

Materials Research News

- [Curriculum Crossroads](#)
Materials Science and Engineering Curriculum Development
- [Arthur Robert von Hippel \(1898-2003\)](#) — In Memoriam
- [Popular Materials Science News](#)
- Suggestions or comments? Please contact [Gopal Rao](#), Web Science Editor.

Research News and Features (External Sources) [[Archives](#)]

Nanoparticles: [Gold nanoparticles emit light strong enough to view single nanoparticles](#) ([Eurekalert](#))

Gold nanoparticles were demonstrated to induce light emission strong enough to make it possible to observe a single nanoparticle. Researchers coaxed the particles into strong emission of visible light using a technique called multiphoton absorption induced luminescence (MAIL). (5.23.05)

Photonics: [Modulating a beam of light with electricity](#) (Cornell University)

Researchers have developed a silicon device that allows an electrical signal to modulate a beam of light on a micrometer scale. The modulator uses a ring resonator -- a circular waveguide coupled to a straight waveguide carrying the beam of light to be modulated. The ring used was 12 microns in diameter to resonate with laser light at a wavelength of 1,576 nanometers, in the near infrared. (5.23.05)

Data Storage: [Dots for data storage](#) ([PhysicsWeb](#))

A new way to double the storage capacity of magnetic recording devices has been reported. This is made possible by combining arrays of

Research News (MRS Staff/Reporters) [[Archives](#)]

Research News from the MRS Bulletin (May 2005 Issue)

Lasing activity of rare-earth-doped bromide materials; Biochemical synthesis of protein-based thermoplastic elastomers; Si₃N₄ nanobelts grown by pyrolysis of polyureasilazane with iron catalyst; Doped PMMA used for 3D multilayered optical memory; Nanopipettes and nanoparticles enable detection of single DNA molecules; Novel hexaferrites show potential for microwave applications; Glass penetration used to repair cracks in alumina

Research News from the MRS Bulletin (April 2005 Issue)

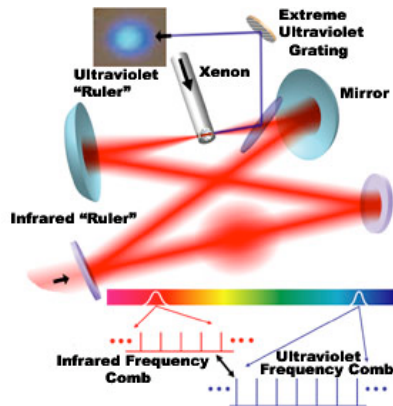
Magnetic field strengthens NiAl-Cr(Mo)-Hf alloy; Synthesis of supramolecular isomers; Metalorganic gel for porous organic polymer template; Tungsten nanoparticles in silica enhance nonvolatile memory; Transparent, highly oriented hydroxyapatite; Highly ductile bulk metallic glass foam

Perovskite Ceramics: A Single-Step Calcination Process To Fabricate Dielectric Perovskite Ceramics Subdivided in Steps Successfully Describes the Reaction Mechanism [*Reported by Siari Sosa*] (3.7.05)

magnetic dots with multiple magnetic layers.
[M Albrecht et al. 2005 J. Appl. Phys. 97
103910]
(5.20.05)

Nanoparticles: Color-changing nanoparticles offer a golden ruler for molecules
(Science)

Researchers report a new method to use pairs of gold nanoparticles to measure distances out to 70 nm between molecules and keep track of their targets indefinitely. This has significant potential for being able to monitor the nanoscale movement of biomolecules.
(5.20.05)



© NIST

Femtosecond Laser: First ultraprecise UV 'Ruler' sizes up atomic world
(NIST)

The world's most accurate "ruler" made with extreme ultraviolet light has been built and demonstrated with ultrafast laser pulses. The new device generates pulses of light lasting just femtoseconds in the ultraviolet region of the electromagnetic spectrum and could become an important tool for ultraprecise measurements.
[R.J. Jones, K.D. Moll, M.J. Thorpe, and J. Ye. 2005. Physical Review Letters. May 20]
(5.19.05)

Fullerenes: Fullerene nanocrystals toxic to bacteria
(Nature Materials Update)

