Volume 3, Issue 14 ■ 05APR2013

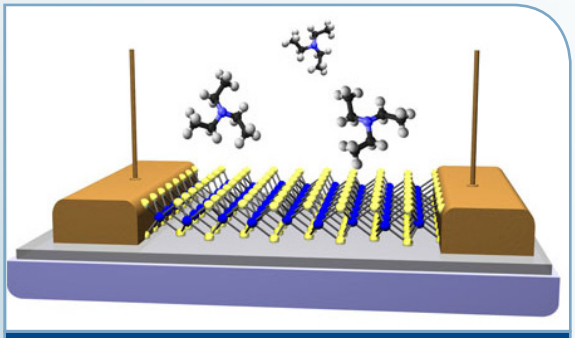
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

Feature Articles

Researchers develop new monolayer materials for chemical vapor sensors

Nanowerk, 01APR2013



This is a schematic of a vapor sensor fabricated from a single monolayer of MoS2. The conductivity of the MoS2 channel changes as specific types of vapor molecules briefly interact with the surface. Molecules of triethylamine are shown a chemical assoicated with V-series nerve gas agents.

NRL scientists have fabricated a sensor using a single monolayer of molybdenum disulfide (MoS2) on a silicon dioxide wafer. They show that it functions effectively as a chemical vapor sensor, exhibiting highly selective reactivity to a range of analytes, and providing sensitive transduction of transient surface physisorption events to the conductance of the monolayer channel. TECHNICAL ARTICLE

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

Spectral compression of single photons

Nature Photonics, 01APR2013

Researchers from Canada demonstrate bandwidth compression of single photons by a factor of 40 as well as tunability over a range 70 times that bandwidth via sum-frequency generation with chirped laser pulses. It is a step towards arbitrary waveform generation for single and entangled photons.

Tags: Photonics, S&T Canada, Featured Article

Optical random access memory: Parts of images can be selectively retrieved from an atomic gas

PhysOrg.com, 30MAR2013

In a new experiment researchers at NIST's Joint Quantum Institute have shown that parts of a single image (spread out across a volume of space) can be stored and later recovered in chunks. Selectively reading out these partial views represents random access memory in space. Portions of the image can also be deleted with what the researchers call an optical eraser. TECHNICAL ARTICLE

Tags: Imaging technology, Featured Article

S&T News Articles

ADVANCED MATERIALS

Ultra-precision positioning

Science Daily, 28MAR2013

Researchers in China improved upon previous designs of rotary actuator with a clamp that integrates the driving and stopping action and can be moved to different distances from the rotor's center. It gives the researchers greater control, more power, torque, accuracy, and speed. TECHNICAL ARTICLE

Tags: Advanced materials, S&T China

Engineers develop nanofoams for better body armor, layers of protection for buildings

Nanowerk, 27MAR2013

The nanofoams are made up of a honeycomb, or porous, structure and are very light—pores make up anywhere from 50 to 80 percent of the structure. Researchers at UC San Diego manufactured samples with pore sizes ranging from 10 nanometers to 10 microns. Preliminary results show that when pore size reaches tens of nanometers, the material seems to perform best.

Tags: Advanced materials

continued...

BACK TO TOP

AUTONOMOUS SYSTEMS & ROBOTICS

Robotic Ants Solve Riddles Without Math

Science NOW, 30MAR2013

Researchers used tiny, cube-shaped robots that were powered by watch motors and ran on dime-sized wheels. They gave the machines three rules: to walk randomly in a given direction, to turn away from obstacles they bump into, and to follow a trail of light left by other robots—similar to the way real ants use their antennae to sense chemicals left behind by other ants. These simple tenets were enough to allow the robots to copy ants' ability to find the shortest path home. TECHNICAL ARTICLE

Tags: Autonomous systems & robotics

Video Friday: Robot Jellyfish, Robot Dragonfly, and a Crazy Game of Telepresence Soccer

IEEE Spectrum, 29MAR2013

When it comes to robotic insects, there is certainly such a thing as far too big.

