrical Insulation. - 2008. - Vol. 15, No. 1. - P. 73-80.

J253. Quintero-Torres R. A Model for the Self Structuring of Nanotubes in Titanium Oxide. IEEE Transactions on Nanotechnology. - 2008. - Vol. 7, No. 3. - P. 371-375.

J254. Tanaka T. Enhanced partial discharge resistance of epoxy/clay nanocomposite prepared by newly developed organic modification and solubilization methods. / Tanaka T., Ohki Y., Ochi M., Harada M., Imai T. // IEEE Transactions on Dielectrics and Electrical Insulation. - 2008. - Vol. 15, No. 1. - P. 81-89.

J255. Wang H. X. Fabrication of field-emission cathode ray tube with a unique nanostructure carbon electron emitter. / Wang H. X., Jiang N., Hiraki H., Harada Y., Zhang H., Wang J., Haba M., Hiraki A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 2. - P. 698-701.

J256. Ozaydin Gozde. Effects of Mo seeding on the formation of Si nanodots during low-energy ion bombardment. / Ozaydin Gozde, Ludwig Karl F., Zhou Hua, Headrick Randall L. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 2. - P. 551-558.

J257. Vasudev M. Optoelectronic Signatures of Biomolecules Including Hybrid Nanostructure-DNA Ensembles.

/ Vasudev M., Yamanaka T., Jianyong Yang, Ramadurai D., Stroscio M.A., Globus T., Khromova T., Dutta M. // IEEE Sensors Journal. - 2008. - Vol. 8, No. 6. - P. 743-749.

J258. Jie Sun. A Novel SR Latch Device Realized by Integration of Three-Terminal Ballistic Junctions in InGaAs/InP. / Jie Sun, Wallin D., Maximov I., Xu H.Q. // IEEE Electron Device Letters. - 2008. - Vol. 29, No. 6. - P. 540-542.

J259. 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.

J260. Zabel H. Polarized Neutron Reflectometry for the Analysis of Nanomagnetic Systems. / Zabel H., Theis Brohl K., Wolff M., Toperverg B.P. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 7. - P. 1928-1934.

J261. Chia-Jen Ting. Experimental Study of a Silver Layer on an Antireflection Subwavelength-Structured Surface. / Chia-Jen Ting, Chi-Feng Chen, Chou C.P. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 13. - P. 1196-1198.

J262. Tjerkstra R. W. Fabrication of three-dimensional nanostructures by focused ion beam milling. / Tjerkstra R. W., Segerink F. B., Kelly J. J., Vos W. L. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 3. - P. 973-977.

J263. Hochleitner G. Electron beam induced deposition of iron nanostructures. / Hochleitner G., Wanzenboeck H. D., Bertagnolli E. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 3. - P. 939-944.

J264. Tzeng T. E. In(Ga, Al)As quantum dot/wire growth on InP. / Tzeng T. E., Feng David J. Y., Chen C. Y., Lay T. S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 3. - P. 1084-1088.

J265. Shyjumon I. Novel in situ setup to study the formation of nanoparticles in the gas phase by small angle x-ray scattering. / Shyjumon I., Rappolt M., Sartori B., Amenitsch H., Laggner P. // Review of Scientific Instruments. - 2008. - Vol. 79, No. 4. - P. 043905-043905-5.

J266. 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.

J267. Asano Tetsuya. Dark current and band profiles in low defect density thick multilayered GaAs/InAs self-assembled quantum dot structures for infrared detectors. / Asano Tetsuya, Madhukar Anupam, Mahalingam Krishnamurthy, Brown Gail J. // Journal of Applied Physics. - 2008. - Vol. 104, No. 11. - P. 113115-113115-5.

J268. Li L. H. Epitaxial growth of quantum rods with high aspect ratio and compositional contrast. / Li L. H., Patriarche G., Fiore A. // Journal of Applied Physics. - 2008. - Vol. 104, No. 11. - P. 113522-113522-4.

J269. Li J. Y. Regulating self-organizing nanostructures via external mechanism. / Li J. Y., Du Q. G., Ducharme Stephen. // Journal of Applied Physics. - 2008. - Vol. 104, No. 9. - P. 094302-094302-7.

J270. He G. Composition dependence of electronic structure and optical properties of Hf 1-x Si x O y gate dielectrics. / He G., Zhang L. D., Meng G. W., Li G. H., Fei G. T., Wang X. J., Zhang J. P., Liu M., Fang Q., Boyd Ian W. // Journal of Applied Physics. - 2008. - Vol. 104, No. 10. - P. 104116-104116-7.

J271. Li Jiang-Yan. Scanning near-field optical microscopy study of metallic square hole array nanostructures. / Li Jiang-Yan, Li Zhi-Yuan, Yang Hai-Fang, Jin Ai-Zi. // Journal of Applied Physics. - 2008. - Vol. 104, No. 11. - P. 114303-114303-10.

J272. Abazari M. Dielectric and ferroelectric properties of strain-relieved epitaxial lead-free KNN-LT-LS ferroelectric thin films on Sr Ti O 3 substrates. / Abazari M., Akdogan E. K., Safari A. // Journal of Applied Physics. - 2008. - Vol. 103, No. 10. - P. 104106-104106-6.

J273. Elliman R. G. Optical emission from erbium-doped silica nanowires. / Elliman R. G., Wilkinson A. R., Kim T.-H., Sekhar P. K., Bhansali S. // Journal of Applied Physics. - 2008. - Vol. 103, No. 10. - P. 104304-104304-5.

J274. Sakai Daisuke. Specific spectral features in electron emission from nanocrystalline silicon quasi-ballistic cold cathode detected by an angle-resolved high resolution analyzer. / Sakai Daisuke, Oshima Chunhei, Ohta Toshiyuki, Koshida Nobuyoshi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 5. - P. 1782-1786.

J275. Rhen Fernando M. F. Dependence of magnetic properties on micro- to nanostructure of CoNiFe films. / Rhen Fernando M. F., Roy Saibal. // Journal of Applied Physics. - 2008. - Vol. 103, No. 10. - P. 103901-103901-4.

J276. Hong Wei. Drying-induced bifurcation in a hydrogel-actuated nanostructure. / Hong Wei, Zhao Xuanhe, Suo Zhigang. // Journal of Applied Physics. - 2008. - Vol. 104, No. 8. - P. 084905-084905-4.

J277. Weis Tanja. Characterization of magnetic force microscopy probe tip remagnetization for measurements in external in-plane magnetic fields. / Weis Tanja, Krug Ingo, Engel Dieter, Ehresmann Arno, Hoink Volker, Schmalhorst Jan, Reiss Gunter. // Journal of Applied Physics. - 2008. - Vol. 104, No. 12. - P. 123503-123503-4.

J278. Aggarwal Ravi. Fabrication of Ag-tetracyanoquinodimethane nanostructures using ink-jet printing/vapor-solid chemical reaction process. / Aggarwal Ravi, Narayan Roger J., Xiao Kai, Geohegan David B. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. L48-L52.

J279. Ang Wei. Field Emission From Hydrothermally Grown ZnO Nanoinjectors. / Ang Wei, Chunxiang Xu, Sun X.W., Wei Huang, Guo-Qiang Lo. // Journal of Display Technology. - 2008. - Vol. 4, No. 1. - P. 9-12.

J280. Naruse M. Design and Simulation of a Nanophotonic Traceable Memory Using Localized Energy Dissipation and Hierarchy of Optical Near-Field Interactions. / Naruse M., Yatsui T., Kawazoe T., Akao Y., Ohtsu M. // IEEE Transactions on Nanotechnology. - 2008. - Vol. 7, No. 1. - P. 14-19.

J281. Dhawan A. Focused in beam fabrication of metallic nanostructures on end faces of optical fibers for chemical sensing applications. / Dhawan A., Muth J. F., Leonard D. N., Gerhold M. D., Gleeson J., Vo-Dinh T., Russell P. E. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. 2168-2173.

J282. Levchenko I. Plasma-controlled metal catalyst saturation and the initial stage of carbon nanostructure array growth. / Levchenko I., Ostrikov K., Mariotti D., Murphy A. B. // Journal of Applied Physics. - 2008. - Vol. 104, No. 7. - P. 073308-073308-8.

J283. Chen X. Measurement of anisotropic fracture energies in periodic templated silica/polymer composite coatings. / Chen X., Richman E. K., Kirsch B. L., Senter R., Tolbert S. H., Gupta V. // Journal of Applied Physics. - 2008. - Vol. 104, No. 8. - P. 083515-083515-6.

J284. Botman A. Investigation of morphological changes in platinum-containing nanostructures created by electron-beam-induced deposition. / Botman A., Hesselberth M., Mulders J. J. L. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. 2464-2467.

J285. Yamazaki Kenji. Three-dimensional alignment with 10 nm order accuracy in electron-beam lithography on rotated sample for three-dimensional nanofabrication. / Yamazaki Kenji, Yamaguchi Hiroshi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2008. - Vol. 26, No. 6. - P. 2529-2533.

J286. Barraza-Lopez Salvador. The interaction between a monolayer of single-molecule magnets and a metal surface. / Barraza-Lopez Salvador, Avery Michael C., Park Kyungwha. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07B907-07B907-3.

J287. Fujikawa R. Contribution of the surface plasmon resonance to optical and magneto-optical properties of a Bi:YIG-Au nanostructure. / Fujikawa R., Baryshev A. V., Kim J., Uchida H., Inoue M. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07D301-07D301-3.

J288. Ma H. Fabrication of magnetic porous hollow silica drug carriers using Ca C O 3 /Fe 3 O 4 composite nanoparticles and cationic surfactant double templates. / Ma H., Zhou J., Caruntu D., Yu M. H., Chen J. F., OConnor C. J., Zhou W. L. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07A320-07A320-3.

J289. Sugano R. Three dimensional simulations of spin Hall effect in magnetic nanostructures. / Sugano R., Ichimura M., Takahashi S., Maekawa S. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07A715-07A715-3.

J290. George Tom A. Nanostructure and magnetic properties of L10 Fe Pt :X films. / George Tom A., Li Zhen, Yan Minglang, Xu Yingfan, Skomski Ralph, Sellmyer David J. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07D502-07D502-3.

J291. Yu X. Silica-Based Nanostructure Core Fiber. / Yu X., Shum P., Ngo N.Q., Tong W.J., Luo J., Ren G.B., Gong Y.D., Zhou J.Q. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 2. - P. 162-164.

J292. Yu X. Silica-Based Birefringent Large-Mode-Area Fiber With a Nanostructure Core. / Yu X., Shum P., Yan M., Ren G.B. // IEEE Photonics Technology Letters. - 2008. - Vol. 20, No. 4. - P. 246-248.

J293. Liu Hong Ling. Synthesis of monosized magnetic-optical AuFe alloy nanoparticles. / Liu Hong Ling, Wu Jun Hua, Min Ji Hyun, Kim Young Keun. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07D529-07D529-3.

J294. Bance Simon. Micromagnetic calculation of spin wave propagation for magnetologic devices. / Bance Simon, Schrefl Thomas, Hrkac Gino, Goncharov Alexander, Allwood Dan A., Dean Julian. // Journal of Applied Physics. - 2008. - Vol. 103, No. 7. - P. 07E735-07E735-3.

J295. Wang X. J. Effects of postdeposition annealing on the structure and optical properties of Y O x N y films. / Wang X. J., Zhang L. D., He G., Zhang J. P., Liu M., Zhu L. Q. // Journal of Applied Physics. - 2008. - Vol. 103, No. 6. - P. 064101-064101-7.

J296. Lee Byounghak. Effects of d -electrons in pseudopotential screened-exchange density functional calculations. / Lee Byounghak, Wang Lin-Wang, Canning Andrew. // Journal of Applied Physics. - 2008. - Vol. 103, No. 11. - P. 113713-113713-6.

J297. Zhang Xia. CuO three-dimensional flowerlike nanostructures: Controlled synthesis and characterization. / Zhang Xia, Guo Yong-Gang, Liu Wei-Min, Hao Jing-Cheng. // Journal of Applied Physics. - 2008. - Vol. 103, No. 11. - P. 114304-114304-5.

J298. Uppireddi Kishore. Study of the temporal current stability of field-emitted electrons from ultrananocrystalline diamond films. / Uppireddi Kishore, Weiner Brad R., Morell Gerardo. // Journal of Applied Physics. - 2008. - Vol. 103, No. 10. - P. 104315-104315-5.

J299. Xu K. Y. Enhanced terahertz detection by localized surface plasma oscillations in a nanoscale unipolar diode. / Xu K. Y., Lu X. F., Song A. M., Wang G. // Journal of Applied Physics. - 2008. - Vol. 103, No. 11. - P. 113708-113708-8.

J300. Peranio N. Structural modulations in Bi 2 Te 3. / Peranio N., Eibl O. // Journal of Applied Physics. - 2008. - Vol. 103, No. 2. - P. 024314-024314-9.

J301. Duan H. G. Turning electrospun poly(methyl methacrylate) nanofibers into graphitic nanostructures by in situ electron beam irradiation. / Duan H. G., Xie E. Q., Han L. // Journal of Applied Physics. - 2008. - Vol. 103, No. 4. - P. 046105-046105-3.

J302. Jiang C.-S. P-induced nanocrystallite dispersion in amorphous-nanocrystalline mixed-phase Si:H thin films. / Jiang C.-S., Yan B., Yan Y., Teplin C. W., Reedy R., Moutinho H. R., Al-Jassim M. M., Yang J. // Journal of Applied Physics. - 2008. - Vol. 103, No. 6. - P. 063515-063515-6.

J303. Webb J. L. Influence of interactions on magnetization behavior of arrays of nanostructures with uniaxial anisotropy. / Webb J. L., Atkinson D. // Journal of Applied Physics. - 2008. - Vol. 103, No. 3. - P. 033905-033905-5.

J304. Volz Sebastian. Increase of thermal resistance between a nanostructure and a surface due to phonon multireflections. / Volz Sebastian, Chapuis Pierre-Olivier. // Journal of Applied Physics. - 2008. - Vol. 103, No. 3. - P. 034306-034306-9.

J305. Wang X. J. The chemical and electronic structures of Y O x N y on Si(100). / Wang X. J., Zhang L. D.,

He G., Zhang J. P., Liu M., Zhu L. Q. // Applied Physics Letters. - 2008. - Vol. 92, No. 4. - P. 042905-042905-3.

J306. Schofield Eleanor J. Strain development in nanoporous metallic foils formed by dealloying. / Schofield Eleanor J., Ingham Bridget, Turnbull Alan, Toney Michael F., Ryan Mary P. // Applied Physics Letters. - 2008. - Vol. 92, No. 4. - P. 043118-043118-3.

J307. He Yuping. The effect of Ti doping on the growth of Mg nanostructures by oblique angle codeposition. / He Yuping, Zhao Yiping, Wu Jinsong. // Applied Physics Letters. - 2008. - Vol. 92, No. 6. - P. 063107-063107-3.

J308. Tang Yan. Single-layer metallodielectric nanostructures as dual-band midinfrared filters. / Tang Yan, Bossard Jeremy A., Werner Douglas H., Mayer Theresa S. // Applied Physics Letters. - 2008. - Vol. 92, No. 26. - P. 263106-263106-3.

J309. Fang C. Preparation of nanochain and nanosphere by self-assembly of gold nanoparticles. / Fang C., Fan Y., Kong J. M., Gao Z. Q., Balasubramanian N. // Applied Physics Letters. - 2008. - Vol. 92, No. 26. - P. 263108-263108-3.

J310. Singh K. A. Dependence of field-effect mobility and contact resistance on nanostructure in regioregular poly(3-hexylthiophene) thin film transistors. / Singh K. A., Sauve G., Zhang R., Kowalewski T., McCullough R. D., Porter L. M. // Applied Physics Letters. - 2008. - Vol. 92, No. 26. - P. 263303-263303-3.

J311. Xia J. H. Hexahedral nanocementites catalyzing the growth of carbon nanohelices. / Xia J. H., Jiang X., Jia C. L., Dong C. // Applied Physics Letters. - 2008. - Vol. 92, No. 6. - P. 063121-063121-3.

J312. Basu Joysurya. Modified electron-beam-induced deposition of metal nanostructure arrays using a parallel electron beam. / Basu Joysurya, Barry Carter C., Divakar R., Shenoy Vijay B., Ravishankar N. // Applied Physics Letters. - 2008. - Vol. 93, No. 13. - P. 133104-133104-3.

J313. Kubo T. Spontaneous alignment of self-assembled ABC triblock terpolymers for large-area nanolithography. / Kubo T., Wang R. F., Olson D. A., Rodwogin M., Hillmyer M. A., Leighton C. // Applied Physics Letters. - 2008. - Vol. 93, No. 13. - P. 133112-133112-3.

J314. Knutsson A. Thermal decomposition products in arc evaporated TiAlN/TiN multilayers. / Knutsson A., Johansson M. P., Persson P. O. A., Hultman L., Oden M. // Applied Physics Letters. - 2008. - Vol. 93, No. 14. - P. 143110-143110-3.

J315. Zheng Yongmei. In situ investigation on dynamic suspending of microdroplet on lotus leaf and gradient of wettable micro- and nanostructure from water condensation. / Zheng Yongmei, Han Dong, Zhai Jin, Jiang Lei. // Applied Physics Letters. - 2008. - Vol. 92, No. 8. - P. 084106-084106-3.

J316. Cheng An-Jen. Thermal chemical vapor deposition growth of zinc oxide nanostructures for dye-sensitized solar cell fabrication. / Cheng An-Jen, Tzeng Yonhua, Zhou Yi, Park Minseo, Wu Tsung-hsueh, Shannon Curtis, Wang Dake, Lee Wonwoo. // Applied Physics Letters. - 2008. - Vol. 92, No. 9. - P. 092113-092113-3.

J317. Huo Kaifu. One-step growth and field emission properties of quasialigned Ti O 2 nanowire/carbon nanocone core-shell nanostructure arrays on Ti substrates. / Huo Kaifu, Zhang Xuming, Hu Liangsheng, Sun Xianjiao, Fu Jijiang, Chu Paul K. // Applied Physics Letters. - 2008. - Vol. 93, No. 1. - P. 013105-013105-3.

J318. Li Han. Preparation and thermoelectric properties of high-performance Sb additional Yb 0.2 Co 4 Sb 12+y bulk materials with nanostructure. / Li Han, Tang Xinfeng, Su Xianli, Zhang Qingjie. // Applied Physics Letters. - 2008. - Vol. 92, No. 20. - P. 202114-202114-3.

J319. Cong D.-Y. Temperature insensitive linewidth enhancement factor of p -type doped In As /Ga As quantum-dot lasers emitting at 1.3 mcm. / Cong D.-Y., Martinez A., Merghem K., Ramdane A., Provost J.-G., Fischer M., Krestnikov I., Kovsh A. // Applied Physics Letters. - 2008. - Vol. 92, No. 19. - P. 191109-191109-3.

J320. Platz Daniel. Intermodulation atomic force microscopy. / Platz Daniel, Tholen Erik A., Pesen Devrim, Haviland David B. // Applied Physics Letters. - 2008. - Vol. 92, No. 15. - P. 153106-153106-3.

J321. Banerjee Soumik. Molecular simulation of the carbon nanotube growth mode during catalytic synthesis. / Banerjee Soumik, Naha Sayangdev, Puri Ishwar K. // Applied Physics Letters. - 2008. - Vol. 92, No. 23. - P. 233121-233121-3.

J322. Jeon Sohee. Ultraviolet nanoimprinted polymer nanostructure for organic light emitting diode application. / Jeon Sohee, Kang Jae-Wook, Park Hyung-Dol, Kim Jang-Joo, Youn Jae R., Shim Jongyoup, Jeong Jun-ho, Choi Dae-Geun, Kim Ki-Don, Altun Ali Ozhan, Kim Se-Heon, Lee Yong-Hee. // Applied Physics Letters. - 2008. - Vol. 92, No. 22. - P. 223307-223307-3.

J323. Wang X. J. Effects of nitrogen atom doping on optical properties and dielectric constant of Hf O 2 gate oxides. / Wang X. J., Zhang L. D., Zhang J. P., Liu M., He G. // Applied Physics Letters. - 2008. - Vol. 92, No. 20. - P. 202906-202906-3.

J324. Cionca C. N. Strain and composition mapping of epitaxial nanostructures. / Cionca C. N., Riposan A., Kumah D. P., Husseini N. S., Walko D. A., Yacoby Y., Millunchick J. M., Clarke R. // Applied Physics Letters. - 2008. - Vol. 92, No. 15. - P. 151914-151914-3.

J325. Soh C. B. Cool white III-nitride light emitting diodes based on phosphor-free indium-rich InGaN nanostructures. / Soh C. B., Liu W., Teng J. H., Chow S. Y., Ang S. S., Chua S. J. // Applied Physics Letters. - 2008. - Vol. 92, No. 26. - P. 261909-261909-3.

J326. Wen Bin. First principles molecular dynamics study of CdS nanostructure temperature-dependent phase stability. / Wen Bin, Melnik Roderick V. N. // Applied Physics Letters. - 2008. - Vol. 92, No. 26. - P. 261911-261911-3.

J327. Yuasa Hiromi. Relation between magnetoresistance and nanostructure of current-perpendicular-to-plane giant-magnetoresistance film with current-confined-path nano-oxide layer. / Yuasa Hiromi, Hara Michiko, Fukuzawa Hideaki. // Applied Physics Letters. - 2008. - Vol. 92, No. 26. - P. 262509-262509-3.

J328. Cao Y. Q. Syntheses and thermoelectric properties of Bi 2 Te 3 /Sb 2 Te 3 bulk nanocomposites with laminated nanostructure. / Cao Y. Q., Zhao X. B., Zhu T. J., Zhang X. B., Tu J. P. // Applied Physics Letters. - 2008. - Vol. 92, No. 14. - P. 143106-143106-3.

J329. Chen Y. C. Synthesis and characterization of smooth ultrananocrystalline diamond films via low pressure bias-enhanced nucleation and growth. / Chen Y. C., Zhong X. Y., Konicek A. R., Grierson D. S., Tai N. H., Lin I. N., Kabius B., Hiller J. M., Sumant A. V., Carpick R. W., Auciello O. // Applied Physics Letters. - 2008. - Vol. 92, No. 13. - P. 133113-133113-3.

J330. Li D. X. Computational design of silicon-based direct-band gap nanostructure: Silicon nanonet. / Li D. X., Feng J. Y. // Applied Physics Letters. - 2008. - Vol. 92, No. 24. - P. 243117-243117-3.

J331. Kim Seok-min. Photonic crystals with SiO 2 -Ag "post-cap" nanostructure coatings for surface enhanced Raman spectroscopy. / Kim Seok-min, Zhang Wei, Cunningham Brian T. // Applied Physics Letters. - 2008. - Vol. 93, No. 14. - P. 143112-143112-3.

J332. Li Juntao. Evolution of the nanostructure of deposits grown by electron beam induced deposition. / Li Juntao, Toth Milos, Tileli Vasiliki, Dunn Kathleen A., Lobo Charlene J., Thiel Bradley L. // Applied Physics Letters. - 2008. - Vol. 93, No. 2. - P. 023130-023130-3.