C₆₀ forms nanoscale crystals in water that can inhibit the growth of bacteria. When dispersed in an organic solvent and then mixed with water, C₆₀ aggregates into faceted crystals that may remain in solution for many weeks. The fact that these nanocrystals can be cytotoxic to bacteria adds to previous concerns about the health hazards of fullerenes.
(5.19.05)

LEDs: Scientists develop novel multi-color light-emitting diodes
(Los Alamos National Laboratory)
Researchers have developed the first completely

Quantum Dots: InAs/GaAs Quantum-Dot Low-Loss Saturable Absorbers for Diode-Pumped Passively Q-Switched Nd-Doped 1.3- μ m Lasers
[Reported by Tao Xu]
(3.7.05)

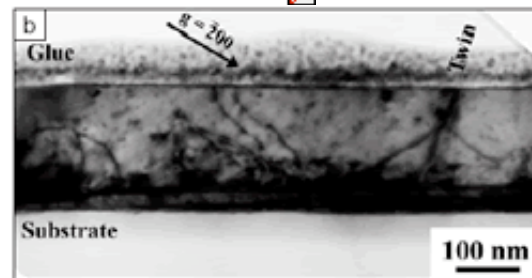
Research News from the MRS Bulletin
(March 2005 Issue)

Fluorescent silica particles approach brightness of quantum dots; Microbatteries assembled from single-particle anodes and cathodes; Damage to DNA by quantum dots; Gamma irradiation enables template-free synthesis of polyaniline nanofibers; Room-temperature nanoimprinting enables fabrication of 1-D laser; Far-field Raman scattering reveals surface plasmons of gold nanoparticle arrays

Research News from the MRS Bulletin
(February 2005 Issue)

Optical limiting displayed by polymer films with Ag nanoparticles grown *in situ*; Nanotubes fluoresce within biological cells; CuO nanotube arrays using MOCVD with template; Silicalite-1 self-supported micromembrane separates propane/nitrogen mixtures; Heavy-Fermion materials properties demystified; Zigzag-shaped magnetic films; Rapid fabrication of porous SOFC electrodes; Quantum dots in silica aerogels

Research News from the MRS Bulletin
(January 2005 Issue)



Fatigue properties of nanoscale Cu films; Resolution optical tomography for imaging biological tissues; Direct methanol-air fuel cell with nanoporous proton-conducting membrane; Cu nanowires broken into nanospheres; Composite cathode with boroxine ring developed for all-solid-polymer lithium cell

Research News from the MRS Bulletin
(December 2004 Issue)

Laser manipulated iron applied to nanofabrication; High-contrast imaging of semiconductor chips; Nanoprint lithography and self assembly combined for protein nanopatterning; Optical waveguiding in CdS nanowires; Structurally ordered polymer

inorganic, multi-color light-emitting diodes (LEDs) based on colloidal quantum dots encapsulated in a gallium nitride (GaN) semiconductor. The work represents a new "hybrid" approach to the development of solid-state lighting.
(5.18.05)

Diamonds: Very large diamonds produced very fast
(Eurekalert)

Researchers have been able to produce 10-carat, half-inch thick single-crystal diamonds at rapid growth rates (100 micrometers per hour) using a chemical vapor deposition (CVD) process. This size is approximately five times that of commercially available diamonds produced by the standard high-pressure/high-temperature method and other CVD techniques.
(5.17.05)

Biomaterials: Novel peptide selectively binds to a conducting polymer
(PhysOrg)

Researchers have identified a protein that could perform the unusual feat of attaching to polypyrrole, a synthetic conducting polymer that has shown promise in biomedical applications. When the peptide was linked to a smaller protein piece that human cells like to attach to, polypyrrole gained the ability to attach to cells grown in flasks in the laboratory.

[A. SANGHVI *et al*, Nature Materials AOP]
(5.17.05)

Magnetic Levitation: Cryogenically enhanced magneto-Archimedes levitation demonstrated
(New Scientist)

The densest materials known have been made to levitate on a pool of liquid air. A mixture of about 80% liquid nitrogen and 20% liquid oxygen was shown to provide enough buoyancy to lift the densest known material, osmium.

