Volume 2, Issue 42 ■ 19OCT2012

S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Physicists crack another piece of the glass puzzle

Science Daily, 15OCT2012

Shattering myths: For all practical purposes, glass is a solid. But physicists are still struggling to explain how, and when, a liquid transitions into a glassy material. (Credit: © Sergios / Fotolia)

Cooling a glass from a liquid into a highly viscous state fundamentally changes the nature of particle diffusion. Researchers at Emory University have provided the first direct observation of how the particles move and tumble through space during this transition, a key piece to a major puzzle in condensed matter physics.

TECHNICAL ARTICLE

Tags: Materials science, Featured Article

Researcher aims to understand one of nature's strangest secrets—magnetotactic bacteria

Nanowerk, 15OCT2012

Magnetotactic bacteria are organisms which develop membrane-encapsulated nano-particles known as magnetosomes. Magnetosomes allow bacteria to orient themselves along the earth's magnetic field lines in order to migrate to more favourable environments. Original contribution of the research was to discover how magnetite crystals form within magnetotactic bacteria, with the ultimate aim of understanding biomineralisation processes as a whole to enable commercial production of magnetite and other biominerals.

Tags: Breakthrough technology, Featured Article

S&T News Articles

ADVANCED MANUFACTURING

Craig Venter Imagines a World with Printable Life Forms

Wired, 16OCT2012

"It's a 3-D printer for DNA, a 3-D printer for life," Venter said at the inaugural Wired Health Conference in New York City. The geneticist and his team of scientists are already testing out a version of his digital biological converter, or "teleporter." If Venter's printer becomes widely available, scientists and engineers would also have to ensure that molecules are printed accurately. Small changes could tweak the structure and make a printed protein work in a way they didn't intend.

Tags: Advanced manufacturing

Effort to mass-produce flexible nanoscale electronics

EurekAlert, 16OCT2012

The team of Case Western Reserve University researchers who specialize in different fields, ultimately aims to build flexible electronics that bend with the realities of life: Health-monitoring sensors that can be worn on or under the skin and foldable electronic devices as thin as a sheet of plastic wrap. And, further down the road, implantable nerve-stimulating electrodes that enable patients to regain control from paralysis or master a prosthetic limb.

Tags: Advanced manufacturing, Flexible electronics

Creating instant graphene electronic devices on demand

KurzweilAI, 15OCT2012

Researchers at Rice University have developed a novel concept: plasmon-induced doping of graphene. That could

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facilitate the instant creation of circuitry on graphene patterned with plasmonic antennas that can manipulate light and inject electrons into the material to affect its conductivity. The research incorporates both theoretical and experimental work to show the potential for making simple, graphene-based diodes and transistors on demand. VIDEO

Tags: Advanced manufacturing, Breakthrough technology

ADVANCED MATERIALS

E-beam 'tweezers' allow precise manipulation of single nanoparticles (w/video)

Nanowerk, 16OCT2012

Optical trapping of nanoparticles remains a challenging task because the forces are often too small when the sizes of the objects are reduced to the nanometer scale. New findings from scientists at Lawrence Berkeley National Laboratory and Singapore fill a gap and also open the door to new discoveries by demonstrating trapping and manipulating nanometer size particles using an electron beam instead of optical forces. It could also lead to new force spectroscopy where nanostructures can be assembled one nanoparticle at a time. VIDEO

Tags: Advanced materials

Making a layer cake with atomic precision

Science Daily, 16OCT2012

A team of researchers at Manchester (UK) has assembled individual atomic layers on top of each other in a desired sequence. The team used individual one-atom-thick crystals to construct a multilayer cake that works as a nanoscale electric transformer. The work proves that complex devices with various functionalities can be constructed plane by plane with atomic precision.

