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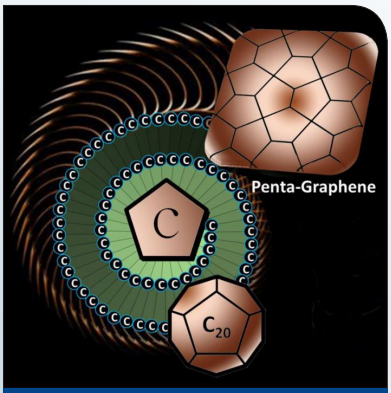
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

Penta-graphene, a new structural variant of carbon, discovered

EurekAlert, 03FEB2015



The newly discovered material, called penta-graphene, is a single layer of carbon pentagons that resembles the Cairo tiling, and that appears to be dynamically, thermally and mechanically stable. Credit: Virginia Commonwealth University

An international team of researchers (USA, China, Japan) has discovered a new structural variant of carbon called "penta-graphene", a single layer of carbon pentagons with unusual properties. It is a semiconductor, and when stretched it will expand in both directions. The material's mechanical strength, derived from Negative Poisson's Ratio, may hold especially interesting applications for technology. TECHNICAL ARTICLE

Tags: Advanced materials, Featured Article

Computer chips: Engineers use disorder to control light on the nanoscale

Science Daily, 02FEB2015

An international team of researchers (USA, Taiwan, UK) was able to control light at tiny lengths, around 500 nanometers, by using random crystal lattice structures to counteract light diffraction. The discovery could begin a new phase in laser collimation, lead to the more precise transfer of information in computer chips and new types of optical materials for light emission and lasers. TECHNICAL ARTICLE

Tags: Breakthrough technology, Photonics, Featured Article

S&T NEWS ARTICLES

ADVANCED MATERIALS

Graphene displays clear prospects for flexible electronics

Science Daily, 02FEB2015

Researchers in the UK show that graphene and related 2D materials could be utilised to create light emitting devices for the next-generation of mobile phones, tablets and televisions to make them incredibly thin, flexible, durable and even semi-transparent. TECHNICAL ARTICLE

Tags: Advanced materials, S&T UK

Graphene's cousin silicene makes transistor debut

Nature News, 02FEB2015

An international team of researchers (USA, Italy) reports on the details of the first silicene transistor. Although the device's performance is modest, and its lifetime measured in mere minutes, this proof of concept has already been causing a stir. Laying an extra coating on top of the silicene transistor could also extend its life. TECHNICAL ARTICLE

Tags: Advanced materials

Nanotechnology and nanomaterials for camouflage and stealth applications

Nanowerk, 30JAN2015

This article briefly describes how nanomaterials and nanotechnology can be useful in the strategic area of camouflage and stealth technology. The section on threat perception briefly describes various sensors and platforms from where those sensors can be operated for the purpose of surveillance, detection and identification of military objects. Prominent nanomaterials, which can find applications in futuristic stealth, have been discussed.

Tags: Advanced materials

continued...

BACK TO TOP

Understanding the reinforcing ability of carbon nanotubes

Science Daily, 30JAN2015

Researchers in Japan describe a new processing method that enables the fabrication of defect-free CNT-concentrated ceramics and CNT-graded composites with unprecedented properties. TECHNICAL ARTICLE

Tags: Advanced materials, Materials science, S&T Japan

Hedgehog particles break the rules

Nanotechweb, 29JAN2015

Researchers at the University of Michigan, Ann Arbor, have made "hedgehog" particles that can disperse in both hydrophilic and hydrophobic solvents without being treated with surfactants first. The new particles might find applications in areas as diverse as drug delivery and more environmentally friendly paints. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Video Friday: Robot Skiing, Cow Art by Drone, and 11 Years Roving on Mars

IEEE Spectrum, 30JAN2015

A cyclocopter is an aircraft that generates lift through rapidly rotating airfoils. This one, from the University of Maryland, is quite possibly the tiniest ever made.

Tags: Autonomous systems & robotics

BIG DATA

New algorithm can separate unstructured text into topics with high accuracy and reproducibility

PhysOrg.com, 29JAN2015

Researchers at Northwestern University took a network approach to develop a new algorithm called TopicMapping. The algorithm was able to perfectly separate the documents according to language and reproduce its results. It also had high accuracy and reproducibility when separating 23,000 scientific papers and 1.2 million Wikipedia articles by topic.