[A T Catherall *et al* 2005 New J. Phys. 7 118]
(5.16.05)

Biomedical Coatings: New coating could give medical implants a longer life
(Eurekalert)

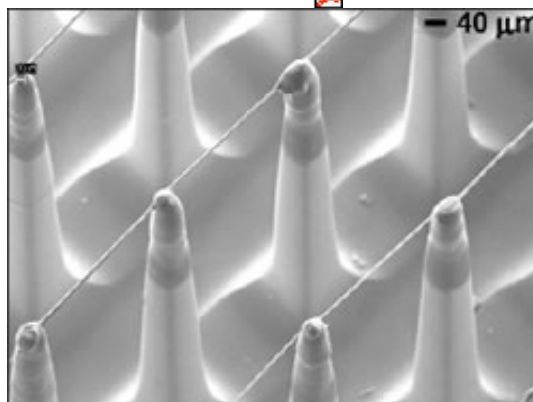
By mimicking an adhesive protein secreted by mussels and a polymer that repels cells and proteins, researchers have designed a new two-sided coating that sticks securely to a surface and prevents cell and protein buildup, and works for a long period of time.

(5.16.05)

Nanoparticles: Gold-coated tumors make detection easier
(Science Daily)

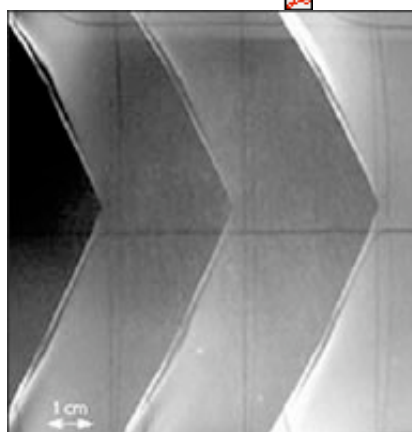
heterostructure; Nanoporous structures by electrodeposition.

Research News from the MRS Bulletin
(November 2004 Issue) 



Triangular diode controls magnetic domain wall movement; Photochromic bands in functionalized semiconducting SWNTs; WS₂ nanotubes for Li storage; Suspended micro- and nanostructures by direct drawing of polymer fibers; Centrifugal force to fabricate reticulated porous ceramics; Miniature fuel cell with a porous Si layer as a catalyst support layer; Bacteria use "Molecular Lasso" to cop copper

Research News from the MRS Bulletin
(October 2004 Issue) 



Silica-coated SWNTs form unique nanostructures; Novel liquid-crystal phases formed with introduction of chirality; High-strength reticulated porous ceramics; Cracks in rubber propagate faster than the speed of sound; F-containing molecules serve as structure-directing agents in synthesis of molecular sieves; Flame-spraying technique yields aluminate bulk glasses and nanoceramics; Composite polymer-carbon nanotubes function as optoelectronic memory devices

Low-Temperature Sol-Gel Processing of Oriented PBT Thin Films

[Reported by Andy Francis]

Scientists are studying ways to bind gold nanoparticles and cancer antibodies to highlight tumors and make them easier to find. The cancer antibodies seek out and bind with a specific protein which is present on the surface of many cancer cells.
(5.16.05)

Bio-Nanotechnology: *Vaults: From Biological Mystery to Nanotech Workhorse?*
(National Science Foundation)

Naturally occurring nano-capsules, known as "vaults," could provide a whole new class of delivery vehicles for therapeutic drugs and DNA, according to recent research. Vaults could likely be used for a wide range of applications in nanotechnology. However, it is not clear how nature itself uses them.
(5.16.05)

Spintronics: *Spintronics under control?*
(Nature Materials Update)

Researchers report a fast and efficient process that can be used to create and manipulate spin textures and currents. They propose a hybrid of superconductors (SCs) and diluted magnetic semiconductors (DMSs) to manipulate the local spin and charge textures formed in the DMS by the magnetic flux bundles (vortices) penetrating the SC when in a magnetic field.
[Berciu M., Rappoport T. G. & Jankó B., *Nature* 435, 71–75 (2005)]
(5.13.05)

Nanocrystalline Metals: *Nanobubbles cause metal fatigue*
(Nature Materials Update)

Nanocrystalline metals are susceptible to fatigue more so than microcrystalline metals. Simulations have now been performed and they show that nanovoids at grain boundaries may be responsible.
[Farkas D., Willemann M. & Hyde B., *Physical Review Letters* 94, 165502 (2005)]
(5.12.05)