Tags: Autonomous systems & robotics

Knowing the unknown

MIT News, 27MAR2013

Researchers at MIT have built a system based on a module called the state estimation component, which calculates the probability of any given object being what or where the robot thinks it is. In this way, if the robot is not sufficiently certain that an object is the one it is looking for, because the probability of it being that object is too low, it knows it needs to gather more information before taking any action.

Tags: Autonomous systems & robotics

BIG DATA

Big Data, Meet Long Data

Information Week, 02APR2013

Sure, big data is a powerful lens—some would even argue a liberating one—for looking at our world. Despite its limitations and requirements, crunching big numbers can help us learn a lot about ourselves. Indeed, historical data certainly has a lot to teach humankind in general, not just businesses hoping to sell more widgets. Related article

Tags: Big data

BIOTECHNOLOGY

Actin up

Nature Materials, 02APR2013

Researchers in France defined the shape and orientation of 3D actin networks through both micropatterning of actin nucleation factors and biochemical control of actin filament polymerization. Networks growing from two opposing layers were able to interpenetrate and form mechanically stable connections, which were then coated with gold using a selective metallization process. The electrical conductivity, robustness and modularity of the metallized self-organized connections make this approach potentially attractive for 3D chip manufacturing.

Tags: Biotechnology, Materials science, S&T France

How to Make a Computer from a Living Cell

MIT Technology Review, 30MAR2013

Stanford University researchers' genetic logic gate can be used to perform the full complement of digital logic tasks, and it can store information, too. It works by making changes to the cell's genome, creating a kind of transcript of the cell's activities that can be read out later with a DNA sequencer.

Tags: Biotechnology

Scientists map protein that creates antibiotic resistance

Nature News, 29MAR2013

Researchers in Japan have determined the detailed molecular structure of a protein that rids cells of toxins, but can also reduce the effectiveness of some antibiotics and cancer drugs by kicking them out of the cells they are targeting. They have also identified a molecule that can thwart the activity of the protein. The discovery suggests new approaches to combat antibiotic resistance and boost the power of cancer therapies.

Tags: Biotechnology, Biology

Scientists Develop Innovative Twists to DNA Nanotechnology

Science Daily, 21MAR2013

Researchers at the University of Arizona made 2-D and 3-D objects that look like wire-frame art of spheres as well as molecular tweezers, scissors, a screw, hand fan, and even a spider web. By varying the length of the DNA between each Holliday junction, they could force the geometry at the Holliday junctions into an unconventional rearrangement, making the junctions more flexible to build for the first time in the vertical dimension. TECHNICAL ARTICLE

Tags: Biotechnology

COMMUNICATIONS TECHNOLOGY

Optically programmable excitonic traps

Nature Scientific Reports, 02APR2013

Researchers in Spain synthesize optically programmable trapping potentials for indirect excitons of bilayer heterostructures. Their approach relies on the injection and spatial patterning of charges trapped in a field-effect device. This technique creates new opportunities to improve state-of-the-art technologies for the study of collective quantum behavior of excitons and also for the functionalisation of emerging exciton-based opto-electronic circuits.

Tags: Communications Technology

continued...

"Research is the process of going up alleys to see if they are blind."

MARSTON BATES

Air-to-ground quantum communication

Nature Photonics, 01APR2013

En route to achieving QKD via satellites, researchers in Germany performed a free-space demonstration of secure key distribution between two ground stations, over a distance of 144 km. This scenario is comparable to links between satellites in low Earth orbit and ground stations with respect to both attenuation and fluctuations.

Tags: Communications Technology, Quantum science, S&T Germany

Theory and practice key to optimized broadband, low-cost optical metamaterials

Nanowerk, 28MAR2013

Researchers at Penn State optimized the dimensions of features such as the size of the fishnet and the thicknesses of the existing fishnet structured metamaterials. One of the transformative innovations made by the researchers was the inclusion of nanonotches in the corners of the fishnet holes, creating a pattern that could be tuned to shape the dispersion over large bandwidths. TECHNICAL ARTICLE

Tags: Communications Technology, Optical communication

ENERGY

A longer life for lithium-sulfur batteries

Science Daily, 02APR2013

Researchers in Germany have developed a new design that increases the charge cycles of lithium-sulfur batteries by a factor of seven. During previous tests, the batteries scarcely crossed the 200-cycle mark. By means of a special combination of anode and cathode material, they have now managed to extend the lifespan of lithium-sulfur button cells to 1,400 cycles.