Tags: Advanced materials

'Invisibility' could be a key to better electronics: Visual 'cloaking' technology enables more efficient transfer of electrons

Science Daily, 15OCT2012

A new approach that allows objects to become "invisible" has now been applied to an entirely different area: letting particles "hide" from passing electrons, which could lead to more efficient thermoelectric devices and new kinds of electronics. TECHNICAL ARTICLE

Tags: Advanced materials

New techniques stretch carbon nanotubes, make stronger composites

Science Daily, 15OCT2012

Researchers have developed new techniques for stretching carbon nanotubes and using them to create carbon composites that can be used as stronger, lighter materials in everything from airplanes to bicycles. The researchers were also able to almost triple the CNT composite's thermal conductivity, to 40 watts per meter per kelvin. Electrical conductivity was increased by 50 percent to 1,230 siemens per meter. TECHNICAL ARTICLE

Tags: Advanced materials, CNT

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: IROS Jubilee

IEEE Spectrum, 12OCT2012

Report on IEEE Conference on Intelligent Robots and Systems.

Tags: Autonomous systems & robotics

BIOTECHNOLOGY

Complex logic circuit made from bacterial genes

Science Daily, 15OCT2012

Researchers at MIT have made the largest gene (or genetic) circuit yet reported. The tiny circuits constructed from these gene gates and others like them may one day be components of engineered cells that will monitor and respond to their environments. Janitor bacteria might clean up pollutants, chemical-engineer bacteria might pump out biofuels and miniature infection-control bacteria might bustle about killing pathogens. TECHNICAL ARTICLE

Tags: Biotechnology

Ebola antibody treatment, produced in plants, protects monkeys from lethal disease

Science Daily, 15OCT2012

Ebola virus study resulting from a widespread scientific collaboration between government and industry partners has shown promising preliminary results, preventing disease in infected nonhuman primates using monoclonal antibodies. The study offers the potential to make an economical and effective medical countermeasure. TECHNICAL ARTICLE

Tags: Biotechnology, Biology

Remotely activating biological materials with nanocomposites

Nanowerk Spotlight, 15OCT2012

Thermophilic enzymes are highly stable biomolecular systems that are excellent tools due to their thermostability and long-term activity for extended lifetime uses in the field and other applications. New work by researchers in the U.S. addresses the problem of remotely activating biological materials with a higher efficiency than conventional methods such as water baths or convection ovens. TECHNICAL ARTICLE

Tags: Biotechnology

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"The important thing is not to stop questioning." ALBERT EINSTEIN

Research team develops single-crystal pump for miniaturized DNA forensics

Science Daily, 15OCT2012

A Boise State University research team has developed a new type of micro pump that can be used in forensic DNA profiling. The pump features a MSM (Magnetic Shape Memory) crystal as its primary component. "With MSM technology we can make entire machines with just two or three pieces. The material is the machine."

Tags: Biotechnology

BREAKTHROUGH TECHNOLOGY

Bacterium in a laser trap

Nanowerk, 17OCT2012

Scientists have constructed an innovative new optical trap that can grab and scan tiny elongated bacteria with the help of a laser. This is fascinating in terms of physics, because the movements of the bacteria are connected with extremely small changes in energy that are usually almost impossible to measure. This turns the discovery into a practical tool for fundamental research.

TECHNICAL ARTICLE

Tags: Breakthrough technology

New Method Measures Movements of Tiny Devices-At Every Step

NIST, 16OCT2012

For the first time researchers at NIST tracked the step-by-step motion of a standard type MEMS device called a "scratch drive actuator," a micromachine that drags itself over a surface by repeatedly flexing and relaxing a tiny hooked arm. Using a novel measurement method adapted from single molecule biophysics research, the researchers tracked and measured each of the device's 500 steps along a 20-micrometer path. The approach can be broadly useful in the area of extremely small electromechanical systems.

Tags: Breakthrough technology

Another advance on the road to spintronics: Researchers unlock ferromagnetic secrets of promising materials

Science Daily, 15OCT2012

A team of researchers led by Berkeley Lab has investigated the bulk electronic structure of the prototypical dilute magnetic semiconductor gallium manganese arsenide. Their findings show that the material's ferromagnetism arises from both of the two different mechanisms that have been proposed to explain it. Their findings have removed a significant road-block impeding further development and use in spintronics. TECHNICAL ARTICLE

Tags: Breakthrough technology, Microelectronics

Freezing electrons in flight: Physicists catch electrons getting knocked out of atoms