J333. Huo B. ZnO/Zn/sub 0.85/Mg/sub 0.15/O superlattice nanoneedles grown by pulsed laser deposition. / Huo B., Hu L., Zhang H., Zhao Z., Fu Q., Ma J. // IET Micro & Nano Letters. - 2008. - Vol. 3, No. 4. - P. 117-120.

J334. Jiajun Chen. Room Temperature Ferromagnetism of FeCo-Codoped ZnO Nanorods Prepared by Chemical Vapor Deposition. / Jiajun Chen, Jingjing Liu, West A., Yan Y., Yu M., Zhou W. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 11. - P. 2681-2683.

J335. Bhushan Bharat. Biomimetic hierarchical structure for self-cleaning. / Bhushan Bharat, Koch Kerstin, Jung Yong Chae. // Applied Physics Letters. - 2008. - Vol. 93, No. 9. - P. 093101-093101-3.

J336. Sreekanth K. V. A planar layer configuration for surface plasmon interference nanoscale lithography. / Sreekanth K. V., Murukeshan V. M., Chua J. K. // Applied Physics Letters. - 2008. - Vol. 93, No. 9. - P. 093103-

093103-3.

J337. Chen Fuyi. Martensitic transformations in Ag-Au bimetallic core-shell nanoalloys. / Chen Fuyi, Johnston Roy L. // Applied Physics Letters. - 2008. - Vol. 92, No. 2. - P. 023112-023112-3.

J338. Chini T. K. Room temperature photoluminescence from the amorphous Si structure generated under keV Ar-ion-induced surface rippling condition. / Chini T. K., Datta D. P., Facsko S., Mucklich A. // Applied Physics Letters. - 2008. - Vol. 92, No. 10. - P. 101919-101919-3.

J339. King P. Book Reviews [review of Biomedical Nanostructures (Gonsalves, K. et al.; 2007)]. IEEE Engineering in Medicine and Biology Magazine. - 2008. - Vol. 27, No. 5. - P. 126.

J340. Yang Hou. Characterization of a broadband all-optical ultrasound transducer-from optical and acoustical properties to imaging. / Yang Hou, Jin-sung Kim, Sheng-wen Huang, Ashkenazi S., Guo L.J., O'Donnell M. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2008. - Vol. 55, No. 8. - P. 1867-1877.

J341. Ooi B.S. Quantum Dashes on InP Substrate for Broadband Emitter Applications. / Ooi B.S., Susanto Djie H., Yang Wang, Chee-Loon Tan, Hwang J.C.M., Xiao-Ming Fang, Fastenau J.M., Liu A.W.K., Dang G.T., Chang W.H. // IEEE Journal of Selected Topics in Quantum Electronics. - 2008. - Vol. 14, No. 4. - P. 1230-1238.

J342. Fukuzawa H. Analysis of the Current-Confined-Paths in the Film Plane for CPP-GMR Films. / Fukuzawa H., Hara M., Yuasa H., Fuji Y. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 11. - P. 3580-3583.

J343. Ju Hun Lee. Synthesis and Characterization of Core-Shell Nanowires. / Ju Hun Lee, Jun Hua Wu, Ji Sung Lee, Ki Seok Jeon, Hae Ryong Kim, Jong Heun Lee, Yung Doug Suh, Young Keun Kim. // IEEE Transactions on Magnetics. - 2008. - Vol. 44, No. 11. - P. 3950-3953.

J344. Po-Chiang Chen. Chemical Sensors and Electronic Noses Based on 1-D Metal Oxide Nanostructures. / Po-Chiang Chen, Guozhen Shen, Chongwu Zhou. // IEEE Transactions on Nanotechnology. - 2008. - Vol. 7, No. 6. - P. 668-682.

J345. Wang X. W. Enhanced thermoelectric figure of merit in nanostructured n -type silicon germanium bulk alloy. / Wang X. W., Lee H., Lan Y. C., Zhu G. H., Joshi G., Wang D. Z., Yang J., Muto A. J., Tang M. Y., Klatsky J., Song S., Dresselhaus M. S., Chen G., Ren Z. F. // Applied Physics Letters. - 2008. - Vol. 93, No. 19. - P. 193121-193121-3.

J346. Yue M. Structure and magnetic properties of bulk nanocrystalline Dy metal prepared by spark plasma sintering. / Yue M., Wang K. J., Liu W. Q., Zhang D. T., Zhang J. X. // Applied Physics Letters. - 2008. - Vol. 93, No. 20. - P. 202501-202501-3.

J347. Laiho Ari. Tuning the electrical switching of polymer/fullerene nanocomposite thin film devices by control of morphology. / Laiho Ari, Majumdar Himadri S., Baral Jayanta K., Jansson Fredrik, Osterbacka Ronald, Ikkala Olli. // Applied Physics Letters. - 2008. - Vol. 93, No. 20. - P. 203309-203309-3.

J348. Ding C. R. Super-radiance of excitons in a single ZnO nanostructure. / Ding C. R., Lin W., Chen B. C., Zhao F. L., Dong J. W., Shi M., Wang H. Z., Hsu Y. F., Djurisic A. B. // Applied Physics Letters. - 2008. - Vol. 93, No. 15. - P. 151902-151902-3.

J349. Fang Jixiang. Single crystal growth via a grain rotation mechanism within amorphous matrix. / Fang Jixiang, Kong Peng, Ding Bingjun, Song Xiaoping, Han Yong, Hahn Horst, Gleiter Herbert. // Applied Physics Letters. - 2008. - Vol. 93, No. 15. - P. 153115-153115-3.

J350. Hsu Kuang-Yuan. Molecular beam epitaxy growth of wurtzite AlN nanotips. / Hsu Kuang-Yuan, Liu Chuan-Pu, Chung Hung-Chin, Chiu Yu-Chen. // Applied Physics Letters. - 2008. - Vol. 93, No. 18. - P. 181902-181902-3.

J351. Reagan Michael A. Electric charging and nanostructure formation in polymeric films using combined amplitude-modulated atomic force microscopy-assisted electrostatic nanolithography and electric force microscopy. / Reagan Michael A., Kashyn Dmytro, Juhl Shane, Vaia Richard A., Lyuksyutov Sergei F. // Applied Physics Letters. - 2008. - Vol. 93, No. 3. - P. 033109-033109-3.

J352. Fukuda Y. Soft x-ray source for nanostructure imaging using femtosecond-laser-irradiated clusters. / Fukuda Y., Faenov A. Ya., Pikuz T., Kando M., Kotaki H., Daito I., Ma J., Chen L. M., Homma T., Kawase K., Kameshima T., Kawachi T., Daido H., Kimura T., Tajima T., Kato Y., Bulanov S. V. // Applied Physics Letters. - 2008. - Vol. 92, No. 12. - P. 121110-121110-3.

J353. Chu Chih-Wei. Control of the nanoscale crystallinity and phase separation in polymer solar cells. / Chu Chih-Wei, Yang Hoichang, Hou Wei-Jen, Huang Jinsong, Li Gang, Yang Yang. // Applied Physics Letters. - 2008. - Vol. 92, No. 10. - P. 103306-103306-3.

J354. Takahashi Ken-ichiro. Artificial pinning enhancement by multilayer nanostructures in Mg B 2 /Ni thin films. / Takahashi Ken-ichiro, Kitaguchi Hitoshi, Doi Toshiya. // Applied Physics Letters. - 2008. - Vol. 92, No. 10. - P. 102510-102510-3.

J355. Hou Kun. Uniform and enhanced field emission from chromium oxide coated carbon nanosheets. / Hou Kun, Outlaw Ronald A., Wang Sigen, Zhu Mingyao, Quinlan Ronald A., Manos Dennis M., Kordesch Martin E., Arp Uwe, Holloway Brian C. // Applied Physics Letters. - 2008. - Vol. 92, No. 13. - P. 133112-133112-3.

J356. Horii S. Two-dimensional vortex-pinning phenomena in Y Ba 2 Cu 3 O y films. / Horii S., Takamura M., Mukaida M., Ichinose A., Yamada K., Teranishi R., Matsumoto K., Kita R., Yoshida Y., Shimoyama J., Kishio K. // Applied Physics Letters. - 2008. - Vol. 92, No. 13. - P. 132502-132502-3.

J357. Wang X. J. The effect of nitrogen concentration on the band gap and band offsets of Hf O x N y gate dielectrics. / Wang X. J., Zhang L. D., Liu M., Zhang J. P., He G. // Applied Physics Letters. - 2008. - Vol. 92, No. 12. - P. 122901-122901-3.

J358. Zhang Q. Magnetic properties and enhanced magnetic refrigeration in (Mn 1-x Fe x)5 Ge 3 compounds. / Zhang Q., Du J., Li Y. B., Sun N. K., Cui W. B., Li D., Zhang Z. D. // Journal of Applied Physics. - 2007. - Vol. 101, No. 12. - P. 123911-123911-5.

J359. Chiu C.-H. Numerical simulation for the formation of nanostructures on the Stranski-Krastanow systems by surface undulation. / Chiu C.-H., Huang Z. // Journal of Applied Physics. - 2007. - Vol. 101, No. 11. - P. 113540-113540-10.

J360. Tsai H. L. Structural analysis of strained p -type Al Ga N /Ga N superlattice. / Tsai H. L., Wang T. Y., Yang J. R., Chuo C. C., Hsu J. T., Ceh M., Shiojiri M. // Journal of Applied Physics. - 2007. - Vol. 101, No. 2. - P. 023521-023521-6.

J361. Seravalli L. Quantum dot strain engineering of In As /In Ga As nanostructures. / Seravalli L., Minelli M., Frigeri P., Franchi S., Guizzetti G., Patrini M., Ciabattoni T., Geddo M. // Journal of Applied Physics. - 2007. - Vol. 101, No. 2. - P. 024313-024313-8.

J362. AbuWaar Ziad Y. Optical behavior of Ga As /Al Ga As ringlike nanostructures. / AbuWaar Ziad Y., Mazur Yuriy I., Lee Jihoon H., Wang Zhiming M., Salamo Gregory J. // Journal of Applied Physics. - 2007. - Vol. 101, No. 2. - P. 024311-024311-5.

J363. Lu Y. H. Phase configuration, nanostructure evolution, and mechanical properties of unbalanced magnetron-sputtered Ti-C x -N y thin films. / Lu Y. H., Shen Y. G., Zhou Z. F., Li K. Y. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2007. - Vol. 25, No. 6. - P. 1539-1546.

J364. De Silva Lakshman. Fabrication of structurally chiral Sc 2 O 3 films and observation of Bragg resonance at deep UV wavelengths. / De Silva Lakshman, Hodgkinson Ian. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2007. - Vol. 25, No. 4. - P. 1118-1122.

J365. Fujita Takeshi. Electron holography of single-crystal iron nanorods encapsulated in carbon nanotubes. / Fujita Takeshi, Chen Mingwei, Wang Xiaomin, Xu Bingshe, Inoke Koji, Yamamoto Kazuo. // Journal of Applied Physics. - 2007. - Vol. 101, No. 1. - P. 014323-014323-5.

J366. Nathani H. Long-term stability of nanostructured systems with negative heats of mixing. / Nathani H., Wang J., Weihs T. P. // Journal of Applied Physics. - 2007. - Vol. 101, No. 10. - P. 104315-104315-4.

J367. Achoyan A. Electron screening in nanostructures. / Achoyan A., Petrosyan S., Craig W., Ruda H. E., Shik A. // Journal of Applied Physics. - 2007. - Vol. 101, No. 10. - P. 104308-104308-10.

J368. Liu M. Characteristics of Hf O x N y thin films by rf reactive sputtering at different deposition temperatures. / Liu M., Fang Q., He G., Zhu L. Q., Zhang L. D. // Journal of Applied Physics. - 2007. - Vol. 101, No. 3. - P. 034107-034107-4.

J369. Saragi Tobat P. I. Photovoltaic and photoconductivity effect in thin-film phototransistors based on a heterocyclic spiro-type molecule. / Saragi Tobat P. I., Londenberg Joscha, Salbeck Josef. // Journal of Applied Physics. - 2007. - Vol. 102, No. 4. - P. 046104-046104-3.

J370. Melechko A. V. Control of carbon nanostructure: From nanofiber toward nanotube and back. / Melechko A. V., Klein K. L., Fowlkes J. D., Hensley D. K., Merkulov I. A., McKnight T. E., Rack P. D., Horton J. A., Simpson M. L. // Journal of Applied Physics. - 2007. - Vol. 102, No. 7. - P. 074314-074314-7.

J371. He G. Temperature-dependent structural stability and optical properties of ultrathin Hf-Al-O films grown by facing-target reactive sputtering. / He G., Zhang L. D., Meng G. W., Li G. H., Fang Q., Zhang J. P. // Journal of Applied Physics. - 2007. - Vol. 102, No. 9. - P. 094103-094103-5.

J372. Zhang J. P. Characterization of ZnO:N films prepared by annealing sputtered zinc oxynitride films at different temperatures. / Zhang J. P., Zhang L. D., Zhu L. Q., Zhang Y., Liu M., Wang X. J., He G. // Journal of Applied Physics. - 2007. - Vol. 102, No. 11. - P. 114903-114903-7.

J373. Colli A. Thermal and chemical vapor deposition of Si nanowires: Shape control, dispersion, and electrical properties. / Colli A., Fasoli A., Beecher P., Servati P., Pisana S., Fu Y., Flewitt A. J., Milne W. I., Robertson J., Ducati C., De Franceschi S., Hofmann S., Ferrari A. C. // Journal of Applied Physics. - 2007. - Vol. 102, No. 3. - P. 034302-034302-13.

J374. Jin Lei. Synthesis and analysis of abnormal wurtzite ZnSe nanowheels. / Jin Lei, Choy Wallace C. H., Leung Yee P., Yuk Tong I., Ong Hock C., Wang Jian-bo. // Journal of Applied Physics. - 2007. - Vol. 102, No. 4. - P. 044302-044302-6.

J375. Peng Can. High fidelity fabrication of microlens arrays by nanoimprint using conformal mold duplication and low-pressure liquid material curing. / Peng Can, Liang Xiaogan, Fu Zengli, Chou Stephen Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 2. - P. 410-414.

J376. Yang Jianshu. Ultrahigh vacuum scanning tunneling microscope manipulation of single gold nanoislands on Mo S 2 for constructing planar nanointerconnects. / Yang Jianshu, Deng Jie, Chandrasekhar N., Joachim C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 5. - P. 1694-1699.

J377. Patel Amil A. Membrane stacking: A new approach for three-dimensional nanostructure fabrication. / Patel Amil A., Smith Henry I. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 6. - P. 2662-2664.

J378. Singh M. A. Thermal quenching sample chamber for grazing incidence small angle x-ray scattering studies of polymer films. / Singh M. A., Groves M. N., Muller M. S., Stahlbrand I. J., Smilgies D.-M. // Review of Scientific Instruments. - 2007. - Vol. 78, No. 11. - P. 113910-113910-7.

J379. Lan Yung-Chiang. Screen effects on field emission from an array of one-dimensional nanostructures grown on silicon substrates: A simulation study using classical transport model. / Lan Yung-Chiang, Yan MingXun, Liu Wen-Jen. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 2. - P. 497-503.

J380. Chang Sunyoung. Effect of UV irradiation during synthesis of polypyrrole by a one-step deposition/polymerization process. / Chang Sunyoung, Park Jaehong, Jang Jiyoung, Lee Jungwoo, Lee Jaeseung, Yi Whikun. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 2. - P. 670-673.

J381. Osten H. J. Integration of functional epitaxial oxides into silicon: From high-K application to nanostructures. / Osten H. J., Kuhne D., Laha A., Czernohorsky M., Bugiel E., Fissel A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2007. - Vol. 25, No. 3. - P. 1039-1043.

J382. Zhu Shaoli. Hybrid metallic nanoparticles for excitation of surface plasmon resonance. / Zhu Shaoli, Luo Xiangang, Du Chunlei, Li Fei, Yin Shaoyun, Deng Qiling, Fu Yongqi. // Journal of Applied Physics. - 2007. - Vol. 101, No. 6. - P. 064701-064701-5.

J383. Grabecki G. Quantum ballistic phenomena in nanostructures of paraelectric PbTe. Journal of Applied Physics. - 2007. - Vol. 101, No. 8. - P. 081722-081722-6.

J384. Xie W. G. Effect of hydrogen treatment on the field emission of amorphous carbon film. / Xie W. G., Chen Jun, Chen Jian, Deng S. Z., She J. C., Xu N. S. // Journal of Applied Physics. - 2007. - Vol. 101, No. 8. - P. 084315-084315-4.

J385. Vorobyev A. Y. Periodic ordering of random surface nanostructures induced by femtosecond laser pulses on metals. / Vorobyev A. Y., Makin V. S., Guo Chunlei. // Journal of Applied Physics. - 2007. - Vol. 101, No. 3. - P. 034903-034903-4.

J386. Mertens J. Role of the gold film nanostructure on the nanomechanical response of microcantilever sensors. / Mertens J., Calleja M., Ramos D., Taryn A., Tamayo J. // Journal of Applied Physics. - 2007. - Vol. 101, No. 3. - P. 034904-034904-8.

J387. Lee Sunwoo. Growth behavior of oxide nanostructures by electrical and thermal conductivities of substrate in atomic force microscope nano-oxidation. / Lee Sunwoo, Pyo Eol, Kim Jeong Oh, Noh Jaegeun, Lee Haiwon, Ahn Jinho. // Journal of Applied Physics. - 2007. - Vol. 101, No. 4. - P. 044905-044905-5.

J388. Coelho T. M. Thermal properties of natural nanostructured hydroxyapatite extracted from fish bone waste. / Coelho T. M., Nogueira E. S., Weinand W. R., Lima W. M., Steimacher A., Medina A. N., Baesso M. L., Bento A. C. // Journal of Applied Physics. - 2007. - Vol. 101, No. 8. - P. 084701-084701-6.

J389. Malkinski Leszek M. Microwave absorption of patterned arrays of nanosized magnetic stripes with different aspect ratios. / Malkinski Leszek M., Yu Minghui, Vovk Andriy Y., Scherer Donald J., Spinu Leonard, Zhou Weilie, Whittenburg Scott, Davis Zachary, Jung Jin-Seung. // Journal of Applied Physics. - 2007. - Vol. 101, No. 9. - P. 09J110-09J110-3.

J390. Zhu Y. Microstructures of SiC nanoparticle-doped Mg B 2 /Fe tapes. / Zhu Y., Matsumoto A., Senkowicz B. J., Kumakura H., Kitaguchi H., Jewell M. C., Hellstrom E. E., Larbalestier D. C., Voyles P. M. // Journal of Applied Physics. - 2007. - Vol. 102, No. 1. - P. 013913-013913-9.

J391. White Richard. Kinetic Monte Carlo simulation of vapor-liquid-solid nanostructure growth. / White Richard, Welland Mark E. // Journal of Applied Physics. - 2007. - Vol. 102, No. 10. - P. 104301-104301-7.

J392. Kobayashi K. Nanographite domains in carbon nanowalls. / Kobayashi K., Tanimura M., Nakai H., Yoshimura A., Yoshimura H., Kojima K., Tachibana M. // Journal of Applied Physics. - 2007. - Vol. 101, No. 9. - P. 094306-094306-4.

J393. Bandaru P. R. A plausible mechanism for the evolution of helical forms in nanostructure growth. / Bandaru P. R., Daraio C., Yang K., Rao A. M. // Journal of Applied Physics. - 2007. - Vol. 101, No. 9. - P. 094307-094307-4.

J394. Konovalenko A. On the mechanism of hysteresis in conductance of point contacts to single ferromagnetic films. / Konovalenko A., Korenivski V., Yanson I. K., Naidyuk Yu. G., Fisun V. V., Balkashin O. P., Triputen L. Yu. // Journal of Applied Physics. - 2007. - Vol. 101, No. 9. - P. 09A513-09A513-3.

J395. Monticone E.. Superconducting MgB 2 Nanostructures Fabricated by Electron Beam Lithography. / Monticone E.., Portesi C.., Borini S.., Taralli E.., Rajteri M.. // IEEE Transactions on Applied Superconductivity. - 2007. - Vol. 17, No. 2. - P. 222-224.

J396. Fukuyama K. Flux Pinning Properties of Multilayered MgB 2 /Ni Thin Films. / Fukuyama K., Doi T., Kitaguchi H., Mori Z., Masuda K., Hamada S., Hakuraku Y. // IEEE Transactions on Applied Superconductivity. - 2007. - Vol. 17, No. 2. - P. 2891-2894.

J397. Bell M. Photon Number-Resolved Detection With Sequentially Connected Nanowires. / Bell M., Antipov A., Karasik B., Sergeev A., Mitin V., Verevkin A. // IEEE Transactions on Applied Superconductivity. - 2007. - Vol. 17, No. 2. - P. 289-292.

J398. Haas P. Spectral Sensitivity and Spectral Resolution of Superconducting Single-Photon Detectors. / Haas P., Semenov A., Hubers H.-W., Beyer P.J., Kirste A., Schurig T., Il'in K., Siegel M., Engel A., Smirnov A. // IEEE Transactions on Applied Superconductivity. - 2007. - Vol. 17, No. 2. - P. 298-301.

J399. 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.

J400. Kawashima S. High-Precision Alignment and Bonding System for the Fabrication of 3-D Nanostructures. / Kawashima S., Imada M., Ishizaki K., Noda S. // Journal of Microelectromechanical Systems. - 2007. - Vol. 16, No. 5. - P. 1140-1144.

J401. Quoc Ngo. Structural and Electrical Characterization of Carbon Nanofibers for Interconnect Via Applications. / Quoc Ngo, Yamada T., Suzuki M., Ominami Y., Cassell A.M., Li Jun, Meyyappan M., Yang C.Y. // IEEE Transactions on Nanotechnology. - 2007. - Vol. 6, No. 6. - P. 688-695.

J402. Rimeika R. Subsecond-response SAW humidity sensor with porphyrin nanostructure deposited on bare and metallised piezoelectric substrate. / Rimeika R., Ciplys D., Poderys V., Rotomskis R., Balakauskas S., Shur M.S. // Electronics Letters. - 2007. - Vol. 43, No. 19. - P. 1055-1057.

J403. Espinosa H.D. Design and Operation of a MEMS-Based Material Testing System for Nanomechanical Characterization. / Espinosa H.D., Yong Zhu, Moldovan N. // Journal of Microelectromechanical Systems. - 2007. - Vol. 16, No. 5. - P. 1219-1231.

J404. Iovan A. Tunneling Spectroscopy of Magnetic Double Barrier Junctions. / Iovan A., Lam K., Andersson S., Cherepov S.S., Haviland D.B., Korenivski V. // IEEE Transactions on Magnetics. - 2007. - Vol. 43, No. 6. - P. 2818-2820.

J405. Goto K. Nanofabrication and Evanescent Light Enhancement by Surface Plasmon. IEEE Transactions on Magnetics. - 2007. - Vol. 43, No. 2. - P. 851-855.