Tags: Energy, Battery, S&T Germany

Discovery opens door to efficiently storing and reusing renewable energy

EurekAlert, 30MAR2013

Researchers in Canada developed electrolyzer devices that use catalysts to drive a chemical reaction that converts electricity into chemical energy by splitting water into hydrogen and oxygen fuels. These fuels can then be stored and re-converted to electricity for use whenever wanted. They used abundant metal compounds or oxides (including iron oxide or 'rust'), to create mixed metal oxide catalysts having a disordered, or amorphous, structure.

Tags: Energy, S&T Canada, Solar energy

IMAGING TECHNOLOGY

Better than X-rays: A more powerful terahertz imaging system

EurekAlert, 30MAR2013

A research team at the University of Michigan has developed a laser-powered terahertz source and detector system that transmits with 50 times more power and receives with 30 times more sensitivity than existing technologies. This offers 1,500 times more powerful systems for imaging and sensing applications.

Tags: Imaging technology, Terahertz technology

INFORMATION TECHNOLOGY

RIT researchers develop advanced video and image processing

EurekAlert, 30MAR2013

Researchers at Rochester Institute of Technology are developing advanced intelligence processing technologies to handle large volumes of remotely sensed data in a timely manner, and to effectively distinguish objects, scale, complexity and organization.

Tags: Information Technology

How hard is it to 'de-anonymize' cellphone data?

MIT News, 27MAR2013

Researchers at MIT and the Université Catholique de Louvain, in Belgium, analyzed data on 1.5 million cellphone users and found that just four points of reference, with fairly low spatial and temporal resolution, was enough to uniquely identify 95 percent of them.

Tags: Information Technology

MATERIALS SCIENCE

Light tsunami in a superconductor

Science Daily, 03APR2013

An international team of researchers (Germany, Japan and UK) investigated if and how superconductivity can be systematically controlled. The objective of their research is to improve the usability of superconducting materials for such new technologies as, for example, the processing of information. They managed to selectively influence resistance-free conductivity with a powerful terahertz laser. TECHNICAL ARTICLE

Tags: Materials science, Communications Technology, S&T Germany, S&T Japan, S&T UK

continued...

Watching fluid flow at nanometer scales: Tiny nanowires can lift liquids as effectively as tubes

Science Daily, 01APR2013

New research carried out at MIT and elsewhere has demonstrated for the first time that when inserted into a pool of liquid, nanowires naturally draw the liquid upward in a thin film that coats the surface of the wire. The finding could have applications in microfluidic devices, biomedical research and inkjet printers. TECHNICAL ARTICLE

Tags: Materials science

Featured Resource

Nature Publishing Index

The Nature Publishing Index ranks institutions according to the number of primary research articles they publish in Nature journals. The Index should be viewed as primarily an index of high quality basic and not applied research.

Ceramic paper? A sophisticated nanostructure makes ceramics foldable

Nanowerk, 30MAR2013

Researchers in Germany were the first to produce a paper-like material from a vanadium pentoxide ceramic which is as hard as copper, yet flexible enough to be rolled up or folded. The material is also different from other ceramics, as it is electrically conductive. Potential applications: batteries, gas sensors and artificial muscles. TECHNICAL ARTICLE

Tags: Materials science, S&T Germany

Engineers enable bulk silicon to emit visible light for the first time

Nanowerk, 30MAR2013

Research from the University of Pennsylvania has enabled "bulk" silicon to emit broad-spectrum, visible light for the first time, opening the possibility of using the element in devices that have both electronic and photonic components. TECHNICAL ARTICLE