Science Daily, 15OCT2012

Using the world's fastest laser pulses, which can freeze the ultrafast motion of electrons and atoms, physicists have caught the action of molecules breaking apart and electrons getting knocked out of atoms. Their research helps us better understand molecular processes and ultimately be able to control them in many possible applications. TECHNICAL ARTICLE

Tags: Breakthrough technology

The rise of graphene in microwave photonics

THz Science and Technology Network, 15OCT2012

A Chinese graphene-photonics research team experimentally demonstrated for the first time that graphene – besides its well-known optical saturable absorption—also shows microwave and terahertz saturable absorption. This work could change the future of microwave communications—such as microwave signal processing, broad-band wireless access networks, sensor networks, radar, and satellite communications. TECHNICAL ARTICLE

Tags: Breakthrough technology

ENERGY

A New Green Energy Idea: Harvesting Deep Ocean Currents

IEEE Spectrum, 16OCT2012

Deep ocean currents are generated by differences in the ocean's salinity and temperature around the continents. They run at a constant speed of about 3 to 5 knots (5.5 to 9 kilometers per hour). A group of companies are working together to place the first 1-megawatt system on the seafloor.

Tags: Energy

ENVIRONMENTAL SCIENCE

Jelly-like atmospheric particles resist chemical aging

Harvard University, 16OCT2012

Researchers at Harvard have shown that solid or semi-solid aerosol particles will only react with other molecules at the surface of the droplet, instead of mixing homogeneously. What this means is that the time scale of important chemical aging processes may be much longer than what is reflected in current models. The findings may call for a revision of regional and global climate models.

Tags: Environmental science

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Scientists identify trigger for explosive volcanic eruptions

Science Daily, 15OCT2012

By analysing crystal cumulate nodules (igneous rocks formed by the accumulation of crystals in magma) discovered in pyroclastic deposits of major eruptions, scientists found that pre-eruptive mixing within the magma chamber—where older cooler magma mixed with younger hotter magma—appears to be the repeating trigger in large-scale eruptions. The findings will prove invaluable in future hazard and risk assessment. TECHNICAL ARTICLE

Tags: Environmental science

GOVERNMENT S&T

Featured Resource

Nanowerk

70-100 news articles every week; Spotlight and Nanomaterials database are popular features. Nanomaterials database is a free tool for the nanotechnology community to research nanomaterials and suppliers. Currently, the database contains over 2,650 nanomaterials. RSS

Interim Report for the Triennial Review of the National Nanotechnology Initiative, Phase II

National Academies, 16OCT2012

The report examines the role of the NNI in maximizing opportunities to transfer selected technologies to the private sector; assess the suitability of current procedures and criteria for determining progress towards NNI goals; and review NNI's management and coordination of nanotechnology research across both civilian and military federal agencies.

Tags: Government S&T, Advanced materials

MATERIALS SCIENCE

New military apparel repels chemical, biological agents

R&D Magazine, 17OCT2012

Lawrence Livermore National Laboratory scientists and collaborators are developing a new military uniform material that repels chemical and biological agents using a novel carbon nanotube fabric. The material will be designed to undergo a rapid transition from a breathable state to a protective state.

Tags: Materials science, Government S&T

Training light to cool the material it strikes

PhysOrg.com, 17OCT2012

Researchers at Johns Hopkins have succeeded in reducing the ratio of Stokes to anti-Stokes to 2:1 in GaN. Possible applications of this discovery include high-frequency, high-power transistors that can operate at high temperatures, solar cell arrays for satellites, biochemical sensors and, because of GaN's relative biocompatibility, electronic implants in humans. TECHNICAL ARTICLE

Tags: Materials science

How To Make Droplets Levitate on Water

MIT Technology Review, 16OCT2012

With the invention of high speed photographic techniques, physicists discovered that before coalescing, a droplet that has fallen onto a surface of the same liquid, first bounces and traps a thin layer of air beneath it. The droplet coalesces with the surface only when this air escapes. But vibrating the surface allows this layer to stay in place indefinitely. Steerable droplets could have considerable application in chemistry and microfluidics. TECHNICAL ARTICLE, VIDEO