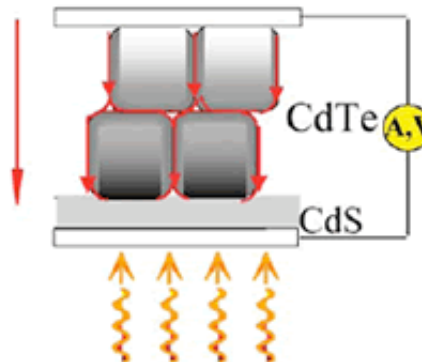
Liquid Sodium: *Room temperature liquid sodium*
(Physics News Update)

The most dramatic case yet seen of a "negative melting curve", similar to water, has been studied for sodium. At a pressure of a million atmospheres sodium melts at room temperature. The liquid is denser than the solid and might have strange plastic or mechanical properties.
(5.12.05)


DNA: *Melting into Our Genes*
(Physical Review Focus)

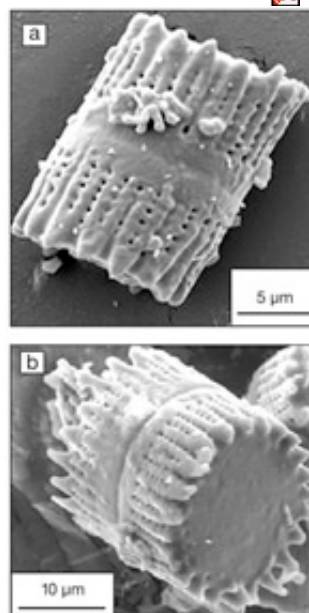
Human genes contains stretches of "junk DNA," that serves no obvious biological purpose. Now,

(September 2004 Issue) 

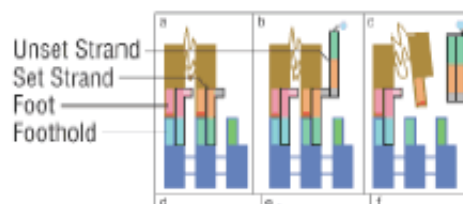


Orientation of protein determined in quantum dot-bioconjugate assembly; Surface plasmons for high-density nanolithography; Defects in solar-cell materials enhance efficiency; Large-scale synthesis of nearly monodisperse Au and Ag nanoparticles; High purity and controllable growth of $Mg_2B_2O_5$ nanowires; DNA Recognition by charge transfer across nanocrystalline metal Oxide/DNA interfaces

Research News from the MRS Bulletin
(August 2004 Issue) 



Structural amorphous Fe-alloys and steels; Conductance in single DNA molecules measured directly; Diatoms as scaffolds for 3D polymeric structures; C_{60} -based organic diodes; Engineering protein hydrogels to promote cell growth



computer studies show that many of these useless "introns" lie between chunks of gene that melt at slightly different temperatures. The results suggest that thermodynamics, not just the specific lettering of the genetic code, might determine where the introns appear in our genes. Biologists have expressed skepticism. [Enrico Carlon, Mehdi Lejard Malki, and Ralf Blossey, Phys. Rev. Lett. 94, 178101 (issue of 6 May 2005)] (5.12.05)

Atomic Force Microscopy: Microscopes reach new depths (PhysicsWeb)

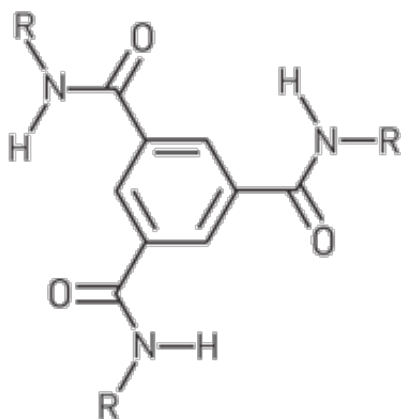
Physicists in China have made a new type of AFM that works with samples immersed in a liquid. The device could be used to image biological samples, materials that are easily oxidized and samples in hazardous environments.

[D Zhang et al. 2005 Rev. Sci. Instrum. 76 053705] (5.12.05)

Batteries: Silicon solution could lead to a truly long-life battery (PhysOrg)

Researchers have created a porous-silicon diode that may lead to improved betavoltaics. Such devices convert low levels of radiation into electricity and can have useful lives spanning several decades.

