Volume 4, Issue 29 ■ 18JUL2014

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

Earth-crushing pressure? This electron spin doesn't care

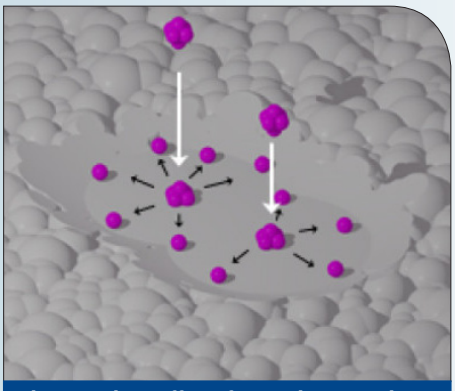
PhysOrg.com, 09JUL2014

A team of researchers led by the University of Chicago report that despite shrinking by one-seventh of its volume GdSi's magnetism remained robust. High pressure will often quench a magnet. But here, the electrons responded to the harsh conditions by forming a resilient superstructure—ideal behavior for digital memory that needs to withstand abuse. TECHNICAL ARTICLE

Tags: Materials science, Government S&T, Featured Article

Plasmonics: Minimizing loss by thinning, smoothing

Science Daily, 08JUL2014



*The smoothing effect of a gas cluster ion beam (purple) on a rough surface (gray). Credit: 2014 A*STAR Institute of Materials Research and Engineering*

An international team of researchers (Singapore, Japan) has used a gas cluster ion beam (GCIB) processing to smooth out surface irregularities of ultrathin metal films and reduce film thickness with nanometer precision. This processing significantly enhances surface plasmon resonance and propagation, and enables the fabrication of ultrathin films with extremely low electrical resistivity and optical loss. TECHNICAL ARTICLE

Tags: Microelectronics, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

Self-assembly machines — a vision for the future of manufacturing

Nanowerk, 10JUL2014

An international team of researchers (USA, Germany) provides blueprints and operational parameters of a reel-to-reel fluidic self-assembly platform to assemble and electrically connect semiconductor chips with a yield clearly exceeding a 99% benchmark set by robotic pick and place machines. TECHNICAL ARTICLE

Tags: Advanced manufacturing

ADVANCED MATERIALS

This new material is not black, it's super black... and you can't see it

Science Alert (Australia), 17JUL2014

Researchers in the UK have developed a super black coating called Vantablack that absorbs 99.96% percent of visual light, setting a new world record. The material can be used to calibrate astronomical cameras, telescopes and infrared scanning systems to get better readings.

Tags: Advanced materials

Future concepts: Carbon nanotube fluid heals damaged aircraft in flight (w/video)

Nanowerk, 10JUL2014

Scientists and engineers at BAE Systems have lifted the lid on some futuristic technologies that could be incorporated in military and civil aircraft of 2040 or even earlier. One of the four concepts is a nanotechnology that allows jets to quickly heal themselves from damage sustained in flight.

Tags: Advanced materials

Uncertainty gives scientists new confidence in search for novel materials

Science Daily, 10JUL2014

Researchers at Stanford University and the DOE's SLAC National Accelerator Laboratory have found a way to

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estimate uncertainties in computer calculations that are widely used to speed the search for new materials for industry, electronics, energy, drug design and a host of other applications. TECHNICAL ARTICLE

Tags: Advanced materials, Mathematics

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Craziest Robot Head, Sphero Tricks, and Autonomous Vehicle Competition

IEEE Spectrum, 11JUL2014

UAVs—are created by super high-tech on-board 3D printers, via Additive Layer Manufacturing and robotic assembly techniques. After use the UAVs could render themselves useless through dissolving circuit boards or they might safely land in a recoverable position if re-use was required.

Tags: Autonomous systems & robotics

BREAKTHROUGH TECHNOLOGY

First boron 'buckyball' could be used to store hydrogen

Nature News, 13JUL2014

Researchers at Brown University have succeeded in building the first "buckyballs" made entirely of boron atoms. Unlike true, carbon-based buckyballs, the boron molecules are not shaped exactly like footballs. This novel form of boron might lead to new nanomaterials and could find uses in hydrogen storage.

Tags: Breakthrough technology, Advanced materials, Materials science

COMMUNICATIONS TECHNOLOGY

Bell Labs Sets New Record for Internet Over Copper

IEEE Spectrum, 14JUL2014

Researchers at Bell Laboratory achieved speeds topping 1 Gbps on a single copper pair over a distance of 70 meters. The new technology should allow for Internet connections over cable that are "indistinguishable" from fiber-to-the-home in places where it's not viable to lay new fiber cables all the way into residences.