Tags: Big data

Large-scale analytics system for predicting major societal events described in Big Data Journal

PhysOrg.com, 28JAN2015

A team of US researchers describes the structure and function of the Early Model Based Event Recognition using Surrogates (EMBERS) system. EMBERS is a working example of a big data streaming architecture that processes large volumes of social media data and uses a variety of modeling approaches to make predictions. TECHNICAL ARTICLE

Tags: Big data

BIOTECHNOLOGY

Forward look report on quantum biology presented in Brussels

Brightsurf, 29JAN2015

Recently, the European Science Foundation released the report Foresight Activity on Research in Quantum Biology (FarQBio). It provides insights into the latest evidence of quantum phenomena in biological systems.

Tags: Biotechnology, Biology, Emerging technology, S&T EU

BREAKTHROUGH TECHNOLOGY

Mini synthetic organism instead of test animals

Science Daily, 02FEB2015

Researchers in Germany have engineered a multi-organ on a 1:100,000 scale to the human being. It replicates complex metabolic processes in the human body with startling accuracy. "Mini-organs" are connected to each other through tiny canals. Researchers can modify the exact configuration of the chip for different sets of questions and different applications. With the chip, it is possible to test the active ingredients in new medications and study cosmetics for their skin tolerability.

Tags: Breakthrough technology

Dance of the nanovortices captured and recorded with help of X-ray holography

Science Daily, 01FEB2015

An international team of researchers (Germany, Switzerland, the Netherlands) has succeeded in capturing and recording the pattern of movement in a magnetic thin film system—in the form of small magnetic nanovortices. In doing so, the researchers made a new discovery: the nanovortices possess mass. The new insights into skyrmion behaviour might contribute to realising these kinds of novel concepts for information processing. TECHNICAL ARTICLE

Tags: Breakthrough technology, Materials science

COMMUNICATIONS TECHNOLOGY

New technique doubles the distance of optical fiber communications

Science Daily, 03FEB2015

Researchers in the UK report that by eliminating the interactions between optical channels they are able to double the distance signals can be transmitted error-free, from 3190km to 5890km, which is the largest increase ever reported for this system architecture. The challenge was to devise a technique to simultaneously capture a group of optical channels, known as a super-channel, with a single receiver. This allowed them to undo the distortion by sending the data channels back on a virtual digital journey at the same time. TECHNICAL ARTICLE

Tags: Communications Technology, S&T UK

continued...

"The imposing edifice of science provides a challenging view of what can be achieved by the accumulation of many small efforts in a steady objective and dedicated search for truth." CHARLES HARD TOWNES

ENERGY

A Battery for Electronics That Lasts Twice as Long

MIT Technology Review, 02FEB2015

A company in the US swapped the conventional electrode material—graphite—for a thin sheet of lithium-metal foil, which can store more lithium ions. The process doesn't require new lithium-ion battery manufacturing equipment. The company says its prototype can be recharged 300 times while retaining 80 percent of its original storage capacity—closer to what you'd need in portable electronics. It also works at room temperature.

Tags: Energy, Battery

Nanoballs Inflate Voltage Capacity of Power Cables, Save Energy

IEEE Spectrum, 30JAN2015

Researchers in Sweden found that variants of the C60 carbon ball, a nanomaterial in the fullerene molecular group, protect against the breakdown of the insulation plastic used in high-voltage cables. According to the researchers, it takes a small amount of the carbon balls to improve the plastic insulator's voltage capacity by 26 percent. TECHNICAL ARTICLE

Tags: Energy, Materials science, S&T Sweden

IMAGING TECHNOLOGY

Ultrasound technology made to measure

Science Daily, 29JAN2015

Researchers in Germany have developed a multichannel ultrasound platform that uses a modular configuration so that it can be adapted to a set of applications that are entirely different from each other. The system uses basic components, like main board, power supply, and control software that always stay the same. Then they add application specific components into the main board.

Tags: Imaging technology, S&T Germany, Sensors

INFORMATION TECHNOLOGY

Building the next generation of efficient computers

PhysOrg.com, 29JAN2015

A team of US researchers (University of Connecticut, UC Berkeley, Cornell University) working with bismuth ferrite discovered a previously unknown two-step ferroelectric switching process. This discovery led to a novel low-energy, highly efficient nonvolatile memory device known as a spin valve that operates at room temperature.