Tags: Materials science

Nanotechnology reverses rusting just by turning on a bright light

Nanowerk, 30MAR2013

Researchers at the University of Michigan made copper nanoparticles about 40 nanometers across. They peppered tiny particles of clear silica with the nanoparticles and then floated a gas of propylene and oxygen over the resulting dust. In the dark, the copper oxidized, and only 20 percent of the gas converted to propylene oxide. But under white light, five times the sun's intensity, the copper stayed in the metallic state and turned 50 percent of the propylene into propylene oxide. TECHNICAL ARTICLE

Tags: Materials science

MEDICAL SCIENCES

Rewinding the clock with epigenomics

Harvard University, 29MAR2013

Since scientists discovered how to create iPS cells (cells whose developmental clocks have been wound backward to an earlier time) seven years ago, researchers have begun to see parallels between the steps required to make iPS cells in the dish and the molecular events that unleash a cancer cell. TECHNICAL ARTICLE

Tags: Medical Sciences, Biology

MICROELECTRONICS

Research Could Improve Heat Dissipation in 3-D Systems

Newswise, 02APR2013

Under DARPA's Intrachip/Interchip Enhanced Cooling (ICECool) program researchers at the Georgia Institute of Technology are developing techniques to dissipate heat of as much as one kilowatt per square centimeter in the overall integrated circuit, and five kilowatts per square centimeter on smaller areas.

Tags: Microelectronics

QUANTUM SCIENCE

Key Reconciliation for High Performance Quantum Key Distribution

Nature Scientific Reports, 02APR2013

Researchers in Spain argue that it is the throughput, the significant magnitude in practical QKD, specially in the case of high speed devices, where the differences are more marked, and give some examples contrasting the usual postprocessing schemes with new ones from modern coding theory. A good understanding of its implications is very important for the design of modern QKD devices.

Tags: Quantum science, Communications Technology

Quantum Computing? Physicists' New Technique for Cooling Molecules May Be a Stepping Stone to Quantum Computing

Science Daily, 27MAR2013

UCLA physicists have pioneered a new technique that combines two traditional atomic cooling technologies and brings normally springy molecules to a frozen standstill. The goal is to build a computer that doesn't work with zeros and ones, but with quantum mechanical objects. TECHNICAL ARTICLE

Tags: Quantum science

continued...

S&T POLICY

NTU sets up one-stop institute to spur medical inventions

Alpha Galileo Foundation, 01APR2013

When researchers from different backgrounds and disciplines work together and exchange ideas, unexpected groundbreaking innovations can emerge. That is what is happening at Nanyang Technological University (NTU) in Singapore, where an exciting "artificial liver" platform is being developed that is expected to speed up the development of new drugs, and also help bring down R&D costs.

Tags: S&T policy

China to build two more Antarctic bases

PhysOrg.com, 30MAR2013

China is to build two extra research stations in Antarctica, where it currently has three facilities. The new station will be used to study geology, glaciers, geomagnetism and atmospheric science. A new all-year base will also be built in Victoria Land, on the Ross Sea, for multi-disciplinary research on bio-ecology and satellite remote sensing. On the other side of the world, China is looking to expand its presence in the Arctic, which is thought to harbor huge natural resources and serve as a shipping route to Europe.

Tags: S&T policy, S&T China

SCIENCE WITHOUT BORDERS

The hunt for the creative individual

Science Daily, 02APR2013

What should we look for when searching for creative people? Researchers in Norway identify seven paramount personality traits that characterise creative people. TECHNICAL ARTICLE

Tags: Science without borders

How does innovation take hold in a community? Math modeling can provide clues

Science Daily, 30MAR2013

Mathematical models can be used to study the spread of technological innovations among individuals connected to each other by a network of peer-to-peer influences, such as in a physical community or neighborhood. TECHNICAL ARTICLE

Tags: Science without borders

SENSORS

Radar advance: Acoustic time delay device could reduce size and cost of phased array systems

Science Daily, 29MAR2013

A research team from the Georgia Institute of Technology has developed a novel device—the ultra-compact passive true time delay. This component could help reduce the size, complexity, power requirements and cost of phased array designs, and may have applications in other defense and communication areas as well.

Tags: Sensors, Imaging Technology ■

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