(5.11.05)

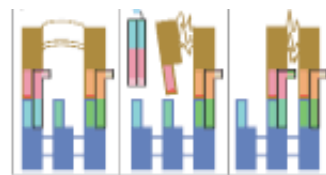


1,3,5-Benzenetrisamide

Polymers: Designer agents control crystal growth and physical properties of polypropylene (Chemical & Engineering News)

A new family of "designer" nucleating agents--substituted 1,3,5-benzenetrisamides--have been found to selectively and efficiently nucleate the growth of different crystal structures of isotactic polypropylene, imparting drastically improved physical properties.

[*Macromolecules* 2005 38, 3688] (5.9.05)

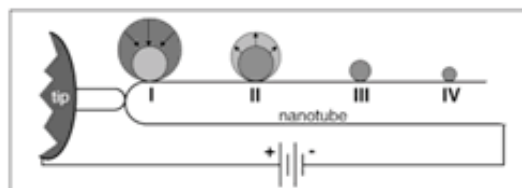


Research

News from the MRS Bulletin

(July 2004 Issue)

Controllable biped walking device constructed from DNA; Sintering Bi₂O₃-coated ZnO yields high-quality ceramics; Bandgap of semiconducting nanotubes shrinks in high magnetic fields; a-SiALON ceramics with high transparency; Nanostructured biosensors by nanosphere lithography



Research News from the MRS Bulletin

(June 2004 Issue)

Carbon nanotubes used as nanoscale mass conveyors; Magnetic nanoparticles assembly by manipulation of magnetotactic bacteria; Circular photonic crystals allow for isotropic photonic bandgap; Garnet/SOI magneto-optical devices fabricated by direct wafer bonding; Vertical InP nanowire arrays by nanoprint lithography

Research News from the MRS Bulletin

(May 2004 Issue)

Optical amplification in a first-generation dendritic organic semiconductor; Nanopatterning on a biocompatible polymer film using UV embossing; Simulation of Spin-MOSFET; Layered ZnDS nanocomposites; Carbon-nanotube formation observed *is-situ*; Selective drilling of thermal barrier coatings

Research News from the MRS Bulletin

(April 2004 Issue)

High-speed Si optical modulator; Individual virus particles weighed; Lasing in ZnS nanoribbons; Polymeric micro-resonators; New form of matter - fermionic condensate - created; Tunable superhydrophobic surfaces; Molecules self-assembled on nanowire FETs

Research News from the MRS Bulletin

(March 2004 Issue)

Thermally assisted magnetic recording; 3D direct writing of structures using femtosecond laser; Organic photodetectors; Tungsten electrodes for poly-Si TFTs; *In situ* TEM for observing carbon nanofiber growth; Stationary light pulses

Surface Bonding: Study blurs the line between thermal and electronic processes in desorption
(Chemical & Engineering News)

A new study indicates that conventional descriptions of the way chemical bonds at surfaces are formed and broken may need to be reevaluated. In the case of a bromine-coated silicon crystal, low-energy thermal vibrations of atoms in the lattice (phonons) can pool their energy and excite an electron at the Si-Br interface into an antibonding state, thereby breaking a bond and causing bromine to desorb. [Surf. Sci., published online April 14, dx.doi.org/10.1016/j.susc.2005.03.053] (5.9.05)

Granular Materials: Shake and stir to make granular materials change phases
(Duke University)

In an experiment originally planned for the International Space Station, physicists have devised a controlled, measurable method to make a container of granular material "freeze" into the equivalent of a solid-state crystal, or "melt" into the equivalent of a fluid, by alternating the rates that the beads are stirred or shaken. [Physical Review Letters (2005)] (5.9.05)

Refrigeration: Solid-state refrigerator works by removing hot electrons from its periphery
(Nature Materials Update)

Scientists have developed a relatively simple metal – insulator – superconductor (MIS) device that can operate at temperatures of just a few hundred millikelvin. The device works by allowing only hot electrons in a metal to tunnel across a thin insulating junction between it and a superconductor. [Applied Physics Letters 86, 173508 (2005)] (5.6.05)

Batteries: Shrinking dimensions spur research into ever-slimmer batteries
(Science)

Researchers around the globe are scrambling to come up with novel materials and designs for two-dimensional batteries to power ever-thinner electronic devices. (5.6.05)

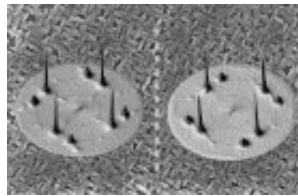
Optics: Lens makers go flat out
(PhysicsWeb)

Researchers have created a liquid-crystal lens with a focal length that can be adjusted by applying a voltage. The lens, which is flat, was formed by adding a small amount of a light-sensitive monomer to a liquid crystal in a commercially available electro-optic cell and irradiating it with a laser beam.