Tags: Communications Technology

Researchers demonstrate novel, tunable nanoantennas

Science Daily, 14JUL2014

Researchers at the University of Illinois show a way of fabricating plasmonic nanoantenna structures under the SEM, which avoids complications such as proximity effects from conventional lithography techniques. It paves the way for new kinds of plasmonic-based optomechanical systems where plasmonic field enhancement can actuate mechanical motion. TECHNICAL ARTICLE

Tags: Communications Technology

The world's first photonic router

Nanowerk, 14JUL2014

Researchers in Israel have demonstrated for the first time a photonic router—a quantum device based on a single atom that enables routing of single photons by single photons. At the core of the device is an atom that can switch between two states. TECHNICAL ARTICLE

Tags: Communications Technology

Agile aperture antenna tested on aircraft to survey ground emitters, maintain satellite connection

Science Daily, 10JUL2014

The Agile Aperture Antenna, developed by researchers at the Georgia Institute of Technology, was able to sustain communication with the commercial satellite in flight as the aircraft changed headings dramatically. The antenna was changing beam directions to compensate for the aircraft headings. At the same time, it maintained communication with a device on the ground.

Tags: Communications Technology

CYBER SECURITY

Computer security: 'Melbourne Shuffle' secures data in the cloud

Science Daily, 10JUL2014

Researchers at Brown University have developed an algorithm called Melbourne Shuffle to sweep away digital footprints. It works by pulling small chunks of data down from the cloud and placing them in a user's local memory. Once the data is out of view of the server's prying eyes, it is rearranged—shuffled like a deck of cards—and then sent back to the cloud server.

Tags: Cyber security

Cyber Attacks—What are the biggest threats?

MIT Technology Review, 10JUL2014

In the last decade, there has been a shift in the perpetrators of this type of activity, with hobbyists having been replaced by new attackers: criminals, hacktivists and even governments. Full Article

Tags: Cyber security

ENERGY

Getting a charge out of water droplets

MIT News, 14JUL2014

Water condensing and jumping from a superhydrophobic surface can be harnessed to produce electricity. This approach could lead to devices that can charge cellphones or other electronics using just the humidity in the air. As a side benefit, the system could also produce clean water. TECHNICAL ARTICLE

Tags: Energy

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"Every honest researcher I know admits he's just a professional amateur."

CHARLES FRANKLIN KETTERING

Pumping efficiency into electrical motors

Science Daily, 14JUL2014

Researchers in Australia used two emerging magnetic materials—called soft magnetic composite (SMC) and amorphous magnetic material (AMM)—and two novel production techniques to form the 'stator' within the electrical motor or generator. It has potential for significant energy savings.

Tags: Energy, S&T Australia

Making a wire-free future

MIT News, 10JUL2014

Researchers at MIT developed WiTricity system of transmitters and receivers with magnetic coils to efficiently transfer power over longer distances. The system can charge through materials such as wood or granite, allow freedom to move the devices around, and charge several devices at once.

Tags: Energy

GOVERNMENT S&T

EXACTO Demonstrates First-Ever Guided .50-Caliber Bullets (w/video)

DARPA News, 10JUL2014

This video shows Extreme Accuracy Tasked Ordnance (EXACTO) rounds maneuvering in flight to hit targets that are offset from where the sniper rifle is aimed. EXACTO's specially designed ammunition and real-time optical guidance system help track and direct projectiles to their targets by compensating for weather, wind, target movement and other factors that could impede successful hits.

Tags: Government S&T, Military technology

IMAGING TECHNOLOGY

The Brilliant Machine That Could Finally Fix Airport Security

Wired, 14JUL2014

The system developed by Silicon Valley-based Qylur Security Systems consists of five pods that sit around a central sensor. With a multi-view X-ray, it matches the shapes of objects it sees against a large, pre-programmed library of images to pick out prohibited items like guns and knives. It has radiation and chemical sensors to pick out explosives. It can process five people at once. The system was tested at the World Cup event in Brazil.

Tags: Imaging technology

A narrower spectrum for a wider view of matter

PhysOrg.com, 11JUL2014

An international team of researchers has developed a new version of inelastic x-ray scattering that bridges the gaps in resolution where the liquid-glass transition takes place. With the new technique they were able to study the dynamics of liquid glycerol. TECHNICAL ARTICLE

Tags: Imaging technology

Virtual finger enables scientists to navigate and analyze complex 3D images

EurekAlert, 11JUL2014

The new technology, called Virtual Finger, allows scientists to move through digital images of small structures like neurons and synapses using the flat surface of their computer screens.