J406. Li H.F. Coarsening of the Nanolamellar Structure in a Soft Magnetic Alloy. / Li H.F., Ramanujan R.V. // IEEE Transactions on Nanotechnology. - 2007. - Vol. 6, No. 2. - P. 177-185.

J407. Tholen Erik A. Nonlinearities and parametric amplification in superconducting coplanar waveguide resonators. / Tholen Erik A., Ergul Adem, Doherty Evelyn M., Weber Frank M., Gregis Fabien, Haviland David B. // Applied Physics Letters. - 2007. - Vol. 90, No. 25. - P. 253509-253509-3.

J408. Saragi Tobat P. I. Solution-processed organic thin-film phototransistors based on donor/acceptor dyad. / Saragi Tobat P. I., Fetten Michael, Salbeck Josef. // Applied Physics Letters. - 2007. - Vol. 90, No. 25. - P. 253506-253506-3.

J409. Carpentieri M. Spin-Transfer Torque Switching in Magnetic Multilayers. / Carpentieri M., Consolo G., Azzerboni B., Torres L., Cardelli E. // IEEE Transactions on Magnetics. - 2007. - Vol. 43, No. 4. - P. 1677-1680.

J410. Hye-Kyoung Seo. Comparison of Micro- and Nano-Pore Platinum Working Electrodes for CMOS Integrated Nondisposable Biosensor Applications. / Hye-Kyoung Seo, Dae-Joon Park, Jae-Yeong Park. // IEEE Sensors Journal. - 2007. - Vol. 7, No. 6. - P. 945-946.

J411. Moreau G. 1516nm room temperature CW operation of quantum dot InAs/InP(311)B singlemode laser. / Moreau G., Merghem K., Martinez A., Bouchoule S., Ramdane A., Grillot F., Piron R., Dehease O., Homeyer E., Tavernier K., Loualiche S., Berdaguer P., Pommerau F. // Electronics Letters. - 2007. - Vol. 43, No. 10. - P. 571-572.

J412. Chu P.K. Plasma-Treated Biomaterials. IEEE Transactions on Plasma Science. - 2007. - Vol. 35, No. 2. - P. 181-187.

J413. Enaya H. Electrical Manipulation of Nonvolatile Spin Cell Based on Diluted Magnetic Semiconductor Quantum Dots. / Enaya H., Semenov Y.G., Kim K.W., Zavada J.M. // IEEE Transactions on Electron Devices. - 2007. - Vol. 54, No. 5. - P. 1032-1039.

J414. Quarta A. Fluorescent-Magnetic Hybrid Nanostructures: Preparation, Properties, and Applications in

Biology. / Quarta A., Di Corato R., Manna L., Ragusa A., Pellegrino T. // IEEE Transactions on NanoBioscience. - 2007. - Vol. 6, No. 4. - P. 298-308.

J415. Ogimoto Yasushi. Resistance switching memory device with a nanoscale confined current path. / Ogimoto Yasushi, Tamai Yukio, Kawasaki Masashi, Tokura Yoshinori. // Applied Physics Letters. - 2007. - Vol. 90, No. 14. - P. 143515-143515-3.

J416. Saragi Tobat P. I. Ultraviolet-sensitive field-effect transistor utilized amorphous thin films of organic donor/acceptor dyad. / Saragi Tobat P. I., Pudzich Robert, Fuhrmann-Lieker Thomas, Salbeck Josef. // Applied Physics Letters. - 2007. - Vol. 90, No. 14. - P. 143514-143514-3.

J417. Yoo Sung Jong. Fast switchable electrochromic properties of tungsten oxide nanowire bundles. / Yoo Sung Jong, Lim Ju Wan, Sung Yung-Eun, Jung Young Hwa, Choi Hong Goo, Kim Do Kyung. // Applied Physics Letters. - 2007. - Vol. 90, No. 17. - P. 173126-173126-3.

J418. Tan E. P. S. Crystallinity and surface effects on Young's modulus of CuO nanowires. / Tan E. P. S., Zhu Y., Yu T., Dai L., Sow C. H., Tan V. B. C., Lim C. T. // Applied Physics Letters. - 2007. - Vol. 90, No. 16. - P. 163112-163112-3.

J419. Zhang C. L. Coercivity and nanostructure in magnetic spinel Mg (Mn ,Fe)2 O 4. / Zhang C. L., Yeo S., Horibe Y., Choi Y. J., Guha S., Croft M., Cheong S.-W., Mori S. // Applied Physics Letters. - 2007. - Vol. 90, No. 13. - P. 133123-133123-3.

J420. Lei W. Effect of substrate misorientation on the In As /In Al As /In P nanostructure morphology and lateral composition modulation in the InAlAs matrix. / Lei W., Wang Y. L., Chen Y. H., Jin P., Ye X. L., Xu B., Wang Z. G. // Applied Physics Letters. - 2007. - Vol. 90, No. 10. - P. 103118-103118-3.

J421. Tang Xinfeng. Preparation and thermoelectric transport properties of high-performance p -type Bi 2 Te 3 with layered nanostructure. / Tang Xinfeng, Xie Wenjie, Li Han, Zhao Wenyu, Zhang Qingjie, Niino Masayuki. // Applied Physics Letters. - 2007. - Vol. 90, No. 1. - P. 012102-012102-3.

J422. Gao Hongjun. Precise replication of antireflective nanostructures from biotemplates. / Gao Hongjun, Liu Zhongfan, Zhang Jin, Zhang Guoming, Xie Guoyong. // Applied Physics Letters. - 2007. - Vol. 90, No. 12. - P. 123115-123115-3.

J423. Sharma Vaneet. Self-assembled periodic nanoporous network in multifunctional Zr O 2 -Ce O 2 -(La 0.8 Sr 0.2)Mn O 3 composites. / Sharma Vaneet, Jiang Jiechao, Hossu Maria, Koymen Ali R., Priya Shashank. // Applied Physics Letters. - 2007. - Vol. 90, No. 12. - P. 123110-123110-3.

J424. Matsuda Akifumi. Anisotropic electric conduction derived from self-organized nanogroove array on Li-doped NiO epitaxial film. / Matsuda Akifumi, Akiba Shusaku, Kasahara Masayasu, Watanabe Takahiro, Akita Yasuyuki, Yoshimoto Mamoru. // Applied Physics Letters. - 2007. - Vol. 90, No. 18. - P. 182107-182107-3.

J425. Sun Cheng-Liang. Fabrication and characterization of Ni /P (VDF -TrFE) nanoscaled coaxial cables. / Sun Cheng-Liang, Lam Kwo Ho, Chao Chen, Lau Sien Ting, Chan Helen Lai Wa, Guo Shishang, Zhao Xingzhong. // Applied Physics Letters. - 2007. - Vol. 90, No. 25. - P. 253107-253107-3.

J426. Lin C. L. Light enhancement by the formation of an Al oxide honeycomb nanostructure on the n -GaN surface of thin-GaN light-emitting diodes. / Lin C. L., Chen P. H., Chan Chia-Hua, Lee C. C., Chen Chii-Chang, Chang Jeng-Yang, Liu C. Y. // Applied Physics Letters. - 2007. - Vol. 90, No. 24. - P. 242106-242106-3.

J427. Yan Zhao. Finite-Difference Time-Domain Study of Guided Modes in Nano-Plasmonic Waveguides. / Yan Zhao, Yang Hao. // IEEE Transactions on Antennas and Propagation. - 2007. - Vol. 55, No. 11. - P. 3070-3077.

J428. Yang Y. Studies on electromagnetic interference shielding characteristics of metal nanoparticle- and carbon nanostructure-filled polymer composites in the Ku-band frequency. / Yang Y., Gupta M.C., Dudley K.L. // IET Micro & Nano Letters. - 2007. - Vol. 2, No. 4. - P. 85-89.

J429. Kubo T. Characterization of pattern transfer in the fabrication of magnetic nanostructure arrays by block copolymer lithography. / Kubo T., Parker J. S., Hillmyer M. A., Leighton C. // Applied Physics Letters. - 2007. - Vol. 90, No. 23. - P. 233113-233113-3.

J430. Murphy Patrick F. Nanoimprint mold fabrication and replication by room-temperature conformal chemical vapor deposition. / Murphy Patrick F., Morton Keith J., Fu Zengli, Chou Stephen Y. // Applied Physics Letters. - 2007. - Vol. 90, No. 20. - P. 203115-203115-3.

J431. Suraprapapich S. Effect of arsenic species on the formation of (Ga)InAs nanostructures after partial capping and regrowth. / Suraprapapich S., Panyakeow S., Tu C. W. // Applied Physics Letters. - 2007. - Vol. 90, No. 18. - P. 183112-183112-3.

J432. Lu Y. H. Nanostructure transition: From solid solution Ti(N,C) to nanocomposite nc -Ti (N ,C)/a-(C ,C N x). / Lu Y. H., Shen Y. G. // Applied Physics Letters. - 2007. - Vol. 90, No. 22. - P. 221913-221913-3.

J433. Aita Carolyn Rubin. Raman scattering by thin film nanomosaic rutile Ti O 2. Applied Physics Letters. - 2007. - Vol. 90, No. 21. - P. 213112-213112-3.

J434. Li S. Z. Enhanced photoluminescence of Zn O /Er 2 O 3 core-shell structure nanorods synthesized by pulsed laser deposition. / Li S. Z., Gan C. L., Cai H., Yuan C. L., Guo J., Lee P. S., Ma J. // Applied Physics Letters. - 2007. - Vol. 90, No. 26. - P. 263106-263106-3.

J435. Kwon Soon-Yong. Observation of oxide precipitates in InN nanostructures. / Kwon Soon-Yong, Ren Zaiyuan, Sun Qian, Han Jung, Kim Young-Woon, Yoon Euijoon, Kong Bo Hyun, Cho Hyung Koun, Kim Il-Joong, Cheong Hyeonsik. // Applied Physics Letters. - 2007. - Vol. 91, No. 23. - P. 234102-234102-3.

J436. He G. Temperature-dependent interfacial chemical bonding states and band alignment of Hf O x N y /Si O 2 /Si gate stacks. / He G., Meng G. W., Zhang L. D., Liu M. // Applied Physics Letters. - 2007. - Vol. 91, No. 23. - P. 232910-232910-3.

J437. Bachelet R. Step formation, faceting, and bunching in atomically flat Sr Ti O 3 (110) surfaces. / Bachelet R., Valle F., Infante I. C., Sanchez F., Fontcuberta J. // Applied Physics Letters. - 2007. - Vol. 91, No. 25. - P. 251904-251904-3.

J438. Cojoc D. Scanning x-ray microdiffraction of optically manipulated liposomes. / Cojoc D., Ferrari E., Garbin V., Di Fabrizio E., Amenitsch H., Rappolt M., Sartori B., Laggner P., Burghammer M., Riekel C. // Applied Physics Letters. - 2007. - Vol. 91, No. 23. - P. 234107-234107-3.

J439. Chen Reui-San. Ultrahigh photocurrent gain in m -axial GaN nanowires. / Chen Reui-San, Chen Hsin-Yi, Lu Chien-Yao, Chen Kuei-Hsien, Chen Chin-Pei, Chen Li-Chyong, Yang Ying-Jay. // Applied Physics Letters. - 2007. - Vol. 91, No. 22. - P. 223106-223106-3.

J440. Lu Yen-Cheng. Enhanced photoluminescence excitation in surface plasmon coupling with an In Ga N /Ga N quantum well. / Lu Yen-Cheng, Chen Cheng-Yen, Shen Kun-Ching, Yeh Dong-Ming, Tang Tsung-Yi, Yang C. C. // Applied Physics Letters. - 2007. - Vol. 91, No. 18. - P. 183107-183107-3.

J441. Zhu L. Q. X-ray photoelectron spectroscopy study of Zr O 2 /Ti O 2 /Si stack. / Zhu L. Q., Zhang L. D., Fang Q. // Applied Physics Letters. - 2007. - Vol. 91, No. 17. - P. 172902-172902-3.

J442. Dragoman D. Giant thermoelectric effect in graphene. / Dragoman D., Dragoman M. // Applied Physics Letters. - 2007. - Vol. 91, No. 20. - P. 203116-203116-3.

J443. Nomura Ken-ichi. Reactive nanojets: Nanostructure-enhanced chemical reactions in a defected energetic crystal. / Nomura Ken-ichi, Kalia Rajiv K., Nakano Aiichiro, Vashishta Priya. // Applied Physics Letters. - 2007. - Vol. 91, No. 18. - P. 183109-183109-3.

J444. Hyun Y. H. Exchange bias in self-organized Nd 0.5 Sr 0.5 Mn O 3 bilayer film. / Hyun Y. H., Park S. Y., Lee Y. P., Prokhorov V. G., Svetchnikov V. L. // Applied Physics Letters. - 2007. - Vol. 91, No. 26. - P. 262505-262505-3.

J445. Chiu Nan-Fu. Enhanced luminescence of organic/metal nanostructure for grating coupler active long-range surface plasmonic device. / Chiu Nan-Fu, Lin Chii-Wann, Lee Jiun-Haw, Kuan Chieh-Hsiung, Wu Kuang-Chong, Lee Chih-Kung. // Applied Physics Letters. - 2007. - Vol. 91, No. 8. - P. 083114-083114-3.

J446. Hou Yang. Broadband all-optical ultrasound transducers. / Hou Yang, Kim Jin-Sung, Ashkenazi Shai, Huang Sheng-Wen, Guo L. Jay, ODonnell Matthew. // Applied Physics Letters. - 2007. - Vol. 91, No. 7. - P.

073507-073507-3.

J447. Li Sheng-Han. Achieving ambipolar vertical organic transistors via nanoscale interface modification. / Li Sheng-Han, Xu Zheng, Ma Liping, Chu Chih-Wei, Yang Yang. // Applied Physics Letters. - 2007. - Vol. 91, No. 8. - P. 083507-083507-3.

J448. Ren Shenqiang. Spinodally synthesized magnetoelectric. / Ren Shenqiang, Wuttig Manfred. // Applied Physics Letters. - 2007. - Vol. 91, No. 8. - P. 083501-083501-3.

J449. Yang Y. Quenching of surface-exciton emission from ZnO nanocombs by plasma immersion ion implantation. / Yang Y., Tay B. K., Sun X. W., Sze J. Y., Han Z. J., Wang J. X., Zhang X. H., Li Y. B., Zhang S. // Applied Physics Letters. - 2007. - Vol. 91, No. 7. - P. 071921-071921-3.

J450. Xu W. High strength ultrafine/nanostructured aluminum produced by back pressure equal channel angular processing. / Xu W., Honma T., Wu X., Ringer S. P., Xia K. // Applied Physics Letters. - 2007. - Vol. 91, No. 3. - P. 031901-031901-3.

J451. Lee Seok Ho. Confocal microscope photoluminescence and electrical characteristics of single poly(3-hexylthiophene) nanowire strand. / Lee Seok Ho, Park Dong Hyuk, Kim Kihyun, Joo Jinsoo, Kim Dae-Chul, Kim Hyun-Jun, Kim Jeongyong. // Applied Physics Letters. - 2007. - Vol. 91, No. 26. - P. 263102-263102-3.

J452. Huang Wu-Ping. Strain on wrinkled bilayer thin film. / Huang Wu-Ping, Cheng Henry H., Fedorchenko Alexander I., Wang An-Bang. // Applied Physics Letters. - 2007. - Vol. 91, No. 5. - P. 053103-053103-3.

J453. Konstantinovic Z. Nanostructural origin of the ac conductance in dielectric granular metals: The case study of Co 20 (Zr O 2)80. / Konstantinovic Z., Garcia del Muro M., Batlle X., Labarta A., Varela M. // Applied Physics Letters. - 2007. - Vol. 91, No. 5. - P. 052108-052108-3.

J454. Makarov D. Arrays of magnetic nanoindentations with perpendicular anisotropy. / Makarov D., Baraban L., Guhr I. L., Boneberg J., Schift H., Gobrecht J., Schatz G., Leiderer P., Albrecht M. // Applied Physics Letters. - 2007. - Vol. 90, No. 9. - P. 093117-093117-3.

J455. Zhou C. M. Growth competition during glancing angle deposition of nanorod honeycomb arrays. / Zhou C. M., Gall D. // Applied Physics Letters. - 2007. - Vol. 90, No. 9. - P. 093103-093103-3.

J456. Gao L. Y. Preparation and photoinduced wettability conversion of superhydrophobic beta -Ga 2 O 3 nanowire film. / Gao L. Y., Zheng M. J., Zhong M., Li M., Ma L. // Applied Physics Letters. - 2007. - Vol. 91, No. 1. - P. 013101-013101-3.

J457. Zhao Peiji. Suppression of electron-phonon scattering in double-quantum-dot based-quantum gates. / Zhao Peiji, Woolard Dwight L. // Applied Physics Letters. - 2007. - Vol. 90, No. 9. - P. 093507-093507-3.

J458. Figielski T. Remnant magnetoresistance in ferromagnetic (Ga,Mn)As nanostructures. / Figielski T., Wosinski T., Morawski A., Makosa A., Wrobel J., Sadowski J. // Applied Physics Letters. - 2007. - Vol. 90, No. 5. - P. 052108-052108-3.

J459. Cui Bo. Large area 50 nm period grating by multiple nanoimprint lithography and spatial frequency doubling. / Cui Bo, Yu Zhaoning, Ge Haixiong, Chou Stephen Y. // Applied Physics Letters. - 2007. - Vol. 90, No. 4. - P. 043118-043118-3.

J460. Young David L. Nanostructure evolution in hydrogenated amorphous silicon during hydrogen effusion and crystallization. / Young David L., Stradins Paul, Xu Yueqin, Gedvilas Lynn M., Iwaniczko Eugene, Yan Yanfa, Branz Howard M., Wang Qi, Williamson Don L. // Applied Physics Letters. - 2007. - Vol. 90, No. 8. - P. 081923-081923-3.

J461. Hsiao Ching-Lien. Micro-Raman spectroscopy of a single freestanding GaN nanorod grown by molecular beam epitaxy. / Hsiao Ching-Lien, Tu Li-Wei, Chi Tung-Wei, Chen Min, Young Tai-Fa, Chia Chih-Ta, Chang Yu-Ming. // Applied Physics Letters. - 2007. - Vol. 90, No. 4. - P. 043102-043102-3.

J462. Djie H. S. Ultrabroad stimulated emission from quantum-dash laser. / Djie H. S., Tan C. L., Ooi B. S., Hwang J. C. M., Fang X.-M., Wu Y., Fastenau J. M., Liu W. K., Dang G. T., Chang W. H. // Applied Physics Letters. - 2007. - Vol. 91, No. 11. - P. 111116-111116-3.

J463. Patel U. Synthesis and superconducting properties of niobium nitride nanowires and nanoribbons. / Patel U., Avci S., Xiao Z. L., Hua J., Yu S. H., Ito Y., Divan R., Ocola L. E., Zheng C., Claus H., Hiller J., Welp U., Miller D. J., Kwok W. K. // Applied Physics Letters. - 2007. - Vol. 91, No. 16. - P. 162508-162508-3.

J464. Wang Qi. Fullerene nanostructure-induced excellent mechanical properties in hydrogenated amorphous carbon. / Wang Qi, Wang Chengbing, Wang Zhou, Zhang Junyan, He Deyan. // Applied Physics Letters. - 2007. - Vol. 91, No. 14. - P. 141902-141902-3.

J465. Bala Kumar S. Nanopillar ferromagnetic nanostructure as highly efficient spin injector into semiconductor. / Bala Kumar S., Tan S. G., Jalil M. B. A., Guo J. // Applied Physics Letters. - 2007. - Vol. 91, No. 14. - P. 142110-142110-3.

J466. Shi J. Highly parallel mix-and-match fabrication of nanopillar arrays integrated in microfluidic channels for long DNA molecule separation. / Shi J., Fang A. P., Malaquin L., Pepin A., Decanini D., Viovy J. L., Chen Y. // Applied Physics Letters. - 2007. - Vol. 91, No. 15. - P. 153114-153114-3.

J467. Laroche Thierry. Crystalline structure's influence on the near-field optical properties of single plasmonic nanowires. / Laroche Thierry, Vial Alexandre, Roussey Matthieu. // Applied Physics Letters. - 2007. - Vol. 91, No. 12. - P. 123101-123101-3.

J468. Jiang Jun. Cluster scale composition determination in a boron-rich compound. / Jiang Jun, Yuan Jun, Bleloch Andrew. // Applied Physics Letters. - 2007. - Vol. 91, No. 11. - P. 113107-113107-3.

J469. Miyaji Godai. Nanoscale ablation on patterned diamondlike carbon film with femtosecond laser pulses. / Miyaji Godai, Miyazaki Kenzo. // Applied Physics Letters. - 2007. - Vol. 91, No. 12. - P. 123102-123102-3.

J470. Stingl C. Nanostructure of chemically phase separated La-Ce-Mn-O thin films. / Stingl C., Moshnyaga V., Luo Y., Damaschke B., Samwer K., Seibt M. // Applied Physics Letters. - 2007. - Vol. 91, No. 13. - P. 132508-132508-3.

J471. Roccaforte F. Nanoscale carrier transport in Ti /Al /Ni /Au Ohmic contacts on AlGaN epilayers grown on Si(111). / Roccaforte F., Iucolano F., Giannazzo F., Alberti A., Raineri V. // Applied Physics Letters. - 2006. - Vol. 89, No. 2. - P. 022103-022103-3.

J472. Miyaji Godai. Ultrafast dynamics of periodic nanostructure formation on diamondlike carbon films irradiated with femtosecond laser pulses. / Miyaji Godai, Miyazaki Kenzo. // Applied Physics Letters. - 2006. - Vol. 89, No. 19. - P. 191902-191902-3.

J473. Xie Guoqiang. Compound nanostructures formed by metal nanoparticles dispersed on nanodendrites grown on insulator substrates. / Xie Guoqiang, Song Minghui, Furuya Kazuo, Louzguine Dmitri V., Inoue Akihisa. // Applied Physics Letters. - 2006. - Vol. 88, No. 26. - P. 263120-263120-3.

J474. Kesapragada S. V. Anisotropic broadening of Cu nanorods during glancing angle deposition. / Kesapragada S. V., Gall D. // Applied Physics Letters. - 2006. - Vol. 89, No. 20. - P. 203121-203121-3.

J475. Sun Xuhui. III-VI compound semiconductor indium selenide (In 2 Se 3) nanowires: Synthesis and characterization. / Sun Xuhui, Yu Bin, Ng Garrick, Nguyen Thuc Dinh, Meyyappan M. // Applied Physics Letters. - 2006. - Vol. 89, No. 23. - P. 233121-233121-3.

J476. Moreau G. Effect of layer stacking and p -type doping on the performance of In As /In P quantum-dash-in-a-well lasers emitting at 1.55 mcm. / Moreau G., Azouigui S., Cong D.-Y., Merghem K., Martinez A., Patriarche G., Ramdane A., Lelarge F., Rousseau B., Dagens B., Poingt F., Accard A., Pommereau F. // Applied Physics Letters. - 2006. - Vol. 89, No. 24. - P. 241123-241123-3.