Research News from the MRS Bulletin

(February 2004 Issue) 

Mimicing color diffraction of butterfly wings; Green-emitting lanthanoid nanocrystals; Proton-irradiation-induced magnetic ordering in graphite; Luminescent CdS nanoparticles nanorings; Light-emitting transistors; Nuclear spin tomography



Research News from the MRS Bulletin

(January 2004 Issue) 

AFM reveals "missing" graphite surface atoms; Pyro-electric effects in amorphous BaTiO₃; Photocatalysis in C-doped TiO₂; Micromirrors using micro-origami; Chiral surfaces through electrodeposition; Photosensitive membrane by molecular imprinting; Tandem OLEDs **MORE >>>>**

[*J. Appl. Phys.* **97** 103101(2005)]
(5.5.05)

Glasses: Neutrons reveal first signs of long-range order in glass
([PhysicsWeb](#))

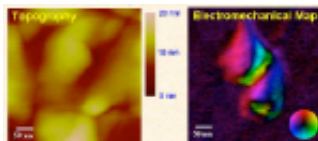
Physicists have observed previously unseen long-range ordering in glass. The ordering was observed in two very different glassy materials, which suggests that it could be a common feature of all glasses.

[*Nature* **435** 75 (2005)]
(5.5.05)

Microfluidics Sensor: Chip gauges cell reactions
([Technology Research News](#))

A microfluidics-based sensor has been developed to quickly test the reactions of biological cells to all types of stimuli. The sensor is a silicon wafer with a 1.5-mm-wide, 15-micron-deep channel that connects a pair of chambers.

(5.4.05)



© S V Kalinin/ORNL

Piezoresponse Force Microscopy: Electromechanical microscope nudges the nanoscale
([PhysicsWeb](#))

Piezoelectricity is an intrinsic property of biological systems and is most pronounced in biomaterials that contain arrays of proteins or polysaccharides. A group of scientists has now used this piezoelectric effect to produce the most detailed images until now of the internal structure of human teeth.

[S V Kalinin et al. (2005) arXiv.org/abs/cond-mat/0504232]

(5.3.05)

DNA Structure: Crystallographic map of DNA structure and conformation created
([Bio.com](#))

Researchers have made a significant new advance in determining the structure of all possible DNA sequences. They used X-ray crystallography to determine the three-dimensional structures of nearly all the possible sequences of a macromolecule, and thereby create a map of DNA structure.

[*Proc. Natl. Acad. Sci. USA*,
[10.1073/pnas.0409455102](https://doi.org/10.1073/pnas.0409455102)]

(5.3.05)

Single Molecule Detection: Molecules queue up to be detected

([Nature Materials Update](#))

A device for channelling molecules into a narrow passage, where they can be detected using single molecule fluorescence has been developed. The researchers cut a channel 5–10 microns deep and 40 microns wide in a silicon wafer. This channel guided a tiny volume of sample past the laser beam used for detection. Also, the molecules or particles in the sample solution were focused even more tightly using metal electrodes.

[Wang T.-H., Peng Y., Zhang C., Wong P. K. & Ho C.-M., J. Am. Chem. Soc. 127, 5354–5359 (2005)]
(5.2.05)

Hydrophobicity: [Slippery when dry](#)
([Science Now](#))

Scientists have created a fluorine-containing polymeric coating material that is hydrophobic when dry but repels water once wet. When water touches the material, the polymer side chain rearranges, exposing the hydrophobic fluorine-containing groups to the surface and causing it to repel water.

[[Langmuir](#), 21 (9), 3742 -3745, 2005.
10.1021/la050357m S0743-7463(05)00357-4]
(4.29.05)

Nanowires: [High-speed integrated nanowire circuits created](#)
([Eurekalert](#))

Researchers have made robust circuits from minuscule nanowires that align themselves on a chip of glass during low-temperature fabrication, creating rudimentary electronic devices that offer solid performance without high-temperature production or the use of silicon.