Tags: Information Technology

MATERIALS SCIENCE

Quest for efficiency in thermoelectric nanowires

Science Daily, 02FEB2015

Researchers at Sandia National Laboratory created thermoelectric nanowire arrays with uniform composition which potentially can include hundreds of millions of nanowires. In addition, they created nanowire crystals of uniform size and orientation. Uniform composition improves efficiency, while orientation is important so electrons flow better.

Tags: Materials science, Government S&T

Wrinkle predictions: New mathematical theory may explain patterns in fingerprints, raisins, and microlenses

Science Daily, 02FEB2015

Combining ideas from fluid mechanics with the elasticity theory, researchers at MIT derived a simplified equation that accurately predicts the wrinkling patterns. From their calculations, they determined that one main parameter, curvature, rules the type of pattern that forms: The more curved a surface is, the more its surface patterns resemble a crystal-like lattice. They report that their theory may help to generally explain how fingerprints and wrinkles form. TECHNICAL ARTICLE

Tags: Materials science, Mathematics

New method allows for greater variation in band gap tunability

EurekAlert, 30JAN2015

Researchers at Northwestern University have discovered a novel way to control the electronic band gap in complex oxide materials without changing the material's overall composition. The finding could potentially lead to better electro-optical devices, new energy-generation and conversion materials, including more absorbent solar cells and improved conversion of sunlight into chemical fuels through photoelectrocatalysis.

Tags: Materials science

Demystifying nanocrystal solar cells

Nanowerk, 28JAN2015

Nanocrystal solar cells contain layers of many individual nano-sized crystals, bound together by a molecular glue. Researchers in Switzerland were able to describe the electron transport in these types of cells via a generally applicable physical model. The model allows for a better understanding of such cells and may help to increase their efficiency. TECHNICAL ARTICLE

Tags: Materials science, Energy, S&T Switzerland

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PHOTONICS

Ultrasound puts a new twist on light

Physics World, 02FEB2015

A new way to create and guide beams of "twisted light" has been created by researchers in the UK. The team used a cylindrical array of ultrasound loudspeakers to create a pattern of density waves in a fluid through which a laser beam is shone. The system creates twisted "Bessel beams" that can be reconfigured at a rate of about 150 kHz and shows promise for use in a wide range of applications including optical tweezers, high-speed data transmission and aberration correction for microscopes. TECHNICAL ARTICLE

Tags: Photonics, S&T UK

The first optically synchronised free-electron laser

PhysOrg.com, 30JAN2015

An international team of researchers (Germany, USA, Ireland, Poland) demonstrates facility-wide timing to better than 30 fs r.m.s. for 90 fs X-ray photon pulses. Crucially, their analysis indicates that the performance of this optical synchronization is limited primarily by the free-electron laser pulse duration, and should naturally scale to the sub-10 femtosecond level with shorter X-ray pulses. TECHNICAL ARTICLE

Tags: Photonics

Featured Resource

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The aim of FreeFullPDF.com is to increase the visibility and ease of use of open access scientific journals, theses, posters and patents. All scientific subjects are covered and all content are freely available in PDF format.

Breakthrough in terahertz spectroscopy

Science Daily, 28JAN2015

An international team of researchers (Italy, Canada, Saudi Arabia) demonstrated that it is possible to retrieve the spectroscopic signature of a single layer of semiconductor nanocrystals and increase their absorption by more than a million times when they are placed in the antennas' nanocavities. The unique method they developed to squeeze terahertz light into nanovolumes opens up new research perspectives in nanophotonics and broadens the field of applications in both spectroscopy and nonlinear optics. TECHNICAL ARTICLE

Tags: Photonics, Terahertz technology

QUANTUM SCIENCE

Basics of quantum plasmonics

IOP Science, 03FEB2015

The present work is a topical review of the theoretical research on the quantum theory of plasmons and plasmon–photon interaction. They all show that the interaction processes are nonlocal ones. The physical origin of the nonlocality is the complex structure of plasmons as composite quasiparticles: they cannot be considered as point particles, as was assumed in all phenomenological theories.