Tags: Materials science

New Paper Reveals Fundamental Chemistry of Plasma/Liquid Interactions

Science Daily, 16OCT2012

Researchers at Case Western Reserve University and the University of Notre Dame have revealed a critical interaction that is occurring at plasma-liquid interface in that the electrons in plasma actually serve to separate water, producing hydrogen gas. Recently, new developments have begun to capitalize on how these microplasmas interact with liquids in applications ranging from killing bacteria for sterilizing a surface to rapidly synthesizing nanoparticles. TECHNICAL ARTICLE

Tags: Materials science

Researchers spray-paint ultrathin coatings that change color with only a few atoms' difference in thickness

PhysOrg.com, 14OCT2012

For centuries it was thought that thin-film interference effects, such as those that cause oily pavements to reflect a rainbow of swirling colors, could not occur in opaque materials. Harvard physicists have now discovered that even very "lossy" thin films, if atomically thin, can be tailored to reflect a particular range of dramatic and vivid colors.

Tags: Materials science

NEUROSCIENCE

Neuroscientists find the molecular 'when' and 'where' of memory formation

Science Daily, 15OCT2012

Neuroscientists have isolated the "when" and "where" of molecular activity that occurs in the formation of short, intermediate, and long-term memories. Their findings offer new insights into the molecular architecture of

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memory formation and, with it, a better road map for developing therapeutic interventions for related afflictions. TECHNICAL ARTICLE

Tags: Neuroscience

QUANTUM SCIENCE

Quantum oscillator responds to pressure

Science Daily, 15OCT2012

In the future, superconducting quantum bits might serve as components of high-performance computers. By means of Josephson junctions, researchers measured the oscillations of individual atoms "tunneling" between two positions. This means that the atoms oscillated quantum mechanically. Deformation of the specimen even changed the frequency. TECHNICAL ARTICLE

Tags: Quantum science

S&T POLICY

NASA must reinvest in nanotechnology research—will be critical to future missions

Nanowerk, 16OCT2012

A new paper from Rice University's Baker Institute for Public Policy sheds light on a broad field that holds tremendous potential for improving space flight by reducing the weight of spacecraft and developing smaller and more accurate sensors. REPORT

Tags: S&T policy, R&D Funding

SCIENCE WITHOUT BORDERS

One million UK jobs depend on physics

Alpha Galileo Foundation, 17OCT2012

Physics-based businesses employ more than one million people in the UK, creating a greater number of jobs than both the finance, banking and insurance sector and the construction sector. Additionally, the value that employees in physics-based businesses add to the UK economy is almost double that of the average UK employee; in 2010, the Gross Value Added (GVA) by the average employee was £36,000, while the average employee in a physics-based business contributed approximately £70,000. REPORT

Tags: Science without borders, S&T UK

Boeing Proposes Gas Clouds to Remove Space Debris

Space Mart, 16OCT2012

The Boeing patent suggested the use of "ballistic gas," a quantity of cryogenic gas, such as xenon or krypton, delivered by a small satellite. The gas would be released as a cloud in the same orbit as the targeted debris, but traveling in the opposite direction. The cloud would be short-lived but hopefully long enough to hit the targeted debris.

Tags: Science without borders, Space technology

New type of cosmic ray discovered after 100 years

Science Daily, 16OCT2012

This is the first time that a major source of low-energy cosmic rays (5) has been discovered outside the Solar System. It shows that the shock waves of supernovae are not the only objects that can cause mass acceleration of atomic nuclei in the Galaxy. These findings should make it possible to identify new sources of ions in the interstellar medium.

Tags: Science without borders, Astronomy, Space technology

Scientists provide window on space radiation hazards

Science Daily, 15OCT2012

Astrophysicists have created the first online system for predicting and forecasting the radiation environment in near-Earth, lunar, and Martian space environments. The near real-time tool will provide critical information as preparations are made for potential future manned missions to the moon and Mars.

Tags: Science without borders, Space technology

STEM

Fostering Tomorrow's Scientific Breakthroughs: New American Chemical Society Video

Science Newsline, 16OCT2012

A new episode in the American Chemical Society's (ACS') popular Prized Science video series features a virtuoso in teaching the next generation of scientists, who must discover tomorrow's life-saving medicines and new fuels and help solve other global challenges. VIDEOS

Tags: STEM ■

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