(4.28.05)

Nanolithography: [Innovative fountain pen writes on the nanoscale](#)
([Science Daily](#))

Researchers have demonstrated writing at the sub-100 nanometer molecular scale in fountain-pen fashion. They developed a novel atomic force microscope (AFM) probe chip with an integrated microfluidic system for capillary feeding of molecular ink. They have named the instrument the Nanofountain Probe (NFP).

(4.28.05)

Fusion: [Fusion seen in table-top experiment](#)
([PhysicsWeb](#))

Physicists in the US have generated nuclear fusion in a simple, table-top device operating at room temperature. The device causes two deuterium nuclei to collide with each other and generate alpha particles, neutrons and energy. The device could have applications as a portable neutron generator or in the propulsion systems

for miniature spacecraft, but will not be useful as an energy source because it consumes more energy than it produces.

[[Nature 434 1115](#)]

(4.27.05)

Colossal Magnetoresistance: Living on the edge

([Physical Review Focus](#))

A research team reports significantly lowering the magnetic field needed to dramatically change the resistance of a material that has so far been impractical for devices. The new detection scheme is based on colossal magnetoresistance.

[M. Tokunaga, H. Song, Y. Tokunaga, and T. Tamegai, [Phys. Rev. Lett.](#) **94**, 157203 (issue of 22 April 2005)]

(4.27.05)

Photonic Structures: Properties of photonic structures tuned with sound

([Nature News](#))

Photonic structures are static; their optical properties cannot be changed once they have been produced. Scientists now demonstrate the formation of a dynamic optical superlattice induced by acoustic phonons in a photonic microcavity.

[de Lima M. M., Hey R., Santos P. V. & Cantarero A, [Phys. Rev. Lett.](#) **94**, 126805 (2005)]

(4.27.05)

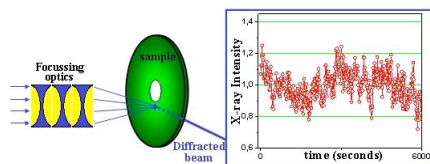
Nanocrystalline Diamond: Ultrananocrystalline diamond shows excellent tribological properties

([Nature Materials Update](#))

Researchers have measured the frictional properties of thin films of 'ultrananocrystalline' diamond (UNCD) grown from carbon-rich gas. They find that this material can have tribological properties similar to that of 'single-crystal' diamond.

[Sumant A. V. et al. [Adv. Mater.](#) **17**, 1039–1045 (2005)]

(4.27.05)



© Max Planck Inst. Metals Res./ESRF

Crystalline Structure: Living metals

(Press Release: Max Planck Institute for Metals Research, Stuttgart/European Synchrotron Radiation Facility)

Using Synchrotron x-ray microbeams, a research team has been able to observe for the first time that the microscopic structure of an Fe-Al crystalline material fluctuates with time.

(4.25.05)

Microlenses: Telescopes make bug-eye optics
([Technology Research News](#))

Similar to insects' compound eyes, researchers have developed a prototype artificial compound eye made from three stacked sets of microlenses that form an array of tiny telescopes.

(4.25.05)

Shape-Memory Polymers: Ultraviolet shifts plastic's shape

([Technology Research News](#))

Researchers have created a polymer material that can be switched from one shape to another in the presence of the right wavelengths of ultraviolet light. The material is a mix of two polymers. The first forms the material's original shape, and the second forms cross-links in the presence of ultraviolet light longer than 260 nm.

(4.25.05)

[MRS is not responsible for the content of external sites. Registration may be required for some sites]

MORE >>>>



[Home](#) • [News](#) • [Society Information](#) • [Site Map](#) • [Comments](#) • [Search](#) • [Contacts](#)
[Meetings](#) • [Membership](#) • [Publications](#) • [Marketing Opportunities](#) • [Materials Connections](#)



[Search the Site](#)

©1995-2005
Materials Research Society
506 Keystone Drive
Warrendale PA 15086-7573 USA
Phone: 724.779.3003, Fax: 724.779.8313
General Information: [email Customer/Member Services](#)
Web site comments/questions: [email MRS Webmaster](#)