Tags: Quantum science

Evidence mounts for quantum criticality theory

PhysOrg.com, 30JAN2015

An international team of researchers (USA, Germany) describes results from a series of experiments on a layered composite of cerium, rhodium and indium which adds to the growing body of evidence supporting a theory that strange electronic behaviors—including high-temperature superconductivity and heavy fermion physics—arise from quantum fluctuations of strongly correlated electrons. Quantum critical points, which are particularly pronounced, mark a smooth phase change. TECHNICAL ARTICLE

Tags: Quantum science

Qubits with staying power

MIT News, 29JAN2015

A team of US researchers (MIT, DOE's Brookhaven National Laboratory) reports that when nitrogen atoms happen to be situated next to gaps in the diamond's crystal lattice, they produce nitrogen vacancies, which enable researchers to optically control the spin of individual electrons and atomic nuclei. In experiments, the new design extended the superposition time of a promising type of qubit a hundredfold. TECHNICAL ARTICLE

Tags: Quantum science

S&T POLICY

A third industrial revolution for Norway

Science Daily, 03FEB2015

According to a futurist, what Norway needs now is a national road map with provisions for the country's major urban areas to make the transition to a new, digital future where communities generate their own power, share their electric vehicles and live in super-insulated efficient buildings. The vision of this new economy was formally endorsed by the European Parliament in 2007.

Tags: S&T policy, S&T EU

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The future of tech, according to NASA

Federal Computer Week, 02FEB2015

NASA has defined several areas of focus in order to extract the most value out of its data, better enable its IT workforce and utilize the latest technology in the market. Wearable technology, augmented reality, the Internet of Things, 3D and event 4D printing are all being developed for use by NASA employees.

Tags: S&T policy, NASA

The Purpose of Silicon Valley

MIT Technology Review, 30JAN2015

Capital and engineering talent have been flocking to seemingly trivial mobile apps. But would we really be better off if more startups instead went directly after big problems? This town used to think big—the integrated circuit, personal computers, the Internet. Are we really leveraging all that intellectual power and creativity creating Instagram and dating apps? Is this truly going to change the world?

Tags: S&T policy

SCIENCE WITHOUT BORDERS

Quantum computer as detector shows space is not squeezed

Science Daily, 28JAN2015

In a new experiment an international team of researchers (USA, Japan, Russia) used partially entangled atoms—identical to the qubits in a quantum computer—to demonstrate more precisely than ever before that space is not squeezed in one direction relative to another. The new method can be used to make very precise measurements of perturbations of space. TECHNICAL ARTICLE

Tags: Science without borders

SENSORS

Researchers equip humans with magnetic sense

PhysOrg.com, 03FEB2015

An international team of researchers (Germany, Japan) has developed new magnetic sensors that can withstand extreme bending with radii of less than three micrometer, and survive crumpling like a piece of paper without sacrificing the sensor performance. They can be stretched to more than 270 percent and for over 1,000 cycles without fatigue. They are ideally suited to be wearable. TECHNICAL ARTICLE

Tags: Sensors

Nanoantennas go fan-shaped

Nanotechweb, 02FEB2015

Researchers at Rice University have developed a new type of "nanoantenna" that pushes the sensitivity of a spectroscopy technique called SEIRA (surface-enhanced infrared absorption) to levels never before seen in the lab. The fan-shaped nanostructure could help in the development of systems capable of detecting single molecules using infrared light and so improve the efficiency of trace chemical analysis. TECHNICAL ARTICLE

Tags: Sensors

Using a single molecule to create a new magnetic field sensor

Nanowerk, 30JAN2015

Researchers in the UK show how magnetism can manipulate the way electricity flows through a single molecule, a key step that could enable the development of magnetic field sensors for hard drives that are a tiny fraction of their present size. TECHNICAL ARTICLE

Tags: Sensors, S&T UK

Tasting light

MIT News, 29JAN2015

A new study from MIT finds that the worm Caenorhabditis elegans can taste hydrogen peroxide, triggering it to stop eating the potentially dangerous substance. Though it is not yet known whether there is a human equivalent of this system, the researchers say their discovery lends support to the idea that there may be human taste receptors dedicated to flavors other than the five canonical ones—sweet, salty, bitter, sour, and savory. It also opens the possibility that humans might be able to sense light in ways that are fundamentally different from those known to act in vision.

Tags: Sensors ■

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