J477. Tang Y. B. Catalyst-seeded synthesis and field emission properties of flowerlike Si-doped AlN nanoneedle array. / Tang Y. B., Cong H. T., Wang Z. M., Cheng H.-M. // Applied Physics Letters. - 2006. - Vol. 89, No. 25. - P. 253112-253112-3.

J478. Lu Guowei. How surface-enhanced chemiluminescence depends on the distance from a corrugated metal film. / Lu Guowei, Shen Hong, Cheng Bolin, Chen Zhenghao, Marquette Christophe A., Blum Loic J., Tillement Olivier, Roux Stephane, Ledoux Gilles, Ou Meigui, Perriat Pascal. // Applied Physics Letters. - 2006. - Vol. 89, No. 22. - P. 223128-223128-3.

J479. Yue M. Preparation, microstructure, and magnetic properties of bulk nanocrystalline Gd metal. / Yue M., Zhang J. X., Zeng H., Wang K. J. // Applied Physics Letters. - 2006. - Vol. 89, No. 23. - P. 232504-232504-3.

J480. Yeo S. Solid state self-assembly of nanocheckerboards. / Yeo S., Horibe Y., Mori S., Tseng C. M., Chen C. H., Khachaturyan A. G., Zhang C. L., Cheong S.-W. // Applied Physics Letters. - 2006. - Vol. 89, No. 23. - P. 233120-233120-3.

J481. Lian Jie. Simultaneous formation of surface ripples and metallic nanodots induced by phase decomposition and focused ion beam patterning. / Lian Jie, Zhou Wei, Wei Q. M., Wang L. M., Boatner L. A., Ewing Rodney C. // Applied Physics Letters. - 2006. - Vol. 88, No. 9. - P. 093112-093112-3.

J482. Nagai Keiji. Angular distribution control of extreme ultraviolet radiation from laser-produced plasma by manipulating the nanostructure of low-density Sn O 2 targets. / Nagai Keiji, Gu QinCui, Gu ZhongZe, Okuno Tomoharu, Fujioka Shinsuke, Nishimura Hiroaki, Tao YeZheng, Yasuda Yuzuri, Nakai Mitsuo, Norimatsu Takayoshi, Shimada Yoshinori, Yamaura Michiteru, Yoshida Hidetsugu, Nakatsuka Masahiro, Miyanaga Noriaki, Nishihara Katsunobu, Izawa Yasukazu. // Applied Physics Letters. - 2006. - Vol. 88, No. 9. - P. 094102-094102-3.

J483. Wang Z. Y. Hollow cadmium selenide semiconductor tetrapods. / Wang Z. Y., Fang X. S., Lu Q. F., Ye C. H., Zhang L. D. // Applied Physics Letters. - 2006. - Vol. 88, No. 8. - P. 083102-083102-3.

J484. Arai T. Carrier-to-noise ratio enhancement of super-resolution near-field structure disks by Ag nanostructure. / Arai T., Kurihara K., Nakano T., Tominaga J., Rockstuhl C. // Applied Physics Letters. - 2006. - Vol. 88, No. 5. - P. 051104-051104-3.

J485. Lei W. Shape and spatial correlation control of InAs-InAlAs-InP (001) nanostructure superlattices. / Lei W., Chen Y. H., Jin P., Ye X. L., Wang Y. L., Xu B., Wang Z. G. // Applied Physics Letters. - 2006. - Vol. 88, No. 6. - P. 063114-063114-3.

J486. Li Wei. Expanded conformation of macromolecular chain in polyaniline with one-dimensional nanostructure prepared by interfacial polymerization. / Li Wei, Zhu Meifang, Zhang Qinghua, Chen Dajun. // Applied Physics Letters. - 2006. - Vol. 89, No. 10. - P. 103110-103110-3.

J487. Hiramoto T. Emerging nanoscale silicon devices taking advantage of nanostructure physics. / Hiramoto T., Saitoh M., Tsutsui G. // IBM Journal of Research and Development. - 2006. - Vol. 50, No. 4. 5. - P. 411-418.

J488. Zhu S. Optical and magnetic properties of Ni nanoparticles in rutile formed by Ni ion implantation. / Zhu S., Wang L. M., Zu X. T., Xiang X. // Applied Physics Letters. - 2006. - Vol. 88, No. 4. - P. 043107-043107-3.

J489. Kolb Florian M. Periodic chains of gold nanoparticles and the role of oxygen during the growth of silicon nanowires. / Kolb Florian M., Berger Andreas, Hofmeister Herbert, Pippel Eckhard, Gosele Ulrich, Zacharias Margit. // Applied Physics Letters. - 2006. - Vol. 89, No. 17. - P. 173111-173111-3.

J490. Le Drogoff B. Fast three-dimensional nanostructure fabrication by laser-assisted nanotransfer printing. / Le Drogoff B., Cui B., Veres T. // Applied Physics Letters. - 2006. - Vol. 89, No. 11. - P. 113103-113103-3.

J491. Chiu C.-H. Common features of nanostructure formation induced by the surface undulation on the Stranski-Krastanow systems. / Chiu C.-H., Huang Z. // Applied Physics Letters. - 2006. - Vol. 89, No. 17. - P. 171904-171904-3.

J492. Saragi Tobat P. I. Organic heterostructure field-effect transistors using C 60 and amorphous spirolinked compound. / Saragi Tobat P. I., Salbeck Josef. // Applied Physics Letters. - 2006. - Vol. 89, No. 25. - P. 253516-253516-3.

J493. Gu Diefeng. Nanochemistry, nanostructure, and electrical properties of Ta 2 O 5 film deposited by atomic layer deposition and plasma-enhanced atomic layer deposition. / Gu Diefeng, Li Jing, Dey Sandwip K., De Waard Henk, Marcus Steven. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 5. - P. 2230-2235.

J494. 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.

J495. Wang Huan-hua. Nanostructure evolution of Y Ba 2 Cu 3 O x thin films grown by pulsed-laser glancing-angle deposition. / Wang Huan-hua, Zhao Yi-Ping. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 3. - P. 1230-1233.

J496. Lan Yung-Chiang. Simulation study of junction effect on field emission from one-dimensional nanostructure grown on silicon substrate. / Lan Yung-Chiang, Yan MingXun, Liu Wen-Jen, Hu Yuan, Lin Tsang-Lang. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 2. - P. 918-923.

J497. Wong Y. M. Carbon nanostructure field emission devices. / Wong Y. M., Kang W. P., Davidson J. L., Soh K. L., Choi B. K., Hofmeister W. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 2. - P. 1008-1012.

J498. Lu Shaoning. Analysis of a microelectromechanical system testing stage for tensile loading of nanostructures. / Lu Shaoning, Guo Zaoyang, Ding Weiqiang, Ruoff Rodney S. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 5. - P. 056103-056103-4.

J499. Lu Shaoning. In situ mechanical testing of templated carbon nanotubes. / Lu Shaoning, Guo Zaoyang, Ding Weiqiang, Dikin Dmitriy A., Lee Junghoon, Ruoff Rodney S. // Review of Scientific Instruments. - 2006. - Vol. 77, No. 12. - P. 125101-125101-6.

J500. Saito Akira. Reproduction of the Morpho blue by nanocasting lithography. / Saito Akira, Miyamura Yusuke, Nakajima Masaki, Ishikawa Yoko, Sogo Kenji, Kuwahara Yuji, Hirai Yoshihiko. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 6. - P. 3248-3251.

J501. Kehagias N. Submicron three-dimensional structures fabricated by reverse contact UV nanoimprint lithography. / Kehagias N., Reboud Vincent, Chansin G., Zelsmann M., Jeppesen C., Reuther F., Schuster C., Kubenz M., Gruetzner G., Sotomayor Torres C. M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 6. - P. 3002-3005.

J502. Persaud A. Micromachined piezoresistive proximal probe with integrated bimorph actuator for aligned single ion implantation. / Persaud A., Ivanova K., Sarov Y., Ivanov Tzv., Volland B. E., Rangelow I. W., Nikolov N., Schenkel T., Djakov V., Jenkins D. W. K., Meijer J., Vogel T. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 6. - P. 3148-3151.

J503. Zhao Wei. Fabrication of hybrid bilayer nanostructure by duo-mold imprinting. / Zhao Wei, Low Hong Yee. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 1. - P. 255-258.

J504. Xia Qiangfei. In situ real time monitoring of nanosecond imprint process. / Xia Qiangfei, Yu Zhaoning, Gao He, Chou Stephen Y. // Applied Physics Letters. - 2006. - Vol. 89, No. 7. - P. 073107-073107-3.

J505. Orellana W. Fe adatoms along Bi nanolines on H /Si (001). / Orellana W., Miwa R. H. // Applied Physics Letters. - 2006. - Vol. 89, No. 9. - P. 093105-093105-3.

J506. Ding G. Q. Indium oxide "rods in dots" nanostructures. / Ding G. Q., Shen W. Z., Zheng M. J., Zhou Z. B. // Applied Physics Letters. - 2006. - Vol. 89, No. 6. - P. 063113-063113-3.

J507. Tsen K. T. Subpicosecond time-resolved Raman studies of field-induced transient transport in an In x Ga 1-x As -based p-i-n semiconductor nanostructure. / Tsen K. T., Kiang Juliann G., Ferry D. K., Morkoc H. // Applied Physics Letters. - 2006. - Vol. 89, No. 26. - P. 262101-262101-3.

J508. Lin Y. Ultrafast-laser-induced parallel phase-change nanolithography. / Lin Y., Hong M. H., Chong T. C., Lim C. S., Chen G. X., Tan L. S., Wang Z. B., Shi L. P. // Applied Physics Letters. - 2006. - Vol. 89, No. 4. - P. 041108-041108-3.

J509. Chang Jee Soo. Effects of silicon nanostructure evolution on Er 3+ luminescence in silicon-rich silicon oxide/Er-doped silica multilayers. / Chang Jee Soo, Jhe Ji-Hong, Yang Moon-Seung, Shin Jung H., Kim Kyung Joong, Moon Dae Won. // Applied Physics Letters. - 2006. - Vol. 89, No. 18. - P. 181909-181909-3.

J510. Luo Xiangang. Nanoscopy of near-field distribution on plasmonic nanostructures. / Luo Xiangang, Lv Yueguang, Du Chunlei, Ma Junxian, Wang Hao, Li Haiying, Yang Gairong, Lin Xiangdi, Yao Hanmin. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2006. - Vol. 24, No. 1. - P. L1-L5.

J511. Hou Yang. Optical generation of high frequency ultrasound using two-dimensional gold nanostructure. / Hou Yang, Kim Jin-Sung, Ashkenazi Shai, ODonnell Matthew, Guo L. Jay. // Applied Physics Letters. - 2006. - Vol. 89, No. 9. - P. 093901-093901-3.

J512. Tang Y. B. Field emission from honeycomblike network of vertically aligned AlN nanoplatelets. / Tang Y. B., Cong H. T., Cheng H.-M. // Applied Physics Letters. - 2006. - Vol. 89, No. 9. - P. 093113-093113-3.

J513. Rosenberg R. A. Anisotropic x-ray absorption effects in the optical luminescence yield of ZnO nanostructures. / Rosenberg R. A., Shenoy G. K., Tien L.-C., Norton D., Pearton S., Sun X. H., Sham T. K. // Applied Physics Letters. - 2006. - Vol. 89, No. 9. - P. 093118-093118-3.

J514. Pramanik C. Piezoresistive pressure sensing by porous silicon membrane. / Pramanik C., Saha H. // IEEE Sensors Journal. - 2006. - Vol. 6, No. 2. - P. 301-309.

J515. Narayanan A. Dielectrophoretic integration of nanodevices with CMOS VLSI circuitry. / Narayanan A., Dan Y., Deshpande V., Nicole Di Lello, Evoy S., Raman S. // IEEE Transactions on Nanotechnology. - 2006. - Vol. 5, No. 2. - P. 101-109.

J516. Fang Xiao-Sheng. Regular MgO nanoflowers and their enhanced dielectric responses. / Fang Xiao-Sheng, Ye Chang-Hui, Xie Ting, Wang Zhen-Yang, Zhao Jian-Wei, Zhang Li-De. // Applied Physics Letters. - 2006. - Vol. 88, No. 1. - P. 013101-013101-3.

J517. Liu C. Effects of cellular fine structure on scattered light pattern. / Liu C., Capjack C.E. // IEEE Transactions on NanoBioscience. - 2006. - Vol. 5, No. 2. - P. 76-82.

J518. Jian-Qing Wang. Effect of Annealing on Extraordinary Hall Effects in Sputtered Granular Cu Co Thin Films. / Jian-Qing Wang, Kim N.H. // IEEE Transactions on Magnetics. - 2006. - Vol. 42, No. 10. - P. 3282-3284.

J519. Aita C. R. Mosaic nanostructure of Ti O 2 with rutile short-range atomic order. and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2006. - Vol. 24, No. 6. - P. 2054-2060.

J520. Heping Chen. CAD-guided automated nanoassembly using atomic force microscopy-based nonrobotics. / Heping Chen, Ning Xi, Guangyong Li. // IEEE Transactions on Automation Science and Engineering. - 2006. - Vol. 3, No. 3. - P. 208-217.

J521. Kucheyev S. O. Monolithic, high surface area, three-dimensional GeO 2 nanostructures. / Kucheyev S. O., Baumann T. F., Wang Y. M., van Buuren T., Poco J. F., Satcher J. H., Hamza A. V. // Applied Physics Letters. - 2006. - Vol. 88, No. 10. - P. 103117-103117-3.

J522. Iovan A. Diode effect in asymmetric double-tunnel barriers with single-metal nanoclusters. / Iovan A., Haviland D. B., Korenivski V. // Applied Physics Letters. - 2006. - Vol. 88, No. 16. - P. 163503-163503-3.

J523. Schroer C. G. Mapping the local nanostructure inside a specimen by tomographic small-angle x-ray scattering. / Schroer C. G., Kuhlmann M., Roth S. V., Gehrke R., Stribeck N., Almendarez-Camarillo A., Lengeler B. // Applied Physics Letters. - 2006. - Vol. 88, No. 16. - P. 164102-164102-3.

J524. Liu M. Effect of post deposition annealing on the optical properties of Hf O x N y films. / Liu M., Fang Q., He G., Li L., Zhu L. Q., Li G. H., Zhang L. D. // Applied Physics Letters. - 2006. - Vol. 88, No. 19. - P. 192904-192904-3.

J525. Fissel A. Cooperative solid-vapor-phase epitaxy: An approach for fabrication of single-crystalline insulator/Si/insulator nanostructures. / Fissel A., Kuhne D., Bugiel E., Osten H. J. // Applied Physics Letters. - 2006. - Vol. 88, No. 15. - P. 153105-153105-3.

J526. Murayama A. Nanoscale magnet for semiconductor spintronics. / Murayama A., Sakuma M. // Applied Physics Letters. - 2006. - Vol. 88, No. 12. - P. 122504-122504-3.

J527. Mohan Premila. Fabrication of In P /In As /In P core-multishell heterostructure nanowires by selective area metalorganic vapor phase epitaxy. / Mohan Premila, Motohisa Junichi, Fukui Takashi. // Applied Physics Letters. - 2006. - Vol. 88, No. 13. - P. 133105-133105-3.

J528. Li Y. J. Zn Ga 2 O 4 nanotubes with sharp cathodoluminescence peak. / Li Y. J., Lu M. Y., Wang C. W., Li K. M., Chen L. J. // Applied Physics Letters. - 2006. - Vol. 88, No. 14. - P. 143102-143102-3.

J529. Popescu D.P. Anisotropy of Carrier Transport in the Active Region of Lasers With Self-Assembled InAs Quantum Dashes. / Popescu D.P., Malloy K.J. // IEEE Photonics Technology Letters. - 2006. - Vol. 18, No. 22. - P. 2401-2403.

J530. Yanagisawa Yoshihiko. Nanoscale patterning of (La ,Pr ,Ca)Mn O 3 thin film using atomic force microscopy lithography and their electrical properties. / Yanagisawa Yoshihiko, Hirooka Motoyuki, Tanaka Hidekazu, Kawai Tomoji. // Journal of Applied Physics. - 2006. - Vol. 100, No. 12. - P. 124316-124316-4.

J531. Davidenko N. A. Thermal influence on passing of polarized light through the Sn O 2 :In 2 O 3 layers. / Davidenko N. A., Pavlov V. A., Chuprina N. G., Davidenko I. I., Baath L. // Journal of Applied Physics. - 2006. - Vol. 100, No. 2. - P. 023111-023111-3.

J532. Wang Q. Diamond cone arrays with controlled morphologies formed by self-organized selective ions sputtering. / Wang Q., Gu C. Z., Xu Z., Li J. J., Wang Z. L., Bai X. D., Cui Z. // Journal of Applied Physics. - 2006. - Vol. 100, No. 3. - P. 034312-034312-5.

J533. Peranio N. Structural and thermoelectric properties of epitaxially grown Bi 2 Te 3 thin films and superlattices. / Peranio N., Eibl O., Nurnus J. // Journal of Applied Physics. - 2006. - Vol. 100, No. 11. - P. 114306-114306-10.

J534. Shiojiri M. Structural and compositional analyses of a strained Al Ga N /Ga N superlattice. / Shiojiri M., Ceh M., Sturm S., Chuo C. C., Hsu J. T., Yang J. R., Saijo H. // Journal of Applied Physics. - 2006. - Vol. 100, No. 1. - P. 013110-013110-7.

J535. Suzuki Makoto. Bright contrast imaging of carbon nanofiber-substrate interface. / Suzuki Makoto, Ominami Yusuke, Ngo Quoc, Yang Cary Y., Yamada Toshishige, Cassell Alan M., Li Jun. // Journal of Applied Physics. - 2006. - Vol. 100, No. 10. - P. 104305-104305-5.

J536. Garrity Patrick L. Quantum decoherence of nanodevices under convective and radiative boundary conditions. Journal of Applied Physics. - 2006. - Vol. 100, No. 10. - P. 104316-104316-9.

J537. Pokrovsky A. L. Transition radiation in metal-metal multilayer nanostructures as a medical source of hard x-ray radiation. / Pokrovsky A. L., Kaplan A. E., Shkolnikov P. L. // Journal of Applied Physics. - 2006. - Vol. 100, No. 4. - P. 044328-044328-8.

J538. L. Kiran Swaroop Kumar. Overlapping Double-Hole Nanostructure in a Metal Film for Localized Field Enhancement. / L. Kiran Swaroop Kumar, Reuven Gordon. // IEEE Journal of Selected Topics in Quantum Electronics. - 2006. - Vol. 12, No. 6. - P. 1228-1232.

J539. Noda S. Recent Progresses and Future Prospects of Two- and Three-Dimensional Photonic Crystals. Journal of Lightwave Technology. - 2006. - Vol. 24, No. 12. - P. 4554-4567.

J540. Kumar L. K. S. Overlapping Double-Hole Nanostructure in a Metal Film for Localized Field Enhancement. / Kumar L. K. S., Gordon R. // IEEE Journal of Selected Topics in Quantum Electronics. - 2006. - Vol. 12, No. 6. - P. 1228-1232.

J541. Coelho T. M. Characterization of natural nanostructured hydroxyapatite obtained from the bones of Brazilian river fish. / Coelho T. M., Nogueira E. S., Steimacher A., Medina A. N., Weinand W. R., Lima W. M., Baesso M. L., Bento A. C. // Journal of Applied Physics. - 2006. - Vol. 100, No. 9. - P. 094312-094312-6.

J542. Daraio Chiara. Impact response by a foamlike forest of coiled carbon nanotubes. / Daraio Chiara, Nesterenko Vitali F., Jin Sungho, Wang Wei, Rao Apparao M. // Journal of Applied Physics. - 2006. - Vol. 100, No. 6. - P. 064309-064309-4.

J543. Van T. T. Nanostructure and temperature-dependent photoluminescence of Er-doped Y 2 O 3 thin films

for micro-optoelectronic integrated circuits. / Van T. T., Hoang J., Ostroumov R., Wang K. L., Bargar J. R., Lu J., Blom H.-O., Chang J. P. // Journal of Applied Physics. - 2006. - Vol. 100, No. 7. - P. 073512-073512-7.

J544. He G. Silicate layer formation at HfO2 /SiO2 /Si interface determined by x-ray photoelectron spectroscopy and infrared spectroscopy. / He G., Zhang L. D., Fang Q. // Journal of Applied Physics. - 2006. - Vol. 100, No. 8. - P. 083517-083517-5.

J545. Zhang Z. H. Transmission electron microscopy investigation of self-assembly ZnO twinning nanostructures. / Zhang Z. H., Liu H. H., Jian J. K., Zou K., Duan X. F. // Applied Physics Letters. - 2006. - Vol. 88, No. 19. - P. 193101-193101-3.

J546. Cui B. Z. Structure and magnetic properties of FePt and FePt-Ag nanostructured magnets by cyclic cold rolling. / Cui B. Z., Han K., Garmestani H., Schneider-Muntau H. J. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08E910-08E910-3.

J547. Zeng Qi. Nanostructured Mn-Al permanent magnets produced by mechanical milling. / Zeng Qi, Baker Ian, Yan Zhi-cheng. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08E902-08E902-3.

J548. Uhlig W. Casey. Size-dependent transition from shape to exchange dominated magnetic nanostructure. / Uhlig W. Casey, Unguris John. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08G302-08G302-3.

J549. Joshi Shashidhar. Structure and magnetism of nanocrystalline exchange-coupled (Ni 0.67 Co 0.25 Fe 0.08)89-x Zr 7 B 4 Cu x (x=0,1) films. / Joshi Shashidhar, Yoon Soack Dae, Yang Aria, Sun Nian X., Vittoria Carmine, Harris Vincent G., Goswami Ramasis, Willard Matthew, Shi Ning. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08F115-08F115-3.

J550. 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.

J551. Goerigk G. Temperature induced differences in the nanostructure of hot-wire deposited silicon-germanium alloys analyzed by anomalous small-angle x-ray scattering. / Goerigk G., Williamson D. L. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 084309-084309-8.

J552. 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.

J553. Socolovsky L. M. Nanostructure and giant Hall effect in TM x (Si O 2)1-x (TM =Co ,Fe ,Ni) granular system. / Socolovsky L. M., Oliveira C. L. P., Denardin J. C., Knobel M., Torriani I. L. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08C511-08C511-3.

J554. Alemu A. Dependence of device performance on carrier escape sequence in multi-quantum-well p-i-n solar cells. / Alemu A., Coaquira J. A. H., Freundlich A. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 084506-084506-5.

J555. Konovalenko A. Spin-torque driven excitations and hysteresis in magnetic point contacts. / Konovalenko A., Korenivski V., Yanson I. K., Naidyuk Yu. G. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08G503-08G503-3.

J556. Ban Shuai. Pattern storage and recognition using ferrofluids. / Ban Shuai, Korenivski V. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08R907-08R907-3.