Tags: Imaging technology

'Nano-pixels' promise thin, flexible, high resolution displays

Science Daily, 09JUL2014

Researchers in England explored the link between the electrical and optical properties of phase change materials. They found that by sandwiching a seven nanometre thick layer of a phase change material Ge2Sb2Te5 between two layers of a transparent electrode they could use a tiny current to 'draw' images within the sandwich 'stack'. TECHNICAL ARTICLE

Tags: Imaging technology, S&T UK

Projecting a three-dimensional future based on nanoantennas

Science Daily, 09JUL2014

Researchers in Israel have developed an efficient holography based on nanoantennas, using the parameters of light itself to create dynamic and complex holographic images. This research could be used for improving laser-based radars and advancing anti-counterfeiting techniques to safeguard against theft. TECHNICAL ARTICLE

Tags: Imaging technology

INFORMATION TECHNOLOGY

Silicon oxide for better computer memory: Use of porous silicon oxide reduces forming voltage, improves manufacturability

Science Daily, 10JUL2014

Rice University has improved resistive random-access memory by reducing the forming voltage to less than

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two volts and eliminated the need for a "device edge structure." The technique brings the next-generation computer memory one step closer to mass production. TECHNICAL ARTICLE

Tags: Information Technology, Microelectronics

MATERIALS SCIENCE

Flashes of light on the superconductor

Science Daily, 14JUL2014

To observe and analyze the features of a superconductor at high critical temperature an international team of researchers (Italy, Japan, USA, Germany, Switzerland) has developed a new technique based on applying short flashes of light. The study opens the possibility of controlling semiconductors' characteristics by means of laser pulses. TECHNICAL ARTICLE

Tags: Materials science

MICROELECTRONICS

Self-Assembly Shows Promise for Extending Moore's Law

MIT Technology Review, 11JUL2014

Researchers in Belgium report that self-assembly looks capable of extending the working life of existing lithography, as an alternative to switching to EUV. They can now pattern transistor-like structures with a design that's similar to those of Intel's latest chips and features as small as 14 nanometers.

Tags: Microelectronics, Advanced manufacturing

Featured Resource

Chinese Academy of Sciences

Provides links to many English language journals and contents; Chinese articles provide English abstracts. RSS

QUANTUM SCIENCE

Arrays of electrons trapped in nanoscale circuitry could form the basis for future scalable quantum computers

PhysOrg.com, 11JUL2014

An international team of researchers (USA, Japan) has demonstrated a scheme for both controlling the electrons in the four quantum dots and measuring or 'reading out' the spin state of the electrons. The results demonstrate that quantum dot architecture has the potential to be scaled up to the number of qubits needed to realize a fully functional quantum computer. TECHNICAL ARTICLE

Tags: Quantum science

Advancing the limits for ultrafast nano-devices

Science Daily, 10JUL2014

Researchers at the University of Illinois, Urbana-Champaign provide new insights on the physical mechanisms governing the interplay of spin and heat at the nanoscale, and address the fundamental limits of ultrafast spintronic devices for data storage and information processing. TECHNICAL ARTICLE

Tags: Quantum science

Speeding up data storage by a thousand times with 'spin current'

Science Daily, 10JUL2014

Using ultra-fast laser pulses researchers in the Netherlands generated a flow of electrons in a material which all have the same spin. Change in the magnetization of the materials is of the order of 100 femtoseconds, which is a factor 1,000 times faster than what is possible with today's technology. They showed that generated spin current is able to cause the change in magnetization. TECHNICAL ARTICLE

Tags: Quantum science, Information technology

Making quantum connections: The speed of information in a spin network

Science Daily, 09JUL2014

Researchers at the University of Maryland are trying to build the world's best experimental platform for evolving the Schrodinger equation. They have the ability to set up the system in a known state, turn the crank, let it evolve and then make measurements at the end. TECHNICAL ARTICLE

Tags: Quantum science

New paths into the world of quasiparticles

Science Daily, 09JUL2014

Quasiparticles can be used to explain physical phenomena in solid bodies even though they are not actual physical particles. Researchers in Austria have realized quasiparticles in a quantum system and observed quantum mechanical entanglement propagation in a many-body system. TECHNICAL ARTICLE

Tags: Quantum science

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SCIENCE WITHOUT BORDERS

When does a physical system compute?

PhysOrg.com, 11JUL2014

The evolving focus on the physical basis of computing has been prompted by a growing interest in non-standard computing systems including quantum and biological computers. Researchers in the UK propose a formal framework that can be used to determine whether or not a physical system is performing a computation. TECHNICAL ARTICLE

Tags: Science without borders, S&T UK

SENSORS

Rice nanophotonics experts create powerful molecular sensor

EurekAlert, 15JUL2014

Using Raman spectroscopy in combination with an intricate but mass reproducible optical amplifier, researchers at Rice University have created a unique sensor that amplifies the optical signature of molecules by about 100 billion times. Newly published tests found the device could accurately identify the composition and structure of individual molecules containing fewer than 20 atoms. TECHNICAL ARTICLE

Tags: Sensors

A drone that finds survivors through their phones

PhysOrg.com, 14JUL2014

A drone developed by researchers in Switzerland uses two powerful antennas to sniff the data packets emitted by mobile phones. With the help of an interface on the ground the drone spots the location of the phones within 10 meters.

Tags: Sensors, S&T Switzerland ■

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