J557. Lee S. G. Strain and magnetic anisotropy of epitaxial Ni /Cu (001) nanostructures. / Lee S. G., Shin S. W., Jang J. W., Hwang H. M., Jang H. K., Lee J., Lee J. H., Song J. H., Choi J.-Y., Lee H. S. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08Q513-08Q513-3.

J558. Lui G. P. Nanowire based quantum interference sensors for electromagnetic radiation. / Lui G. P., Qiao Bi, Ruda H. E. // Journal of Applied Physics. - 2006. - Vol. 99, No. 9. - P. 094306-094306-10.

J559. Serrano-Guisan Santiago. Thermoelectrical study of ferromagnetic nanowire structures. / Serrano-Guisan Santiago, Gravier Laurent, Abid Mohamed, Ansermet J.-Ph. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08T108-08T108-3.

J560. Guo Qian. Molecular rheology of perfluoropolyether lubricant via nonequilibrium molecular dynamics simulation. / Guo Qian, Chung Pil Seung, Chen Haigang, Jhon Myung S. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08N105-08N105-3.

J561. Yan M. L. Nanostructure and magnetic properties of highly (001) oriented L10 (Fe 49 Pt 51)1-x Cu x films. / Yan M. L., Xu Y. F., Sellmyer D. J. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08G903-08G903-3.

J562. Dorfbauer F. Nanostructure calculation of CoAg core-shell clusters. / Dorfbauer F., Schrefl T., Kirschner M., Hrkac G., Suess D., Ertl O., Fidler J. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08G706-08G706-3.

J563. Urech M. Enhanced spin accumulation in a superconductor. / Urech M., Johansson J., Poli N., Korenivski V., Haviland D. B. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08M513-08M513-3.

J564. Poli N. Spin-flip scattering at Al surfaces. / Poli N., Urech M., Korenivski V., Haviland D. B. // Journal of Applied Physics. - 2006. - Vol. 99, No. 8. - P. 08H701-08H701-3.

J565. Shiao Wen-Yu. Comparison of nanostructure characteristics of ZnO grown on GaN and sapphire. / Shiao Wen-Yu, Chi Chun-Yung, Chin Shu-Cheng, Huang Chi-Feng, Tang Tsung-Yi, Lu Yen-Cheng, Lin Yu-Li, Hong Lin, Jen Fang-Yi, Yang C. C., Zhang Bao-Ping, Segawa Yusaburo. // Journal of Applied Physics. - 2006. - Vol. 99, No. 5. - P. 054301-054301-6.

J566. Wang X.-S. Self-assembly of antimony nanowires on graphite. / Wang X.-S., Kushvaha S. S., Yan Z., Xiao W. // Applied Physics Letters. - 2006. - Vol. 88, No. 23. - P. 233105-233105-3.

J567. Zhu L. Q. Thermal stability and energy-band alignment of nitrogen-incorporated Zr O 2 films on Si(100). / Zhu L. Q., Zhang L. D., Li G. H., He G., Liu M., Fang Q. // Applied Physics Letters. - 2006. - Vol. 88, No. 23. - P. 232901-232901-3.

J568. Sundstrom Linnea. Patterning 20 nm half-pitch lines on silicon using a self-assembled organosilicate etch mask. / Sundstrom Linnea, Krupp Leslie, Delenia Eugene, Rettner Charles, Sanchez Martha, Hart Mark W., Kim Ho-Cheol, Zhang Ying. // Applied Physics Letters. - 2006. - Vol. 88, No. 24. - P. 243107-243107-3.

J569. Huang G. L. Modeling heterostructures of nanophononic crystals by continuum model with microstructures. / Huang G. L., Sun C. T. // Applied Physics Letters. - 2006. - Vol. 88, No. 26. - P. 261908-261908-3.

J570. Sarpe-Tudoran C. Plasma dynamics of water breakdown at a water surface induced by femtosecond laser pulses. / Sarpe-Tudoran C., Assion A., Wollenhaupt M., Winter M., Baumert T. // Applied Physics Letters. - 2006. - Vol. 88, No. 26. - P. 261109-261109-3.

J571. Wang C. C. Magnetic and transport properties of multilayer nanoscale antidot arrays. / Wang C. C., Adeyeye A. O., Singh N. // Applied Physics Letters. - 2006. - Vol. 88, No. 22. - P. 222506-222506-3.

J572. Che Xiao-Ling. Porous InP array-directed assembly of InAs nanostructure. / Che Xiao-Ling, Li Lu, Liu Feng-Qi, Huang Xiu-Qi, Wang Zhan-Guo. // Applied Physics Letters. - 2006. - Vol. 88, No. 26. - P. 263107-263107-3.

J573. Zheng Y. B. Fabrication of tunable nanostructure arrays using ion-polishing-assisted nanosphere lithography. / Zheng Y. B., Wang S. J., Huan A. C. H., Wang Y. H. // Journal of Applied Physics. - 2006. - Vol. 99, No. 3. - P. 034308-034308-4.

J574. Zhou Y. Direct femtosecond laser nanopatterning of glass substrate by particle-assisted near-field enhancement. / Zhou Y., Hong M. H., Fuh JYH, Lu L., Lukyanchuk B. S., Wang Z. B., Shi L. P., Chong T. C. // Applied Physics Letters. - 2006. - Vol. 88, No. 2. - P. 023110-023110-3.

J575. Lu T. C. Low-temperature high-pressure preparation of transparent nanocrystalline Mg Al 2 O 4 ceramics. / Lu T. C., Chang X. H., Qi J. Q., Luo X. J., Wei Q. M., Zhu S., Sun K., Lian J., Wang L. M. // Applied Physics Letters. - 2006. - Vol. 88, No. 21. - P. 213120-213120-3.

J576. Scudino S. High strength hexagonal structured dendritic phase reinforced Zr-Ti-Ni bulk alloy with

enhanced ductility. / Scudino S., Das J., Stoica M., Kim K. B., Kusy M., Eckert J. // Applied Physics Letters. - 2006. - Vol. 88, No. 20. - P. 201920-201920-3.

J577. Collard C. RF plasma conditions for growth of carbon nanostructures. / Collard C., Holloway J.P., Brake M.L. // IEEE Transactions on Plasma Science. - 2005. - Vol. 33, No. 1. - P. 170-175.

J578. Sellmyer D.J. High-anisotropy nanocluster films for high-density perpendicular recording. / Sellmyer D.J., Yan M., Yingfan Xu, Skomski R. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 2. - P. 560-565.

J579. Khitun A. Cellular nonlinear network based on semiconductor tunneling nanostructure. / Khitun A., Wang K.L. // IEEE Transactions on Electron Devices. - 2005. - Vol. 52, No. 2. - P. 183-189.

J580. Wang J.J. Innovative high-performance nanowire-grid polarizers and integrated isolators. / Wang J.J., Jiandong Deng, Xuegong Deng, Feng Liu, Sciortino P., Lei Chen, Nikolov A., Graham A. // IEEE Journal of Selected Topics in Quantum Electronics. - 2005. - Vol. 11, No. 1. - P. 241-253.

J581. Takahashi A. Heat-resistant epoxy-silicon hybrid materials for printed wiring boards. / Takahashi A., Satsu Y., Nagai A., Umino M., Nakamura Y. // IEEE Transactions on Electronics Packaging Manufacturing. - 2005. - Vol. 28, No. 2. - P. 163-167.

J582. Montanari G.C. Space charge phenomenology in polymeric insulating materials. / Montanari G.C., Morshuis P.H.F. // IEEE Transactions on Dielectrics and Electrical Insulation. - 2005. - Vol. 12, No. 4. - P. 754-767.

J583. 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.

J584. Long J.D. In situ catalyzation of carbon nanostructures growth in low-frequency inductively coupled plasmas. / Long J.D., Xu S., Huang S.Y., Rutkevych P.P., Xu M., Diong C.H. // IEEE Transactions on Plasma Science. - 2005. - Vol. 33, No. 2. - P. 240-241.

J585. Gorea A. Structure and magnetic properties of chemically prepared mixtures of crystalline and amorphous Fe(B) nanoparticles. / Gorea A., Ekiert T. F., Pearson E. A., Unruh K. M. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 10F501-10F501-3.

J586. Cui B. Z. Magnetization reversal and nanostructure refinement in magnetically annealed Nd 2 Fe 14 B /alpha -Fe -type nanocomposites. / Cui B. Z., Yu C. T., Han K., Liu J. P., Garmestani H., Pechan M. J., Schneider-Muntau H. J. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 10F308-10F308-3.

J587. 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.

J588. Tang Zhi. Physical models for coupled electromechanical analysis of silicon nanoelectromechanical systems. / Tang Zhi, Xu Yang, Li Gang, Aluru N. R. // Journal of Applied Physics. - 2005. - Vol. 97, No. 11. - P. 114304-114304-13.

J589. Cui Bentao. Nanostructure formation during ion-assisted growth of GaN by molecular beam epitaxy. / Cui Bentao, Cohen P. I., Dabiran A. M. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 104313-104313-6.

J590. Yang L. W. In situ synthesis of Mn-doped ZnO multileg nanostructures and Mn-related Raman vibration. / Yang L. W., Wu X. L., Huang G. S., Qiu T., Yang Y. M. // Journal of Applied Physics. - 2005. - Vol. 97, No. 1. - P. 014308-014308-4.

J591. Brosseau Christian. Effective magnetic permeability of Ni and Co micro- and nanoparticles embedded in a ZnO matrix. / Brosseau Christian, Talbot Philippe. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 104325-104325-11.

J592. Zhou X. T. One-dimensional zigzag gallium nitride nanostructures. / Zhou X. T., Sham T. K., Shan Y. Y., Duan X. F., Lee S. T., Rosenberg R. A. // Journal of Applied Physics. - 2005. - Vol. 97, No. 10. - P. 104315-

104315-6.

J593. Dery H. The impact of energy band diagram and inhomogeneous broadening on the optical differential gain in nanostructure lasers. / Dery H., Eisenstein G. // IEEE Journal of Quantum Electronics. - 2005. - Vol. 41, No. 1. - P. 26-35.

J594. Johnson S. Effect of crystal orientation on self-assembled silicon nanostructures formed by electron-beam annealing. / Johnson S., Markwitz A., Rudolphi M., Baumann H., Kuo P.-Y., Blaikie R., Mucklich A. // Journal of Applied Physics. - 2005. - Vol. 97, No. 9. - P. 094301-094301-4.

J595. Sung-Jei Hong. Low-temperature catalyst adding for tin-oxide nanostructure gas sensors. / Sung-Jei Hong, Jeong-In Han. // IEEE Sensors Journal. - 2005. - Vol. 5, No. 1. - P. 12-19.

J596. Rey-de-Castro R. Cd1-x Mnx Te semimagnetic semiconductors for ultrafast spintronics and magnetooptics. / Rey-de-Castro R., Daozhi Wang, Verevkin A., Mycielski A., Sobolewski R. // IEEE Transactions on Nanotechnology. - 2005. - Vol. 4, No. 1. - P. 106-112.

J597. Jacobsohn L. G. The effects of ion irradiation on porous silicon photoluminescence. / Jacobsohn L. G., Bennett B. L., Cooke D. W., Muenchausen R. E., Nastasi M. // Journal of Applied Physics. - 2005. - Vol. 97, No. 3. - P. 033528-033528-5.

J598. Randolph S. J. Effects of heat generation during electron-beam-induced deposition of nanostructures. / Randolph S. J., Fowlkes J. D., Rack P. D. // Journal of Applied Physics. - 2005. - Vol. 97, No. 12. - P. 124312-124312-8.

J599. Barreca Davide. Silica-supported silver nanoparticles: Tailoring of structure-property relationships. / Barreca Davide, Gasparotto Alberto, Maragno Cinzia, Tondello Eugenio, Gialanella Stefano. // Journal of Applied Physics. - 2005. - Vol. 97, No. 5. - P. 054311-054311-8.

J600. Rong Chuan-Bing. Coherent precipitation in the TbCu 7 -type GdCo -based ribbons prepared by simple processing. / Rong Chuan-Bing, Zhang Hong-Wei, Zhang Jian, Du Xiao-Bo, Zhang Shao-Ying, Shen Bao-Gen. // Journal of Applied Physics. - 2005. - Vol. 97, No. 3. - P. 033907-033907-4.

J601. Hrkac G. Influence of eddy current on magnetization processes in submicrometer permalloy structures. / Hrkac G., Schrefl T., Ertl O., Suess D., Kirschner M., Dorfbauer F., Fidler J. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3097-3099.

J602. Beydaghyan Gisia. Ex situ ellipsometric investigation of nanocolumns inclination angle of obliquely evaporated silicon thin films. / Beydaghyan Gisia, Buzea Cristina, Cui Yan, Elliott Chelsea, Robbie Kevin. // Applied Physics Letters. - 2005. - Vol. 87, No. 15. - P. 153103-153103-3.

J603. Palinginis Phedon. Ultraslow light (200 m /s) propagation in a semiconductor nanostructure. / Palinginis Phedon, Crankshaw Shanna, Sedgwick Forrest, Kim Eui-Tae, Moewe Michael, Chang-Hasnain Connie J., Wang Hailin, Chuang Shun-Lien. // Applied Physics Letters. - 2005. - Vol. 87, No. 17. - P. 171102-171102-3.

J604. Sousa M. E. Patterning lyotropic liquid crystals as precursors for carbon nanotube arrays. / Sousa M. E., Cloutier S. G., Jian K. Q., Weissman B. S., Hurt R. H., Crawford G. P. // Applied Physics Letters. - 2005. - Vol. 87, No. 17. - P. 173115-173115-3.

J605. Yamada Y. Epitaxial nanostructure and defects effective for pinning in Y (RE)Ba 2 Cu 3 O 7-x coated conductors. / Yamada Y., Takahashi K., Kobayashi H., Konishi M., Watanabe T., Ibi A., Muroga T., Miyata S., Kato T., Hirayama T., Shiohara Y. // Applied Physics Letters. - 2005. - Vol. 87, No. 13. - P. 132502-132502-3.

J606. Hor Y. S. Superconducting NbSe 2 nanowires and nanoribbons converted from NbSe 3 nanostructures. / Hor Y. S., Welp U., Ito Y., Xiao Z. L., Patel U., Mitchell J. F., Kwok W. K., Crabtree G. W. // Applied Physics Letters. - 2005. - Vol. 87, No. 14. - P. 142506-142506-3.

J607. Lu Y. H. Effect of B content on nanostructure evolution and twinning deformation of nanocrystallite in nc -Ti (N ,B)/a-(Ti B 2 ,B N) nanocomposite thin films. / Lu Y. H., Xu Z. K., Chen Haydn, Shen Y. G., Li K. Y. // Applied Physics Letters. - 2005. - Vol. 87, No. 15. - P. 151902-151902-3.

J608. Wang Ruey-Chi. ZnO symmetric nanosheets integrated with nanowalls. / Wang Ruey-Chi, Liu Chuan-Pu, Huang Jow-Lay, Chen Shu-Jen. // Applied Physics Letters. - 2005. - Vol. 87, No. 5. - P. 053103-053103-3.

J609. Taylor Curtis R. Nanoscale dislocation patterning by ultralow load indentation. / Taylor Curtis R., Stach Eric A., Salamo Gregory, Malshe Ajay P. // Applied Physics Letters. - 2005. - Vol. 87, No. 7. - P. 073108-073108-3.

J610. Chaudhuri Debangshu. Self-organization of polyaniline nanorods: Towards achieving a higher conductivity. / Chaudhuri Debangshu, Datar Suwarna, Viswanatha Ranjani, Sarma D. D., Amenitsch Heinz. // Applied Physics Letters. - 2005. - Vol. 87, No. 9. - P. 093117-093117-3.

J611. Zhu Y. W. Efficient field emission from alpha -Fe 2 O 3 nanoflakes on an atomic force microscope tip. / Zhu Y. W., Yu T., Sow C. H., Liu Y. J., Wee A. T. S., Xu X. J., Lim C. T., Thong J. T. L. // Applied Physics Letters. - 2005. - Vol. 87, No. 2. - P. 023103-023103-3.

J612. Lopez-Richard V. Intraband magnetoabsorption as a probing tool for the quantum dot charge. / Lopez-Richard V., Alcalde A. M., Prado S. J., Marques G. E., Trallero-Giner C. // Applied Physics Letters. - 2005. - Vol. 87, No. 23. - P. 231101-231101-3.

J613. Matsuda K. Local density of states mapping of a field-induced quantum dot by near-field photoluminescence microscopy. / Matsuda K., Saiki T., Nomura S., Aoyagi Y. // Applied Physics Letters. - 2005. - Vol. 87, No. 4. - P. 043112-043112-3.

J614. Jin-Seung Jung. Synthesis and magnetic characterization of ZnFe2 O4 nanostructure in AAO template. / Jin-Seung Jung, Yun-Ku Jung, Eun-Mee Kim, Seok-Hong Min, Jong-Ho Jun, Malkinski L.M., Barnakov Y., Spinu L., Stokes K. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3403-3405.

J615. Hu G. Rotation and wall propagation in multidomain Co/Pd islands. / Hu G., Thomson T., Rettner C.T., Terris B.D. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3589-3591.

J616. Togawa K. High-sensitivity InSb thin-film micro-Hall sensor arrays for simultaneous multiple detection of magnetic beads for biomedical applications. / Togawa K., Sanbonsugi H., Lapicki A., Abe M., Handa H., Sandhu A. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3661-3663.

J617. Gonzalez J.M. Reversible magnetization variations in large field ranges associated to periodic arrays of antidots. / Gonzalez J.M., Chubykalo-Fesenko O.A., Garcia-Sanchez F., Bruna J.M.T., Bartolome J., Vinuesa L.M.G. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3106-3108.

J618. Hu J. Nanostructure and magnetic properties of As-quenched Fe-based ribbons. / Hu J., Bo Li, Hongwei Qin, Minhua Jiang. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3268-3270.

J619. Seung Pil Ko. Control of magnetic behavior in Fe3 O4 nanostructures. / Seung Pil Ko, Joon-Young Soh, Young Keun Kim. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3304-3306.

J620. Murakami M. Tunable multiferroic properties in nanocomposite PbTiO 3 -CoFe 2 O 4 epitaxial thin films. / Murakami M., Chang K.-S., Aronova M. A., Lin C.-L., Yu Ming H., Simpers J. Hattrick, Wuttig M., Takeuchi I., Gao C., Hu B., Lofland S. E., Knauss L. A., Bendersky L. A. // Applied Physics Letters. - 2005. - Vol. 87, No. 11. - P. 112901-112901-3.

J621. Li Jing-Liang. Architecture and engineering of a supramolecular functional material by manipulating the nanostructure of fiber network. / Li Jing-Liang, Liu Xiang-Yang. // Applied Physics Letters. - 2005. - Vol. 87, No. 11. - P. 113103-113103-3.

J622. Prakelt A. Filling a spectral hole via self-phase modulation. / Prakelt A., Wollenhaupt M., Sarpe-Tudoran C., Assion A., Baumert T. // Applied Physics Letters. - 2005. - Vol. 87, No. 12. - P. 121113-121113-3.

J623. Jianhua Yin. High coercivity Co-ferrite thin films on SiO2 (100) substrate prepared by sputtering and PLD. / Jianhua Yin, Jun Ding, Binghai Liu, Yongchao Wang, Jiabao Yi, Jingsheng Chen, Xiangshui Miao. // IEEE Transactions on Magnetics. - 2005. - Vol. 41, No. 10. - P. 3904-3906.

J624. Xu Li. Recent progress in exact and reduced-order modeling of light-scattering properties of complex structures. / Xu Li, Taflove A., Backman V. // IEEE Journal of Selected Topics in Quantum Electronics. - 2005. -

Vol. 11, No. 4. - P. 759-765.

J625. Nagata T. GaN nanostructure fabrication by focused-ion-beam-assisted chemical vapor deposition. / Nagata T., Ahmet P., Sakuma Y., Sekiguchi T., Chikyow T. // Applied Physics Letters. - 2005. - Vol. 87, No. 1. - P. 013103-013103-3.

J626. Neogi A. Near-field optical spectroscopy and microscopy of self-assembled Ga N /Al N nanostructures. / Neogi A., Gorman B. P., Morkoc H., Kawazoe T., Ohtsu M. // Applied Physics Letters. - 2005. - Vol. 86, No. 4. - P. 043103-043103-3.

J627. Lin Wen-Chin. Self-aligned Co nanoparticle chains supported by single-crystalline Al 2 O 3 /Ni Al (100) template. / Lin Wen-Chin, Kuo Chien-Cheng, Luo Meng-Fan, Song Ker-Jar, Lin Minn-Tsong. // Applied Physics Letters. - 2005. - Vol. 86, No. 4. - P. 043105-043105-3.

J628. Baker M. A. Investigation of the nanostructure and wear properties of physical vapor deposited CrCuN nanocomposite coatings. / Baker M. A., Kench P. J., Tsotsos C., Gibson P. N., Leyland A., Matthews A. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 3. - P. 423-433.

J629. Sanjabi S. Binary and ternary NiTi-based shape memory films deposited by simultaneous sputter deposition from elemental targets. / Sanjabi S., Cao Y. Z., Sadrnezhaad S. K., Barber Z. H. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 5. - P. 1425-1429.

J630. Hrudey P. C. P. Optical properties of porous nanostructured Y 2 O 3 :Eu thin films. / Hrudey P. C. P., Taschuk M., Tsui Y. Y., Fedosejevs R., Brett M. J. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 4. - P. 856-861.

J631. Suemori Kouji. Three-layered organic solar cells incorporating a nanostructure-optimized phthalocyanine:fullerene codeposited interlayer. / Suemori Kouji, Miyata Takahiro, Yokoyama Masaaki, Hiramoto Masahiro. // Applied Physics Letters. - 2005. - Vol. 86, No. 6. - P. 063509-063509-3.

J632. 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.

J633. Wang Jian Jim. High performance 100 mm -in-diameter true zero-order waveplates fabricated by imprint lithography. / Wang Jian Jim, Deng Xuegong, Liu Feng, Chen Lei, Nikolov Anguel, Liu Xiaoming, Deng Jiandong, Sciortino Paul. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2950-2953.

J634. Wang W. J. Nonvolatile phase change memory nanocell fabrication by femtosecond laser writing assisted with near-field optical microscopy. / Wang W. J., Zhao R., Shi L. P., Miao X. S., Tan P. K., Hong M. H., Chong T. C., Wu Y. H., Lin Y. // Journal of Applied Physics. - 2005. - Vol. 98, No. 12. - P. 124313-124313-6.

J635. Stepanova M. Copper nanopattern on Si O 2 from sputter etching a Cu /Si O 2 interface. / Stepanova M., Dew S. K., Soshnikov I. P. // Applied Physics Letters. - 2005. - Vol. 86, No. 7. - P. 073112-073112-3.

J636. Bielejec E. Tunneling and nonlinear transport in a vertically coupled GaAs /AlGaAs double quantum wire system. / Bielejec E., Seamons J. A., Reno J. L., Lilly M. P. // Applied Physics Letters. - 2005. - Vol. 86, No. 8. - P. 083101-083101-3.

J637. Suga T. Characterization of nanotextured AlN thin films by x-ray absorption near-edge structures. / Suga T., Kameyama S., Yoshioka S., Yamamoto T., Tanaka I., Mizoguchi T. // Applied Physics Letters. - 2005. - Vol. 86, No. 16. - P. 163113-163113-3.

J638. Kim K. B. Propagation of shear bands in Ti 66.1 Cu 8 Ni 4.8 Sn 7.2 Nb 13.9 nanostructure-dendrite composite during deformation. / Kim K. B., Das J., Baier F., Eckert J. // Applied Physics Letters. - 2005. - Vol. 86, No. 17. - P. 171909-171909-3.

J639. Scherbakov A. V. Spin control in heteromagnetic nanostructures. / Scherbakov A. V., Akimov A. V., Yakovlev D. R., Ossau W., Hansen L., Waag A., Molenkamp L. W. // Applied Physics Letters. - 2005. - Vol. 86, No. 16. - P. 162104-162104-3.

J640. Mayrhofer P. H. Self-organized nanocolumnar structure in superhard TiB 2 thin films. / Mayrhofer P. H., Mitterer C., Wen J. G., Greene J. E., Petrov I. // Applied Physics Letters. - 2005. - Vol. 86, No. 13. - P. 131909-131909-3.

J641. Tang Y. B. Field emission from AlN nanorod array. / Tang Y. B., Cong H. T., Zhao Z. G., Cheng H. M. // Applied Physics Letters. - 2005. - Vol. 86, No. 15. - P. 153104-153104-3.

J642. Nam C. Y. Focused-ion-beam platinum nanopatterning for GaN nanowires: Ohmic contacts and patterned growth. / Nam C. Y., Kim J. Y., Fischer J. E. // Applied Physics Letters. - 2005. - Vol. 86, No. 19. - P. 193112-193112-3.

J643. Liu W. L. Assembly and characterization of hybrid virus-inorganic nanotubes. / Liu W. L., Alim K., Balandin A. A., Mathews D. M., Dodds J. A. // Applied Physics Letters. - 2005. - Vol. 86, No. 25. - P. 253108-253108-3.

J644. Vlcek Jaroslav. Reactive magnetron sputtering of hard Si-B-C-N films with a high-temperature oxidation resistance. / Vlcek Jaroslav, Potocky Stepan, Cizek Jiri, Houska Jiri, Kormunda Martin, Zeman Petr, Perina Vratislav, Zemek Josef, Setsuhara Yuichi, Konuma Seiji. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2005. - Vol. 23, No. 6. - P. 1513-1522.

J645. Korenivski V. Thermally activated switching in spin-flop tunnel junctions. / Korenivski V., Worledge D. C. // Applied Physics Letters. - 2005. - Vol. 86, No. 25. - P. 252506-252506-3.

J646. Yang X. G. Nanostructured tungsten carbide catalysts for polymer electrolyte fuel cells. / Yang X. G., Wang C. Y. // Applied Physics Letters. - 2005. - Vol. 86, No. 22. - P. 224104-224104-3.

J647. Tang Yongbing. An array of Eiffel-tower-shape AlN nanotips and its field emission properties. / Tang Yongbing, Cong Hongtao, Chen Zhigang, Cheng Huiming. // Applied Physics Letters. - 2005. - Vol. 86, No. 23. - P. 233104-233104-3.

J648. Kalinin Sergei V. Electronic transport imaging in a multiwire SnO 2 chemical field-effect transistor device. / Kalinin Sergei V., Shin J., Jesse S., Geohegan D., Baddorf A. P., Lilach Y., Moskovits M., Kolmakov A. // Journal of Applied Physics. - 2005. - Vol. 98, No. 4. - P. 044503-044503-8.

J649. Goulpeau Jacques. Experimental study and modeling of polydimethylsiloxane peristaltic micropumps. / Goulpeau Jacques, Trouchet Daniel, Ajdari Armand, Tabeling Patrick. // Journal of Applied Physics. - 2005. - Vol. 98, No. 4. - P. 044914-044914-9.

J650. Tabbal M. Correlation between the sp2 -phase nanostructure and the physical properties of unhydrogenated carbon nitride. / Tabbal M., Christidis T., Isber S., Merel P., El Khakani M. A., Chaker M., Amassian A., Martinu L. // Journal of Applied Physics. - 2005. - Vol. 98, No. 4. - P. 044310-044310-8.

J651. Nakamatsu Ken-ichiro. Nanoimprint and nanocontact technologies using hydrogen silsesquioxane. / Nakamatsu Ken-ichiro, Watanabe Keiichiro, Tone Katsuhiko, Namatsu Hideo, Matsui Shinji. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 2. - P. 507-512.

J652. Narvaez Gustavo A. Dependence of the electronic structure of self-assembled (In ,Ga)As /Ga As quantum dots on height and composition. / Narvaez Gustavo A., Bester Gabriel, Zunger Alex. // Journal of Applied Physics. - 2005. - Vol. 98, No. 4. - P. 043708-043708-12.

J653. Nazzal Amjad Y. Electronic properties and tunability in Si quantum rings. / Nazzal Amjad Y., Fu Huaxiang, Wang Lin-Wang. // Journal of Applied Physics. - 2005. - Vol. 98, No. 8. - P. 083703-083703-4.

J654. Dashevsky Z. Physical properties and inversion of conductivity type in nanocrystalline PbTe films. / Dashevsky Z., Kreizman R., Dariel M. P. // Journal of Applied Physics. - 2005. - Vol. 98, No. 9. - P. 094309-094309-5.

J655. van Popta Andy C. Double-handed circular Bragg phenomena in polygonal helix thin films. / van Popta Andy C., Brett Michael J., Sit Jeremy C. // Journal of Applied Physics. - 2005. - Vol. 98, No. 8. - P. 083517-083517-9.

J656. Hamrle J. Three-dimensional distribution of the spin-polarized current inside nanostructures. / Hamrle J.,

Kimura T., Yang T., Otani Y. // Journal of Applied Physics. - 2005. - Vol. 98, No. 6. - P. 064301-064301-7.

J657. Kim S. Characterization of nanostructure in Si 1-x Ge x epilayers using x-ray reflectivity and fluorescence techniques. / Kim S., Kioseoglou G., Huang S., Kao Y. H., Soo Y. L., Zhu X., Wang K. L. // Journal of Applied Physics. - 2005. - Vol. 98, No. 7. - P. 074309-074309-8.

J658. Kannan Balaji. Chemical patterning for the highly specific and programmed assembly of nanostructures. / Kannan Balaji, Kulkarni Rajan P., Satyanarayana Srinath, Castelino Kenneth, Majumdar Arun. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1364-1370.

J659. Suraprapapich S. Self-assembled quantum-dot molecules by molecular-beam epitaxy. / Suraprapapich S., Thainoi S., Kanjanachuchai S., Panyakeow S. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 3. - P. 1217-1220.

J660. Awazu Koichi. Fabrication of two- and three-dimensional photonic crystals of titania with submicrometer resolution by deep x-ray lithography. / Awazu Koichi, Wang Xiaomin, Fujimaki Makoto, Kuriyama Taketo, Sai Akihide, Ohki Yoshimichi, Imai Hiroaki. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 3. - P. 934-939.

J661. Lu C.-T. Atmospheric pressure operation of a field emission diode based on self-assembled silicon nanostructures. / Lu C.-T., Johnson S., Lansley S. P., Blaikie R. J., Markwitz A. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1445-1449.

J662. Chen Lei. Defect control in nanoimprint lithography. / Chen Lei, Deng Xuegong, Wang Jian, Takahashi Ken, Liu Feng. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 6. - P. 2933-2938.

J663. Harant Adam W. Solvent vapor annealed block copolymer films on organosilane self-assembled monolayers. / Harant Adam W., Bowman Christopher N. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1615-1621.

J664. Johnson S. Patterned growth of self-assembled silicon nanostructures by ion implantation and electron beam annealing. / Johnson S., Markwitz A., Rudolphi M., Baumann H. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 4. - P. 1459-1462.

J665. Lazzeri P. Thin-film transformations and volatile products in the formation of nanoporous low-k polymethylsilsesquioxane-based dielectric. / Lazzeri P., Vanzetti L., Anderle M., Bersani M., Park J. J., Lin Z., Briber R. M., Rubloff G. W., Kim H. C., Miller R. D. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2005. - Vol. 23, No. 3. - P. 908-917.

J666. Dey Sandwip K. Ruthenium films by digital chemical vapor deposition: Selectivity, nanostructure, and work function. / Dey Sandwip K., Goswami Jaydeb, Gu Diefeng, de Waard Henk, Marcus Steve, Werkhoven Chris. // Applied Physics Letters. - 2004. - Vol. 84, No. 9. - P. 1606-1608.

J667. Kim Eui-Tae. High detectivity InAs quantum dot infrared photodetectors. / Kim Eui-Tae, Madhukar Anupam, Ye Zhengmao, Campbell Joe C. // Applied Physics Letters. - 2004. - Vol. 84, No. 17. - P. 3277-3279.

J668. Carey M. J. Giant magnetoresistance in PtMn alloys. / Carey M. J., Banful A. B., Folks L., Gurney B. A., Farrow R. F. C., Kellock A. J. // Applied Physics Letters. - 2004. - Vol. 84, No. 16. - P. 3097-3099.

J669. Sabirianov R. F. First principles study of transition-metal substitutions in Sm -Co permanent magnets. / Sabirianov R. F., Kashyap A., Skomski R., Jaswal S. S., Sellmyer D. J. // Applied Physics Letters. - 2004. - Vol. 85, No. 12. - P. 2286-2288.

J670. Park Jeong Woo. Tribonanolithography of silicon in aqueous solution based on atomic force microscopy. / Park Jeong Woo, Kawasegi Noritaka, Morita Noboru, Lee Deug Woo. // Applied Physics Letters. - 2004. - Vol. 85, No. 10. - P. 1766-1768.

J671. Qiu T. Self-assembled growth and optical emission of silver-capped silicon nanowires. / Qiu T., Wu X. L., Yang X., Huang G. S., Zhang Z. Y. // Applied Physics Letters. - 2004. - Vol. 84, No. 19. - P. 3867-3869.

J672. Kent A. D. Spin-transfer-induced precessional magnetization reversal. / Kent A. D., Ozyilmaz B., del Barco E. // Applied Physics Letters. - 2004. - Vol. 84, No. 19. - P. 3897-3899.

J673. El Dahdah N. Ultrafast InGaAs/InGaAlAs multiple-quantum-well electro-absorption modulator for wavelength conversion at high bit rates. / El Dahdah N., Aubin G., Harmand J.-C., Ramdane A., Shen A., Devaux F., Garreau A., Benkelfat B.-E. // Applied Physics Letters. - 2004. - Vol. 84, No. 21. - P. 4268-4270.

J674. Li Jian-Min. Bulk nanostructure formation directly from the multicomponent alloy melt. Applied Physics Letters. - 2004. - Vol. 84, No. 3. - P. 347-349.

J675. Freericks J. K. Crossover from tunneling to incoherent (bulk) transport in a correlated nanostructure. Applied Physics Letters. - 2004. - Vol. 84, No. 8. - P. 1383-1385.

J676. Zhao Yusheng. Enhancement of fracture toughness in nanostructured diamond-SiC composites. / Zhao Yusheng, Qian Jiang, Daemen Luke L., Pantea Cristian, Zhang Jianzhong, Voronin Georgiy A., Zerda T. Waldek. // Applied Physics Letters. - 2004. - Vol. 84, No. 8. - P. 1356-1358.

J677. Wang Y. C. High-coercivity Co-ferrite thin films on (100)-SiO 2 substrate. / Wang Y. C., Ding J., Yi J. B., Liu B. H., Yu T., Shen Z. X. // Applied Physics Letters. - 2004. - Vol. 84, No. 14. - P. 2596-2598.

J678. Kong David S. Conductive nanostructure fabrication by focused ion beam direct-writing of silver nanoparticles. / Kong David S., Varsanik Jonathan S., Griffith Saul, Jacobson Joseph M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 2987-2991.

J679. Chen Ying. Boron nitride nanotubes: Pronounced resistance to oxidation. / Chen Ying, Zou Jin, Campbell Stewart J., Le Caer Gerard. // Applied Physics Letters. - 2004. - Vol. 84, No. 13. - P. 2430-2432.

J680. Trelenberg T. W. Instrument for the investigation of the nanostructure of Pu and other actinides. / Trelenberg T. W., Glade S. C., Felter T. E., Tobin J. G., Hamza A. V. // Review of Scientific Instruments. - 2004. - Vol. 75, No. 3. - P. 713-718.

J681. Saragi Tobat P. I. Organic phototransistor based on intramolecular charge transfer in a bifunctional spiro compound. / Saragi Tobat P. I, Pudzich Robert, Fuhrmann Thomas, Salbeck Josef. // Applied Physics Letters. - 2004. - Vol. 84, No. 13. - P. 2334-2336.

J682. Sorbello R. S. Dielectric function of thin-film titanium oxide with a granular nanostructure. / Sorbello R. S., DeLoach J. D., Aita C. R., Fejes P. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 6. - P. 2658-2662.

J683. Wang Z. M. Fabrication of (In,Ga)As quantum-dot chains on GaAs(100). / Wang Z. M., Holmes K., Mazur Yu. I., Salamo G. J. // Applied Physics Letters. - 2004. - Vol. 84, No. 11. - P. 1931-1933.

J684. Lee T.-Y. Directed nanostructural evolution in Ti 0.8 Ce 0.2 N layers grown as a function of low-energy, high-flux ion irradiation. / Lee T.-Y., Kodambaka S., Wen J. G., Twesten R. D., Greene J. E., Petrov I. // Applied Physics Letters. - 2004. - Vol. 84, No. 15. - P. 2796-2798.

J685. Qu Shiliang. Metal nanoparticle precipitation in periodic arrays in Au 2 O -doped glass by two interfered femtosecond laser pulses. / Qu Shiliang, Qiu Jianrong, Zhao Chongjun, Jiang Xiongwei, Zeng Huidan, Zhu Congshan, Hirao K. // Applied Physics Letters. - 2004. - Vol. 84, No. 12. - P. 2046-2048.

J686. Ichihara Tsutomu. Correlation between nanostructure and electron emission characteristics of a ballistic electron surface-emitting device. / Ichihara Tsutomu, Baba Toru, Komoda Takuya, Koshida Nobuyoshi. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 3. - P. 1372-1376.

J687. Weng X. Formation and blistering of GaAsN nanostructure layers. / Weng X., Ye W., Goldman R. S., Mabon J. C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2004. - Vol. 22, No. 3. - P. 989-992.

J688. Basu R. Room temperature nanofabrication of atomically registered heteromolecular organosilicon nanostructures using multistep feedback controlled lithography. / Basu R., Guisinger N. P., Greene M. E., Hersam M. C. // Applied Physics Letters. - 2004. - Vol. 85, No. 13. - P. 2619-2621.

J689. Ono H. Noble magnetic films for effective electromagnetic noise absorption in the gigahertz frequency range. / Ono H., Ito T., Yoshida S., Takase Y., Hashimoto O., Shimada Y. // IEEE Transactions on Magnetics. - 2004. - Vol. 40, No. 4. - P. 2853-2857.

J690. Yingfan Xu. Nanostructure and magnetic properties of FePt:C cluster films. / Yingfan Xu, Yan M.L., Sellmyer D.J. // IEEE Transactions on Magnetics. - 2004. - Vol. 40, No. 4. - P. 2525-2527.

J691. Nakagawa W. Tunable optical nanocavity based on modulation of near-field coupling between subwavelength periodic nanostructures. / Nakagawa W., Fainman Y. // IEEE Journal of Selected Topics in Quantum Electronics. - 2004. - Vol. 10, No. 3. - P. 478-483.

J692. Montanari G.C. Modification of electrical properties and performance of EVA and PP insulation through nanostructure by organophilic silicates. / Montanari G.C., Fabiani D., Palmieri F., Kaempfer D., Thomann R., Mulhaupt R. // IEEE Transactions on Dielectrics and Electrical Insulation. - 2004. - Vol. 11, No. 5. - P. 754-762.

J693. Jahanshahi M. Preparation and purification of synthetic protein nanoparticulates. / Jahanshahi M., Williams S., Lyddiatt A., Shojaosadati S.A. // IEE Proceedings - Nanobiotechnology. - 2004. - Vol. 151, No. 5. - P. 176-182.

J694. Korte F. Three-dimensional nanostructuring with femtosecond laser pulses. / Korte F., Koch J., Serbin J., Ovsianikov A., Chichkov B.N. // IEEE Transactions on Nanotechnology. - 2004. - Vol. 3, No. 4. - P. 468-472.

J695. Lixin Dong. Destructive constructions of nanostructures with carbon nanotubes through nanorobotic manipulation. / Lixin Dong, F. Arai, T. Fukuda. // IEEE/ASME Transactions on Mechatronics. - 2004. - Vol. 9, No. 2. - P. 350-357.

J696. Alexson D. Binding of semiconductor quantum dots to cellular integrins. / Alexson D., Yang Li, Ramadurai D., Peng Shi, George L., Uddin M., Thomas P., Rufo S., Dutta M., Stroscio M.A. // IEEE Transactions on Nanotechnology. - 2004. - Vol. 3, No. 1. - P. 86-92.

J697. Singh K. Analysis of cellular structure by light scattering measurements in a new cytometer design based on a liquid-core waveguide. / Singh K., Liu C., Capjack C., Rozmus W., Backhouse C.J. // IEE Proceedings - Nanobiotechnology. - 2004. - Vol. 151, No. 1. - P. 10-16.

J698. Czaplewski D.A. A micromechanical flow sensor for microfluidic applications. / Czaplewski D.A., Ilic B.R., Zalalutdinov M., Olbricht W.L., Zehnder A.T., Craighead H.G., Michalske T.A. // Journal of Microelectromechanical Systems. - 2004. - Vol. 13, No. 4. - P. 576-585.

J699. Southin J.E.A. Finite element modelling of nanostructured piezoelectric resonators (NAPIERs). / Southin J.E.A., Whatmore R.W. // IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control. - 2004. - Vol. 51, No. 6. - P. 654-662.

J700. Binks D.J. Quasi-bound state theory of field-dependent photogeneration from polymer-embedded nanoparticles. IEEE Journal of Quantum Electronics. - 2004. - Vol. 40, No. 8. - P. 1140-1149.

J701. Hillmer H. Low-cost edge-emitting DFB laser arrays for DWDM communication systems implemented by bent and tilted waveguides. / Hillmer H., Klepser B. // IEEE Journal of Quantum Electronics. - 2004. - Vol. 40, No. 10. - P. 1377-1383.

J702. Johnson S. Nanostructuring of silicon (100) using electron beam rapid thermal annealing. / Johnson S., Markwitz A., Rudolphi M., Baumann H. // Journal of Applied Physics. - 2004. - Vol. 96, No. 1. - P. 605-609.

J703. Yater J. E. Electron transport mechanisms in thin boron-doped diamond films. / Yater J. E., Shih A., Butler J. E., Pehrsson P. E. // Journal of Applied Physics. - 2004. - Vol. 96, No. 1. - P. 446-453.

J704. Zhang B. P. Low-temperature growth of ZnO nanostructure networks. / Zhang B. P., Wakatsuki K., Binh N. T., Segawa Y., Usami N. // Journal of Applied Physics. - 2004. - Vol. 96, No. 1. - P. 340-343.

J705. Nishikawa Tadashi. Nanohole-array size dependence of soft x-ray generation enhancement from femtosecond-laser-produced plasma. / Nishikawa Tadashi, Nakano Hidetoshi, Oguri Katsuya, Uesugi Naoshi,

Nishio Kazuyuki, Masuda Hideki. // Journal of Applied Physics. - 2004. - Vol. 96, No. 12. - P. 7537-7543.

J706. Barreca Davide. Influence of process parameters on the morphology of Au /SiO 2 nanocomposites synthesized by radio-frequency sputtering. / Barreca Davide, Gasparotto Alberto, Tondello Eugenio, Bruno Giovanni, Losurdo Maria. // Journal of Applied Physics. - 2004. - Vol. 96, No. 3. - P. 1655-1665.

J707. Makeev Maxim A. Atomic scale stresses and strains in Ge /Si (001) nanopixels: An atomistic simulation study. / Makeev Maxim A., Yu Wenbin, Madhukar Anupam. // Journal of Applied Physics. - 2004. - Vol. 96, No. 8. - P. 4429-4443.

J708. Alizadeh A. Templated wide band-gap nanostructures. / Alizadeh A., Sharma P., Ganti S., LeBoeuf S. F., Tsakalakos L. // Journal of Applied Physics. - 2004. - Vol. 95, No. 12. - P. 8199-8206.

J709. Cui B.Z. Crystallization, morphology and magnetic properties of melt-spun (Nd,Pr,Dy)2 (Fe,Co,Mo)14 B/α-Fe nanocomposites. / Cui B.Z., Han K., Zhang Y., Liu J.P., Garmestani H., Liu S., Schneider-Muntau H.J. // IEEE Transactions on Magnetics. - 2004. - Vol. 40, No. 4. - P. 2867-2870.

J710. Jung A. Biomolecule-compatible support structures for biomolecule coupling to physical measuring principle surfaces. / Jung A., Berlin P., Wolters B. // IEE Proceedings - Nanobiotechnology. - 2004. - Vol. 151, No. 3. - P. 87-94.

J711. Dey S. K. Relationships among equivalent oxide thickness, nanochemistry, and nanostructure in atomic layer chemical-vapor-deposited Hf-O films on Si. / Dey S. K., Das A., Tsai M., Gu D., Floyd M., Carpenter R. W., De Waard H., Werkhoven C., Marcus S. // Journal of Applied Physics. - 2004. - Vol. 95, No. 9. - P. 5042-5048.

J712. Zehnder T. Nanostructural and mechanical properties of nanocomposite nc-TiC /a-C:H films deposited by reactive unbalanced magnetron sputtering. / Zehnder T., Schwaller P., Munnik F., Mikhailov S., Patscheider J. // Journal of Applied Physics. - 2004. - Vol. 95, No. 8. - P. 4327-4334.

J713. Hayazawa Norihiko. Amplification of coherent anti-Stokes Raman scattering by a metallic nanostructure for a high resolution vibration microscopy. / Hayazawa Norihiko, Ichimura Taro, Hashimoto Mamoru, Inouye Yasushi, Kawata Satoshi. // Journal of Applied Physics. - 2004. - Vol. 95, No. 5. - P. 2676-2681.

J714. Nam C. Y. Effect of the polar surface on GaN nanostructure morphology and growth orientation. / Nam C. Y., Tham D., Fischer J. E. // Applied Physics Letters. - 2004. - Vol. 85, No. 23. - P. 5676-5678.

J715. Lee H. S. Dimensional structural transition in CdTe /Cd x Zn 1-x Te nanostructures. / Lee H. S., Park H. L., Kim T. W. // Applied Physics Letters. - 2004. - Vol. 85, No. 23. - P. 5598-5600.

J716. Lin Ming. Nanocantilevers made of bent silicon carbide nanowire-in-silicon oxide nanocones. / Lin Ming, Loh Kian Ping, Boothroyd Chris, Du Anyan. // Applied Physics Letters. - 2004. - Vol. 85, No. 22. - P. 5388-5390.

J717. Idzikowski B. Nanogranular Fe x Ni 23-x B 6 phase formation during devitrification of nickel-rich Ni 64 Fe 16 Zr 7 B 12 Au 1 amorphous alloy. / Idzikowski B., Szajek A., Greneche J.-M., Kovac J. // Applied Physics Letters. - 2004. - Vol. 85, No. 8. - P. 1392-1394.

J718. Atkinson D. Heat-assisted magnetization switching in elongated submicrometer Permalloy structures. / Atkinson D., Cowburn R. P. // Applied Physics Letters. - 2004. - Vol. 85, No. 8. - P. 1386-1388.

J719. Sakuma M. Giant Zeeman effect of excitons in a hybrid nanostructure of diluted magnetic semiconductor quantum well sandwiched in Co wires. / Sakuma M., Hyomi K., Souma I., Murayama A., Oka Y. // Applied Physics Letters. - 2004. - Vol. 85, No. 25. - P. 6203-6205.

J720. Hugelmann M. Schottky diode characteristics of electrodeposited Au /n-Si (111) nanocontacts. / Hugelmann M., Schindler W. // Applied Physics Letters. - 2004. - Vol. 85, No. 16. - P. 3608-3610.

J721. Gutierrez H. R. Three-dimensional mapping of the strain anisotropy in self-assembled quantum-wires by grazing incidence x-ray diffraction. / Gutierrez H. R., Magalhaes-Paniago R., Bortoleto J. R. R., Cotta M. A. // Applied Physics Letters. - 2004. - Vol. 85, No. 16. - P. 3581-3583.

J722. Johnson S. Field emission properties of self-assembled silicon nanostructures on n-and p -type silicon. /

Johnson S., Markwitz A., Rudolphi M., Baumann H., Oei S. P., Teo K. B. K., Milne W. I. // Applied Physics Letters. - 2004. - Vol. 85, No. 15. - P. 3277-3279.

J723. Leiderer P. Imaging optical near-fields of nanostructures. / Leiderer P., Bartels C., Konig-Birk J., Mosbacher M., Boneberg J. // Applied Physics Letters. - 2004. - Vol. 85, No. 22. - P. 5370-5372.

J724. Yu Zhaoning. In situ real time process characterization in nanoimprint lithography using time-resolved diffractive scatterometry. / Yu Zhaoning, Gao He, Chou Stephen Y. // Applied Physics Letters. - 2004. - Vol. 85, No. 18. - P. 4166-4168.

J725. Thomas M. Single-molecule spontaneous emission close to absorbing nanostructures. / Thomas M., Greffet J.-J., Carminati R., Arias-Gonzalez J. R. // Applied Physics Letters. - 2004. - Vol. 85, No. 17. - P. 3863-3865.

J726. Alvarez-Herrero A. High-sensitivity sensor of low relative humidity based on overlay on side-polished fibers. / Alvarez-Herrero A., Guerrero H., Levy D. // IEEE Sensors Journal. - 2004. - Vol. 4, No. 1. - P. 52-56.

J727. Asoh Hidetaka. Transfer of nanoporous pattern of anodic porous alumina into Si substrate. / Asoh Hidetaka, Matsuo Mamoru, Yoshihama Megumi, Ono Sachiko. // Applied Physics Letters. - 2003. - Vol. 83, No. 21. - P. 4408-4410.

J728. Xia Qiangfei. Ultrafast patterning of nanostructures in polymers using laser assisted nanoimprint lithography. / Xia Qiangfei, Keimel Chris, Ge Haixiong, Yu Zhaoning, Wu Wei, Chou Stephen Y. // Applied Physics Letters. - 2003. - Vol. 83, No. 21. - P. 4417-4419.

J729. Iwamoto C. Dynamic and atomistic deformation of sp2 -bonded boron nitride nanoarrays. / Iwamoto C., Yang H. S., Watanabe S., Yoshida T. // Applied Physics Letters. - 2003. - Vol. 83, No. 21. - P. 4402-4404.

J730. Soraru Gian Domenico. Si nanocrystals obtained through polymer pyrolysis. / Soraru Gian Domenico, Modena Stefano, Bettotti Paolo, Das Gobind, Mariotto Gino, Pavesi Lorenzo. // Applied Physics Letters. - 2003. - Vol. 83, No. 4. - P. 749-751.

J731. Schoffel U. R. Scanning tunneling microscope mediated nanostructure fabrication from GeH 4 on Si(111)-(7Ч7). / Schoffel U. R., Rauscher H., Behm R. J. // Applied Physics Letters. - 2003. - Vol. 83, No. 18. - P. 3794-3796.

J732. Chen Fang. Imaging of optical field confinement in ridge waveguides fabricated on very-small-aperture laser. / Chen Fang, Itagi A., Bain J. A., Stancil D. D., Schlesinger T. E., Stebounova L., Walker G. C., Akhremitchev B. B. // Applied Physics Letters. - 2003. - Vol. 83, No. 16. - P. 3245-3247.

J733. Ma Liping. Nonvolatile electrical bistability of organic/metal-nanocluster/organic system. / Ma Liping, Pyo Seungmoon, Ouyang Jianyong, Xu Qianfei, Yang Yang. // Applied Physics Letters. - 2003. - Vol. 82, No. 9. - P. 1419-1421.

J734. Zhang Z. H. Surface morphology control of InAs nanostructures grown on InGaAs/InP. / Zhang Z. H., Pickrell G. W., Chang K. L., Lin H. C., Hsieh K. C., Cheng K. Y. // Applied Physics Letters. - 2003. - Vol. 82, No. 25. - P. 4555-4557.

J735. Ozasa Kazunari. Enhanced photoluminescence of InGaAs/GaAs quantum dots induced by nanoprobe pressure effects. / Ozasa Kazunari, Aoyagi Yoshinobu, Yamane Akihiko, Arai Yoshio. // Applied Physics Letters. - 2003. - Vol. 83, No. 11. - P. 2247-2249.

J736. Zhang Y.D. Consolidation and magnetic properties of nanostructured Ni75 Fe25. / Zhang Y.D., Mingzhong Wu, Ge S.H., Hui S., Ma X.Q., Zhang H., Budnick J.I., Hines W.A. // IEEE Transactions on Magnetics. - 2003. - Vol. 39, No. 5. - P. 3145-3147.

J737. Wu Wei. Room-temperature Si single-electron memory fabricated by nanoimprint lithography. / Wu Wei, Gu Jian, Ge Haixiong, Keimel Christopher, Chou Stephen Y. // Applied Physics Letters. - 2003. - Vol. 83, No. 11. - P. 2268-2270.

J738. Martin-Concepcion A. I. X-ray photoelectron spectroscopy study of the first stages of ZnO growth and nanostructure dependence of the effects of polarization at ZnO /SiO 2 and ZnO /Al 2 O 3 interfaces. / Martin-

Concepcion A. I., Yubero F., Espinos J. P., Gonzalez-Elipe A. R., Tougaard S. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2003. - Vol. 21, No. 4. - P. 1393-1398.

J739. Craighead H. G. Nanostructure science and technology: Impact and prospects for biology. and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2003. - Vol. 21, No. 5. - P. S216-S221.

J740. Zhukov A.A. Patterned magnetic media from self-assembly template methods. / Zhukov A.A., Goncharov A.V., de Groot P.A.J., Bartlett P.N., Ghanem M.A., Kupfer H., Pugh R.J., Tomka G.J. // IEE Proceedings - Science, Measurement and Technology. - 2003. - Vol. 150, No. 5. - P. 257-259.

J741. Prott C. Modeling of ultrawidely tunable vertical cavity air-gap filters and VCSELs. / Prott C., Romer F., Ataro E.O., Daleiden J., Irmer S., Tarraf A., Hillmer H. // IEEE Journal of Selected Topics in Quantum Electronics. - 2003. - Vol. 9, No. 3. - P. 918-928.

J742. Drysdale T.D. Artificial dielectric devices for variable polarization compensation at millimeter and submillimeter wavelengths. / Drysdale T.D., Blaikie R.J., Chong H.M.H., Cumming D.R.S. // IEEE Transactions on Antennas and Propagation. - 2003. - Vol. 51, No. 11. - P. 3072-3079.

J743. Wang Z. M. Morphology evolution during strained (In,Ga)As epitaxial growth on GaAs vicinal (100) surfaces. / Wang Z. M., Shultz J. L., Salamo G. J. // Applied Physics Letters. - 2003. - Vol. 83, No. 9. - P. 1749-1751.

J744. Liang W. Large electric-field induced electron drift velocity observed in an In x Ga 1-x As-based p-i-n semiconductor nanostructure at T=300 K. / Liang W., Tsen K. T., Ferry D. K., Wu Meng-Chyi, Ho Chong-Long, Ho Wen-Jeng. // Applied Physics Letters. - 2003. - Vol. 83, No. 7. - P. 1438-1440.

J745. Hosoda M. Quantum-well microtube constructed from a freestanding thin quantum-well layer. / Hosoda M., Kishimoto Y., Sato M., Nashima S., Kubota K., Saravanan S., Vaccaro P. O., Aida T., Ohtani N. // Applied Physics Letters. - 2003. - Vol. 83, No. 5. - P. 1017-1019.

J746. Baba M. DNA size separation using artificially nanostructured matrix. / Baba M., Sano T., Iguchi N., Iida K., Sakamoto T., Kawaura H. // Applied Physics Letters. - 2003. - Vol. 83, No. 7. - P. 1468-1470.

J747. Zhang Wei. Fabrication of 60-nm transistors on 4-in. wafer using nanoimprint at all lithography levels. / Zhang Wei, Chou Stephen Y. // Applied Physics Letters. - 2003. - Vol. 83, No. 8. - P. 1632-1634.

J748. Mancoff F. B. Angular dependence of spin-transfer switching in a magnetic nanostructure. / Mancoff F. B., Dave R. W., Rizzo N. D., Eschrich T. C., Engel B. N., Tehrani S. // Applied Physics Letters. - 2003. - Vol. 83, No. 8. - P. 1596-1598.

J749. S. Irmer. Ultralow biased widely continuously tunable fabry-Perot filter. / S. Irmer, J. Daleiden, V. Rangelov, C. Prott, F. Romer, M. Strassner, A. Tarraf, H. Hillmer. // IEEE Photonics Technology Letters. - 2003. - Vol. 15, No. 3. - P. 434-436.

J750. Gol'tsman G.N. Fabrication of nanostructured superconducting single-photon detectors. / Gol'tsman G.N., Smirnov K., Kouminov P., Voronov B., Kaurova N., Drakinsky V., Zhang J., Verevkin A., Sobolewski R. // IEEE Transactions on Applied Superconductivity. - 2003. - Vol. 13, No. 2. - P. 192-195.

J751. Salama I. A. Laser synthesis of carbon-rich SiC nanoribbons. / Salama I. A., Quick N. R., Kar A. // Journal of Applied Physics. - 2003. - Vol. 93, No. 11. - P. 9275-9281.

J752. Makino A. As-quenched and nanocrystallized structure for Nb-poor Fe-Nb-B-P-Cu soft magnetic alloys melt spun in air. / Makino A., Bitoh T. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 6522-6524.

J753. Reale Andrea. Comprehensive description of the dynamical screening of the internal electric fields of AlGaN/GaN quantum wells in time-resolved photoluminescence experiments. / Reale Andrea, Massari Gianluca, Di Carlo Aldo, Lugli Paolo, Vinattieri Anna, Alderighi Daniel, Colocci Marcelo, Semond F., Grandjean N., Massies J. // Journal of Applied Physics. - 2003. - Vol. 93, No. 1. - P. 400-409.

J754. Prakelt A. Compact, robust, and flexible setup for femtosecond pulse shaping. / Prakelt A., Wollenhaupt M., Assion A., Horn Ch., Sarpe-Tudoran C., Winter M., Baumert T. // Review of Scientific Instruments. - 2003. - Vol. 74, No. 11. - P. 4950-4953.

J755. Wang Z. M. Strain-driven facet formation on self-assembled InAs islands on GaAs (311)A. / Wang Z. M., Wen H., Yazdanpanah V. R., Shultz J. L., Salamo G. J. // Applied Physics Letters. - 2003. - Vol. 82, No. 11. - P. 1688-1690.

J756. Yang Heesun. Enhanced photoluminescence from CdS:Mn/ZnS core/shell quantum dots. / Yang Heesun, Holloway Paul H. // Applied Physics Letters. - 2003. - Vol. 82, No. 12. - P. 1965-1967.

J757. Kabashin A. V. Visible photoluminescence from nanostructured Si-based layers produced by air optical breakdown on silicon. / Kabashin A. V., Meunier M. // Applied Physics Letters. - 2003. - Vol. 82, No. 10. - P. 1619-1621.

J758. Banno N. New fabrication approach to fine multifilamentary Nb3 (Al,Ge) superconductors using an intermediate rapid quenching technique. / Banno N., Takeuchi T., Kosuge M., Yuyama M., Wada H. // IEEE Transactions on Applied Superconductivity. - 2003. - Vol. 13, No. 2. - P. 3450-3453.

J759. Kopcewicz M. Mossbauer study of the magnetism and structure of amorphous and nanocrystalline Fe 81-x Ni x Zr 7 B 12 (x=10-40) alloys. / Kopcewicz M., Idzikowski B., Kalinowska J. // Journal of Applied Physics. - 2003. - Vol. 94, No. 1. - P. 638-649.

J760. Shirakashi Jun-ichi. RC-coupled ferromagnetic single-electron transistors. / Shirakashi Jun-ichi, Takemura Yasushi. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 6873-6875.

J761. Yater J. E. Transmission of low-energy electrons in boron-doped nanocrystalline diamond films. / Yater J. E., Shih A., Butler J. E., Pehrsson P. E. // Journal of Applied Physics. - 2003. - Vol. 93, No. 5. - P. 3082-3089.

J762. Taraschi Gianni. Nanostructure and infrared photoluminescence of nanocrystalline Ge formed by reduction of Si 0.75 Ge 0.25 O 2 /Si 0.75 Ge 0.25 using various H 2 pressures. / Taraschi Gianni, Saini Sajan, Fan Wendy W., Kimerling Lionel C., Fitzgerald Eugene A. // Journal of Applied Physics. - 2003. - Vol. 93, No. 12. - P. 9988-9996.

J763. Suh Yong J. Origins of the elastic behavior of nanoparticle chain aggregates: Measurements using nanostructure manipulation device. / Suh Yong J., Friedlander Sheldon K. // Journal of Applied Physics. - 2003. - Vol. 93, No. 6. - P. 3515-3523.

J764. Yamamoto Hiroki. Effects of substrate temperature on nanostructure and band structure of sputtered Co 3 O 4 thin films. / Yamamoto Hiroki, Tanaka Shuhei, Hirao Kazuyuki. // Journal of Applied Physics. - 2003. - Vol. 93, No. 7. - P. 4158-4162.

J765. Dey S. K. Atomic layer chemical vapor deposition of ZrO 2 -based dielectric films: Nanostructure and nanochemistry. / Dey S. K., Wang C.-G., Tang D., Kim M. J., Carpenter R. W., Werkhoven C., Shero E. // Journal of Applied Physics. - 2003. - Vol. 93, No. 7. - P. 4144-4157.

J766. Johansson Jan. Suppression of superconductivity due to spin imbalance in Co/Al/Co single electron transistor. / Johansson Jan, Urech Mattias, Haviland David, Korenivski V. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 8650-8652.

J767. Zhao X. G. Structure and magnetic properties of nanostructured Pr 1-x Gd x Co 5 (x=0-1) powders prepared by mechanical alloying. / Zhao X. G., Zhang Z. D., Cui B. Z., Ren W. J., Liu W., Geng D. Y. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 8125-8127.

J768. Sato Kazuhisa. Effects of surface step and substrate temperature on nanostructure of L 10 -FePt nanoparticles. / Sato Kazuhisa, Kajiwara Takenori, Fujiyoshi Masaru, Ishimaru Manabu, Hirotsu Yoshihiko, Shinohara Tadashi. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 7414-7416.

J769. Cui B. Z. Magnetic properties of (Nd,Pr,Dy)2 Fe 14 B /alpha -Fe nanocomposite magnets crystallized in a magnetic field. / Cui B. Z., Huang M. Q., Yu R. H., Kramp A., Dent J., Miles D. D., Liu S. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 8128-8130.

J770. Xu Yingfan. Magnetic properties of L 10 FePt and FePt:Ag nanocluster films. / Xu Yingfan, Sun Z. G., Qiang Y., Sellmyer D. J. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 8289-8291.

J771. Shao Y. Effects of rapid thermal annealing on nanostructure, texture and magnetic properties of granular FePt:Ag films for perpendicular recording (invited). / Shao Y., Yan M. L., Sellmyer D. J. // Journal of Applied Physics. - 2003. - Vol. 93, No. 10. - P. 8152-8154.

J772. Lebedev O. I. Structure and properties of artificial [(La 0.7 Sr 0.3 MnO 3)m (SrTiO 3)n]15 superlattices on (001)SrTiO 3 .. / Lebedev O. I., Verbeeck J., Van Tendeloo G., Dubourdieu C., Rosina M., Chaudouet P. // Journal of Applied Physics. - 2003. - Vol. 94, No. 12. - P. 7646-7656.

J773. Wang Weitian. Effects of the morphology and nanostructure on the optical nonlinearities of Au:BaTiO 3 nanocomposite films. / Wang Weitian, Yang Guang, Wu Weidong, Chen Zhenghao. // Journal of Applied Physics. - 2003. - Vol. 94, No. 10. - P. 6837-6840.

J774. Lee S. J. Influence of nanostructure and nitrogen content on the optical and electrical properties of reactively sputtered FeSiAl(N) films. / Lee S. J., Snyder J. E., Lo C. C. H., Campos-Anderson K. M., Anderegg J. W., Jiles D. C. // Journal of Applied Physics. - 2003. - Vol. 94, No. 4. - P. 2607-2611.

J775. Czaplewski David. Nonlithographic approach to nanostructure fabrication using a scanned electrospinning source. / Czaplewski David, Kameoka Jun, Craighead H. G. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 2994-2997.

J776. Tsurumachi Noriaki. Observation of ultrashort pulse propagation anisotropy in a semiconductor quantum nanostructure optical waveguide by cross-correlation frequency resolved optical gating spectroscopy. / Tsurumachi Noriaki, Hikosaka Kazunori, Wang Xue-Lun, Ogura Mutsuo, Watanabe Naoki, Hattori Toshiaki. // Journal of Applied Physics. - 2003. - Vol. 94, No. 4. - P. 2616-2621.

J777. Dey S. K. Growth and nanostructure of conformal ruthenium films by liquid-source metalorganic chemical vapor deposition. / Dey S. K., Goswami J., Das A., Cao W., Floyd M., Carpenter R. // Journal of Applied Physics. - 2003. - Vol. 94, No. 1. - P. 774-777.

J778. Yu Zhaoning. Fabrication of nanoscale gratings with reduced line edge roughness using nanoimprint lithography. / Yu Zhaoning, Chen Lei, Wu Wei, Ge Haixiong, Chou Stephen Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 5. - P. 2089-2092.

J779. Yu Zhaoning. Fabrication of large area subwavelength antireflection structures on Si using trilayer resist nanoimprint lithography and liftoff. / Yu Zhaoning, Gao He, Wu Wei, Ge Haixiong, Chou Stephen Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 6. - P. 2874-2877.

J780. Carey J. D. Role of nanostructure on electron field emission from amorphous carbon thin films. / Carey J. D., Forrest R. D., Poa C. H., Silva S. R. P. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 4. - P. 1633-1639.

J781. Li Mingtao. Large area direct nanoimprinting of SiO 2 -TiO 2 gel gratings for optical applications. / Li Mingtao, Tan Hua, Chen Lei, Wang Jian, Chou Stephen Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 2. - P. 660-663.

J782. Ferroni M. Selective sublimation processing of a molybdenum-tungsten mixed oxide thin film. / Ferroni M., Guidi V., Comini E., Sberveglieri G., Vomiero A., Della Mea G., Martinelli G. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2003. - Vol. 21, No. 4. - P. 1442-1448.

J783. Sleyter U.B. Nanotechnology and biomimetics with 2-D protein crystals. / Sleyter U.B., Schuster B., Pum D. // IEEE Engineering in Medicine and Biology Magazine. - 2003. - Vol. 22, No. 3. - P. 140-150.

J784. Babonneau D. Nanostructure and magnetic properties of BN-encapsulated Fe(B) and Fe 2 N nanoparticles prepared by dual ion-beam sputtering. / Babonneau D., Jaouen M., Denanot M.-F., Guerin P., Petroff F. // Applied Physics Letters. - 2003. - Vol. 82, No. 18. - P. 3056-3058.

J785. Wu Lin. Dynamic modeling and scaling of nanostructure formation in the lithographically induced self-assembly and self-construction. / Wu Lin, Chou Stephen Y. // Applied Physics Letters. - 2003. - Vol. 82, No. 19. - P. 3200-3202.

J786. Behdani M. Alignment of liquid crystals with periodic submicron structures ablated in polymeric and

indium tin oxide surfaces. / Behdani M., Keshmiri S. H., Soria S., Bader M. A., Ihlemann J., Marowsky G., Rasing Th. // Applied Physics Letters. - 2003. - Vol. 82, No. 16. - P. 2553-2555.

J787. Granados Daniel. In(Ga)As self-assembled quantum ring formation by molecular beam epitaxy. / Granados Daniel, Garc , a Jorge M. // Applied Physics Letters. - 2003. - Vol. 82, No. 15. - P. 2401-2403.

J788. Bennett A. J. Simulating collective magnetic dynamics in nanodisk arrays. / Bennett A. J., Xu J. M. // Applied Physics Letters. - 2003. - Vol. 82, No. 15. - P. 2503-2505.

J789. Romer F. Tuning efficiency and linewidth of electrostatically actuated multiple air-gap filters. / Romer F., Prott C., Irmer S., Daleiden J., Tarraf A., Hillmer H., Strassner M. // Applied Physics Letters. - 2003. - Vol. 82, No. 2. - P. 176-178.

J790. Atkinson D. Magnetic domain wall dynamics in a permalloy nanowire. / Atkinson D., Allwood D.A., Faulkner C.C., Gang Xiong, Cooke M.D., Cowburn R.P. // IEEE Transactions on Magnetics. - 2003. - Vol. 39, No. 5. - P. 2663-2665.

J791. Seo J. T. Large pure refractive nonlinearity of nanostructure silica aerogel. / Seo J. T., Yang Q., Creekmore S., Tabibi B., Temple D., Kim S. Y., Yoo K., Mott A., Namkung M., Jung S. S. // Applied Physics Letters. - 2003. - Vol. 82, No. 25. - P. 4444-4446.

J792. Gu B. X. Magnetic properties and magneto-optical effect of Co 0.5 Fe 2.5 O 4 nanostructured films. Applied Physics Letters. - 2003. - Vol. 82, No. 21. - P. 3707-3709.

J793. Cui B.Z. Magnetic properties of SmCo7 /Co and Sm(Co,Fe)7 /α-(Fe,Co) nanocomposite magnets prepared by magnetic annealing. / Cui B.Z., Huang M.-Q., Liu S. // IEEE Transactions on Magnetics. - 2003. - Vol. 39, No. 5. - P. 2866-2868.

J794. Denardin J.C. Modifying the nanostructure of Co[SiO2] samples by controlled annealing. / Denardin J.C., Knobel M., Socolovsky L.M., Brandl A.L., Zhang X.X. // IEEE Transactions on Magnetics. - 2003. - Vol. 39, No. 5. - P. 2767-2769.

J795. Tarun Alvarado. Apertureless optical near-field fabrication using an atomic force microscope on photoresists. / Tarun Alvarado, Daza Marlon Rosendo H., Hayazawa Norihiko, Inouye Yasushi, Kawata Satoshi. // Applied Physics Letters. - 2002. - Vol. 80, No. 18. - P. 3400-3402.

J796. Ong W. J. Self-assembly of Si nanoclusters on 6H-SiC (0001)-(3Ч3) reconstructed surface. / Ong W. J., Tok E. S., Xu H., Wee A. T. S. // Applied Physics Letters. - 2002. - Vol. 80, No. 18. - P. 3406-3408.

J797. Chen Zhonghui. Normal-incidence voltage-tunable middle- and long-wavelength infrared photoresponse in self-assembled InAs quantum dots. / Chen Zhonghui, Kim Eui-Tae, Madhukar Anupam. // Applied Physics Letters. - 2002. - Vol. 80, No. 14. - P. 2490-2492.

J798. Chen Zhonghui. Intraband-transition-induced dipoles in self-assembled InAs/GaAs(001) quantum dots. / Chen Zhonghui, Kim Eui-Tae, Madhukar Anupam. // Applied Physics Letters. - 2002. - Vol. 80, No. 15. - P. 2770-2772.

J799. Allwood D. A. Shifted hysteresis loops from magnetic nanowires. / Allwood D. A., Vernier N., Xiong Gang, Cooke M. D., Atkinson D., Faulkner C. C., Cowburn R. P. // Applied Physics Letters. - 2002. - Vol. 81, No. 21. - P. 4005-4007.

J800. Austin Michael D. Fabrication of 70 nm channel length polymer organic thin-film transistors using nanoimprint lithography. / Austin Michael D., Chou Stephen Y. // Applied Physics Letters. - 2002. - Vol. 81, No. 23. - P. 4431-4433.

J801. Kim Eui-Tae. Selective manipulation of InAs quantum dot electronic states using a lateral potential confinement layer. / Kim Eui-Tae, Chen Zhonghui, Madhukar Anupam. // Applied Physics Letters. - 2002. - Vol. 81, No. 18. - P. 3473-3475.

J802. Liang W. Simultaneous observation of electron and hole velocity overshoots in an Al 0.3 Ga 0.7 As - based p-i-n semiconductor nanostructure. / Liang W., Lee H., Tsen K. T., Sankey O. F., Ferry D. K. // Applied Physics Letters. - 2002. - Vol. 81, No. 21. - P. 3999-4001.

J803. Muller-Wiegand M. Spinodal patterning in organic-inorganic hybrid layer systems. / Muller-Wiegand M., Georgiev G., Oesterschulze E., Fuhrmann T., Salbeck J. // Applied Physics Letters. - 2002. - Vol. 81, No. 26. - P. 4940-4942.

J804. Barbic Mladen. Single crystal silver nanowires prepared by the metal amplification method. / Barbic Mladen, Mock Jack J., Smith D. R., Schultz S. // Journal of Applied Physics. - 2002. - Vol. 91, No. 11. - P. 9341-9345.

J805. Carey M. J. Improved corrosion resistance of IrMn by Cr and Ru additions. / Carey M. J., Kellock A., Baril L., Childress J. R., Le T., Thompson T., Gurney B. A. // Applied Physics Letters. - 2002. - Vol. 81, No. 27. - P. 5198-5200.

J806. Terabe K. Formation and disappearance of a nanoscale silver cluster realized by solid electrochemical reaction. / Terabe K., Nakayama T., Hasegawa T., Aono M. // Journal of Applied Physics. - 2002. - Vol. 91, No. 12. - P. 10110-10114.

J807. Wang Yi. In search of nanoperfection: Experiment and Monte Carlo simulation of nucleation-controlled step doubling. / Wang Yi, Pearl T. P., Darling S. B., Gimmell J. L., Sibener S. J. // Journal of Applied Physics. - 2002. - Vol. 91, No. 12. - P. 10081-10087.

J808. Coffey Mark W. Logarithmically perturbed two dimensional oscillator model of a quantum-dot nanostructure. Applied Physics Letters. - 2002. - Vol. 80, No. 7. - P. 1219-1221.

J809. Li Hanxuan. Effects of the matrix on self-organization of InAs quantum nanostructures grown on InP substrates. / Li Hanxuan, Daniels-Race Theda, Hasan Mohamed-Ali. // Applied Physics Letters. - 2002. - Vol. 80, No. 8. - P. 1367-1369.

J810. Morelhao S. L. Nanostructure of sol-gel films by x-ray specular reflectivity. / Morelhao S. L., Brito G. E. S., Abramof E. // Applied Physics Letters. - 2002. - Vol. 80, No. 3. - P. 407-409.

J811. Omi H. Strain distribution control on the silicon wafer scale for advanced nanostructure fabrication. / Omi H., Bottomley D. J., Ogino T. // Applied Physics Letters. - 2002. - Vol. 80, No. 6. - P. 1073-1075.

J812. Yung C. S. Thermal conductance and electron-phonon coupling in mechanically suspended nanostructures. / Yung C. S., Schmidt D. R., Cleland A. N. // Applied Physics Letters. - 2002. - Vol. 81, No. 1. - P. 31-33.

J813. Ghebremichael F. Temporal and thermal studies of charge transportation in self-assembly organic photovoltaic devices. Applied Physics Letters. - 2002. - Vol. 81, No. 16. - P. 2971-2973.

J814. Cao Han. Gradient nanostructures for interfacing microfluidics and nanofluidics. / Cao Han, Tegenfeldt Jonas O., Austin Robert H., Chou Stephen Y. // Applied Physics Letters. - 2002. - Vol. 81, No. 16. - P. 3058-3060.

J815. Cao Han. Fabrication of 10 nm enclosed nanofluidic channels. / Cao Han, Yu Zhaoning, Wang Jian, Tegenfeldt Jonas O., Austin Robert H., Chen Erli, Wu Wei, Chou Stephen Y. // Applied Physics Letters. - 2002. - Vol. 81, No. 1. - P. 174-176.

J816. Wang J. High critical current density and improved irreversibility field in bulk MgB 2 made by a scaleable, nanoparticle addition route. / Wang J., Bugoslavsky Y., Berenov A., Cowey L., Caplin A. D., Cohen L. F., MacManus Driscoll J. L., Cooley L. D., Song X., Larbalestier D. C. // Applied Physics Letters. - 2002. - Vol. 81, No. 11. - P. 2026-2028.

J817. Csaba G. Nanocomputing by field-coupled nanomagnets. / Csaba G., Imre A., Bernstein G.H., Porod W., Metlushko V. // IEEE Transactions on Nanotechnology. - 2002. - Vol. 1, No. 4. - P. 209-213.

J818. Diaspro A. Microscopical characterization of nanocapsules templated on ionic crystals and biological cells toward biomedical applications. / Diaspro A., Krol S., Cavalleri O., Silvano D., Gliozzi A. // IEEE Transactions on NanoBioscience. - 2002. - Vol. 1, No. 3. - P. 110-115.

J819. Reddy D. Raja. Laser-like mechanoluminescence in ZnMnTe-diluted magnetic semiconductor. / Reddy D. Raja, Reddy B. K. // Applied Physics Letters. - 2002. - Vol. 81, No. 3. - P. 460-462.

J820. Harris K.D. Fabrication and optical characterization of template-constructed thin films with chiral nanostructure. / Harris K.D., Sit J.C., Brett M.J. // IEEE Transactions on Nanotechnology. - 2002. - Vol. 1, No. 3. - P. 122-128.

J821. Fukunaga H. Improvement in coercivity by high-speed crystallization for PrFeB-Based nanocomposite magnets. / Fukunaga H., Tokunaga K., Jae Man Song. // IEEE Transactions on Magnetics. - 2002. - Vol. 38, No. 5. - P. 2970-2972.

J822. Jeong Sangki. In situ ordered polycrystalline FePt L10 (001) nanostructured films and the effect of CrMn and Zn top layer diffusion. / Jeong Sangki, Ohkubo T., Roy Anup G., Laughlin D. E., McHenry M. E. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 6863-6865.

J823. Wegrowe J.-E. Spin-polarized current induced magnetization switch: Is the modulus of the magnetic layer conserved? (invited). / Wegrowe J.-E., Hoffer X., Guittienne Ph., Fabian A., Gravier L., Wade T., Ansermet J.-Ph. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 6806-6811.

J824. Kim Eui-Tae. Tailoring mid- and long-wavelength dual response of InAs quantum-dot infrared photodetectors using In x Ga 1-x As capping layers. / Kim Eui-Tae, Chen Zhonghui, Ho Max, Madhukar Anupam. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 3. - P. 1188-1191.

J825. Huang S. M. Sub-50 nm nanopatterning of metallic layers by green pulsed laser combined with atomic force microscopy. / Huang S. M., Hong M. H., Lukyanchuk B. S., Lu Y. F., Song W. D., Chong T. C. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 3. - P. 1118-1125.

J826. Austin Michael. Fabrication of nanocontacts for molecular devices using nanoimprint lithography. / Austin Michael, Chou Stephen Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 2. - P. 665-667.

J827. Chen Zhonghui. Intraband and interband photocurrent spectroscopy and induced dipole moments of InAs/GaAs(001) quantum dots in n-i-n photodetector structures. / Chen Zhonghui, Kim Eui-Tae, Madhukar Anupam. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 3. - P. 1243-1246.

J828. Gu Jian. Single-crystal Si formed on amorphous substrate at low temperature by nanopatterning and nickel-induced lateral crystallization. / Gu Jian, Chou Stephen Y., Yao Nan, Zandbergen Henny, Farrer Jeffrey K. // Applied Physics Letters. - 2002. - Vol. 81, No. 6. - P. 1104-1106.

J829. Klug Kevin L. Observation of two- and three-dimensional magnesium oxide nanostructures formed by thermal treatment of magnesium diboride powder. / Klug Kevin L., Dravid Vinayak P. // Applied Physics Letters. - 2002. - Vol. 81, No. 9. - P. 1687-1689.

J830. Griffith Saul. Nanostructure fabrication by direct electron-beam writing of nanoparticles. / Griffith Saul, Mondol Mark, Kong David S., Jacobson Joseph M. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2002. - Vol. 20, No. 6. - P. 2768-2772.

J831. You-Wei Du. Giant tunneling magnetoresistance in polycrystalline nanostructured Znx Fe3-x O4 -α-Fe2 O3. / You-Wei Du, Peng Chen, Gang Ni, Jian-min Zhu, Ding-yu Xing. // IEEE Transactions on Magnetics. - 2002. - Vol. 38, No. 5. - P. 2889-2891.

J832. Kalli K. Characterization of reflectivity inversion, alpha-and beta -phase transitions and nanostructure formation in hydrogen activated thin Pd films on silicon based substrates. / Kalli K., Othonos A., Christofides C. // Journal of Applied Physics. - 2002. - Vol. 91, No. 6. - P. 3829-3840.

J833. Huang S. M. Pulsed-laser assisted nanopatterning of metallic layers combined with atomic force microscopy. / Huang S. M., Hong M. H., Lu Y. F., Luky`anchuk B. S., Song W. D., Chong T. C. // Journal of Applied Physics. - 2002. - Vol. 91, No. 5. - P. 3268-3274.

J834. Antonelli G. Andrew. Picosecond ultrasonics study of the vibrational modes of a nanostructure. / Antonelli G. Andrew, Maris Humphrey J., Malhotra Sandra G., Harper James M. E. // Journal of Applied Physics. - 2002. - Vol. 91, No. 5. - P. 3261-3267.

J835. Sqalli O. Gold elliptical nanoantennas as probes for near field optical microscopy. / Sqalli O., Utke I., Hoffmann P., Marquis-Weible F. // Journal of Applied Physics. - 2002. - Vol. 92, No. 2. - P. 1078-1083.

J836. Ducati C. Influence of cluster-assembly parameters on the field emission properties of nanostructured carbon films. / Ducati C., Barborini E., Piseri P., Milani P., Robertson J. // Journal of Applied Physics. - 2002. - Vol. 92, No. 9. - P. 5482-5489.

J837. Hoffmann H. Single domain and vortex state in ferromagnetic circular nanodots. / Hoffmann H., Steinbauer F. // Journal of Applied Physics. - 2002. - Vol. 92, No. 9. - P. 5463-5467.

J838. Carey M. J. IrMn spin valves using Si layers. / Carey M. J., Le T., Thompson T., Gurney B. A. // Journal of Applied Physics. - 2002. - Vol. 92, No. 8. - P. 4538-4540.

J839. Cui B. Z. Phase evolution, structure, and magnetic properties of Nd 8.4 Fe 86 Mo 1.1 B 4.5 nanocomposite magnets. / Cui B. Z., Sui Y. C., Sun X. K., Xiong L. Y., OShea M. J., Zhang Z. D. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7881-7883.

J840. Phillips David M. Dynamic simulation of nanoscale lubricant films. / Phillips David M., Jhon Myung S. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7577-7579.

J841. Shirakashi Jun-ichi. Resistively coupled ferromagnetic single-electron transistors. / Shirakashi Jun-ichi, Takemura Yasushi. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 7442-7444.

J842. Schoffel U. R. Nanostructure formation by localized decomposition of Mo (CO)6 on Si (111)-(7Ч7) surfaces. / Schoffel U. R., Rauscher H., Behm R. J. // Journal of Applied Physics. - 2002. - Vol. 91, No. 5. - P. 2853-2858.

J843. Jeong Sangki. Nanostructure and magnetic properties of polycrystalline FePdPt/MgO thin films. / Jeong Sangki, Roy Anup G., Laughlin D. E., McHenry M. E. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 8813-8815.

J844. Snyder J. E. X-ray photoelectron spectroscopy study of the role of nitrogen in FeSiAl(N) reactive sputtered films. / Snyder J. E., Anderegg J. W. // Journal of Applied Physics. - 2002. - Vol. 91, No. 10. - P. 8459-8461.

J845. Tamoria M.R. Magnetism, structure and the effects of thermal aging on (Fe1-x Mnx)73.5 Si13.5 B9 Nb3 Cu1 alloys. / Tamoria M.R., Carpenter E.E., Miller M.M., Claassen J.H., Das B.N., Stroud R.M., Kurihara L.K., Everett R.K., Willard M.A., Hsiao A.C., McHenry M.E., Harris V.G. // IEEE Transactions on Magnetics. - 2001. - Vol. 37, No. 4. - P. 2264-2267.

J846. Yu Zhaoning. Fabrication of large area 100 nm pitch grating by spatial frequency doubling and nanoimprint lithography for subwavelength optical applications. / Yu Zhaoning, Wu Wei, Chen Lei, Chou Stephen Y. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 6. - P. 2816-2819.

J847. Garman C. An improved automated anodization apparatus for fabricating nanostructure devices and porous silicon. / Garman C., Sines P., McGinnis S. P., Das B. // Review of Scientific Instruments. - 2001. - Vol. 72, No. 1. - P. 275-277.

J848. Sukstanskii A. Impedance of a ferromagnetic sandwich strip. / Sukstanskii A., Korenivski V., Gromov A. // Journal of Applied Physics. - 2001. - Vol. 89, No. 1. - P. 775-782.

J849. Chen Sy-Hann. Nanostructure patterns written in polycarbonate by a bent optical fiber probe. / Chen Sy-Hann, Chen Yung-Fu. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 6. - P. 2299-2300.

J850. Ruchhoeft Paul. Ion beam aperture-array lithography. / Ruchhoeft Paul, Wolfe J. C., Bass Robert. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 6. - P. 2529-2532.

J851. Deshpande Paru. Lithographically induced self-assembly of microstructures with a liquid-filled gap between the mask and polymer surface. / Deshpande Paru, Chou Stephen Y. // Journal of Vacuum Science &

Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 6. - P. 2741-2744.

J852. Vrenken H. Microstructure and properties of giant magnetoresistive granular Au 80 Co 20 alloys. / Vrenken H., Kooi B. J., De Hosson J. Th. M. // Journal of Applied Physics. - 2001. - Vol. 89, No. 6. - P. 3381-3387.

J853. Pinnow C. U. Decomposition and nanocrystallization in reactively sputtered amorphous Ta-Si-N thin films. / Pinnow C. U., Bicker M., Geyer U., Schneider S., Goerigk G. // Journal of Applied Physics. - 2001. - Vol. 90, No. 4. - P. 1986-1991.

J854. Wang C. L. Nanostructure of thin amorphous hydrogenated carbon films studied by positron annihilation and photoluminescence. / Wang C. L., Kobayashi Y., Katoh R., Suzuki R., Ohdaira T. // Journal of Applied Physics. - 2001. - Vol. 90, No. 1. - P. 404-410.

J855. Yasufuku H. Diffusion of chloroaluminum phthalocyanine on MoS 2 surface detected by photoemission electron microscopy and metastable electron emission microscopy. / Yasufuku H., Ibe T., Okumura M., Kera S., Okudaira K. K., Harada Y., Ueno N. // Journal of Applied Physics. - 2001. - Vol. 90, No. 1. - P. 213-216.

J856. Zheng Ruisheng. Simulation of photoluminescence excitation spectra of InGaN epitaxial layers. / Zheng Ruisheng, Taguchi Tsunemasa. // Journal of Applied Physics. - 2001. - Vol. 90, No. 10. - P. 5183-5186.

J857. Goerigk G. Comparative anomalous small-angle x-ray scattering study of hotwire and plasma grown amorphous silicon-germanium alloys. / Goerigk G., Williamson D. L. // Journal of Applied Physics. - 2001. - Vol. 90, No. 11. - P. 5808-5811.

J858. Viera G. Polymorphous Si thin films from radio frequency plasmas of SiH 4 diluted in Ar: A study by transmission electron microscopy and Raman spectroscopy. / Viera G., Huet S., Bertran E., Boufendi L. // Journal of Applied Physics. - 2001. - Vol. 90, No. 8. - P. 4272-4280.

J859. Park Kyung Ho. Field electron emission from patterned nanostructured carbon films on sodalime glass substrates. / Park Kyung Ho, Lee Kyung Moon, Choi Seungho, Lee Soonil, Koh Ken Ha. // Journal of Vacuum Science & Technology B: Microelectronics and Nanometer Structures. - 2001. - Vol. 19, No. 3. - P. 946-949.

J860. Li Mingtao. Direct three-dimensional patterning using nanoimprint lithography. / Li Mingtao, Chen Lei, Chou Stephen Y. // Applied Physics Letters. - 2001. - Vol. 78, No. 21. - P. 3322-3324.

J861. Radloff C. Enhanced thermal stability of silica-encapsulated metal nanoshells. / Radloff C., Halas N. J. // Applied Physics Letters. - 2001. - Vol. 79, No. 5. - P. 674-676.

J862. Kawamura Ken-ichi. Periodic nanostructure array in crossed holographic gratings on silica glass by two interfered infrared-femtosecond laser pulses. / Kawamura Ken-ichi, Sarukura Nobuhiko, Hirano Masahiro, Ito Naoko, Hosono Hideo. // Applied Physics Letters. - 2001. - Vol. 79, No. 9. - P. 1228-1230.

J863. Sakaue Hiroyuki. Atomic-scale defect control on hydrogen-terminated silicon surface at wafer scale. / Sakaue Hiroyuki, Fujiwara Shinya, Shingubara Shoso, Takahagi Takayuki. // Applied Physics Letters. - 2001. - Vol. 78, No. 3. - P. 309-311.

J864. Cao Huaqiang. Array of nickel nanowires enveloped in polyaniline nanotubules and its magnetic behavior. / Cao Huaqiang, Tie Chenyang, Xu Zheng, Hong Jianming, Sang Hai. // Applied Physics Letters. - 2001. - Vol. 78, No. 11. - P. 1592-1594.

J865. Kiraz A. Cavity-quantum electrodynamics using a single InAs quantum dot in a microdisk structure. / Kiraz A., Michler P., Becher C., Gayral B., Imamoglu A., Zhang Lidong, Hu E., Schoenfeld W. V., Petroff P. M. // Applied Physics Letters. - 2001. - Vol. 78, No. 25. - P. 3932-3934.

J866. Merkulov Vladimir I. Shaping carbon nanostructures by controlling the synthesis process. / Merkulov Vladimir I., Guillorn Michael A., Lowndes Douglas H., Simpson Michael L., Voelkl Edgar. // Applied Physics Letters. - 2001. - Vol. 79, No. 8. - P. 1178-1180.

J867. Jang Jin. Self-organized carbon nanotips. / Jang Jin, Chung Suk Jae, Kim Hong Sik, Lim Sung Hoon, Lee Choong Hun. // Applied Physics Letters. - 2001. - Vol. 79, No. 11. - P. 1682-1684.

J868. Kirsch P. D. Interfacial chemistry of the Ba/SiO x N y /Si (100) nanostructure. / Kirsch P. D., Ekerdt J. G. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2001. - Vol. 19, No. 1. - P. 207-214.

J869. Kirsch P. D. Interfacial chemistry of the Sr/SiO x N y /Si(100) nanostructure. / Kirsch P. D., Ekerdt J. G. // and Films Journal of Vacuum Science & Technology A: Vacuum, Surfaces. - 2001. - Vol. 19, No. 5. - P. 2222-2231.

J870. Zhang Wei. Multilevel nanoimprint lithography with submicron alignment over 4 in. Si wafers. / Zhang Wei, Chou Stephen Y. // Applied Physics Letters. - 2001. - Vol. 79, No. 6. - P. 845-847.

J871. Kim Eui-Tae. Tailoring detection bands of InAs quantum-dot infrared photodetectors using In x Ga 1-x As strain-relieving quantum wells. / Kim Eui-Tae, Chen Zhonghui, Madhukar Anupam. // Applied Physics Letters. - 2001. - Vol. 79, No. 20. - P. 3341-3343.

J872. Deshpande Paru. Observation of dynamic behavior of lithographically induced self-assembly of supramolecular periodic pillar arrays in a homopolymer film. / Deshpande Paru, Sun Xiaoyun, Chou Stephen Y. // Applied Physics Letters. - 2001. - Vol. 79, No. 11. - P. 1688-1690.

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