Volume 2, Issue 19 ■ 11MAY2012

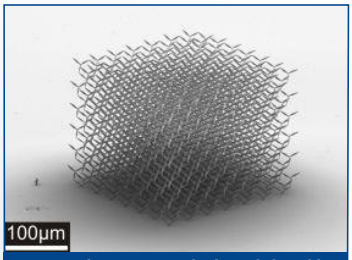
S&T NEWS BULLETIN

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH NEWS

FEATURE ARTICLES

New material class developed: Pentamode metamaterial

Science Daily, 08MAY2012



Pentamode metamaterials almost behave like fluids. Their manufacture opens new possibilities in transformation acoustics. (Credit: CFN, KIT)

Engineers in Germany have succeeded in realizing a new material class through the manufacturing of a stable crystalline metafluid, a pentamode metamaterial. Using new nanostructuring methods, these materials can now be realized for the first time with any conceivable mechanical properties.

Tags: Advanced materials, Metamaterials, Nanomaterials, Featured Article

Shhhh. Listen to the data

Physics Today, 08MAY2012

Sifting through large amounts of data, monitoring data streams, and communicating results are promising areas for sonification. This is commonplace for such things as stock prices, monitoring such things as web traffic for internet security purposes, and to looking for correlations of stock prices with certain words on Twitter. A pure science example is the Laser Interferometer Gravitational-Wave Observatory (LIGO).

Tags: Big data, Featured Article

Graphene-based Terahertz Devices: the Wave of the Future

THz Science and Technology Network, 03MAY2012

Researchers at the University of Notre Dame have shown that it is possible to efficiently manipulate THz electromagnetic waves with atomically thin graphene layers. This achievement sets the stage for development of compact efficient and cost-effective devices and systems operating in the THz band. TECHNICAL ARTICLE

Tags: Advanced materials, Terahertz technology, Featured Article

S&T NEWS ARTICLES

ADVANCED MANUFACTURING

In Denmark, a printable house

KurzweilAI, 05MAY2012

Danish architects Frederik Agdrup and Nicholas Bjorndal of Eentileen used just a computer, a "printer"—actually, a computer numerical control (CNC) machine—and 820 sheets of plywood to build a 125 square meter (1,345 square foot) home in four weeks. The designers are touting the process of mass-customizing houses and responsibly producing them on site.

Tags: Advanced manufacturing

ADVANCED MATERIALS

Guiding crystallization in thin films around bends and corners

Nanowerk, 08MAY2012

Researchers have now demonstrated a method to guide crystallization along arbitrary patterns in the plane of organic thin films (ca. 100 nm thick), using an organic semiconductor, triethylsilylethynyl anthradithiophene (TES ADT). The surface energy of the path is selected such that fast crystallization is promoted along the path, while the surface energy of the region surrounding the path is selected such that crystallization is suppressed. VIDEO

Tags: Advanced materials

Power generation technology based on piezoelectric nanocomposite materials developed by KAIST

EurekAlert, 07MAY2012

A research team in Korea produced a piezoelectric nanocomposite by mixing piezoelectric nanoparticles with carbon-based nanomaterials (carbon nanotubes and reduced graphene oxide) in a polydimethylsiloxane (PDMS) matrix and fabricated the nanocomposite generator by the simple process of spin-casting or bar-coating method. This method successfully overcomes the critical restrictions that existed in previous nanogenerators and builds a simple, low-cost, and large-scale self-powered energy system.

Tags: Advanced materials, Energy

continued...

BACK TO TOP

Next-generation nanoelectronics: A decade of progress, coming advances

Science Daily, 03MAY2012

Ultimately, realizing next-generation hybrid NEM-CMOS devices will enable continued scaling of the electronics that power numerous systems we encounter on a daily basis. At the same time, it will require continued push from the engineering, basic sciences, and materials science communities. TECHNICAL ARTICLE 1, TECHNICAL ARTICLE 2

Tags: Advanced materials, Microelectronics

Bejeweled: Nanotech gets boost from nanowire decorations

Stanford University, 01MAY2012

Engineers at Stanford have found a novel method for "decorating" nanowires with chains of tiny particles to increase their electrical and catalytic performance. The new technique is simpler, faster and provides greater control than earlier methods and could lead to better batteries, solar cells and catalysts. TECHNICAL ARTICLE

Tags: Advanced materials

AUTONOMOUS SYSTEMS & ROBOTICS

Japanese Humanoid Robot Can Keep Its Balance After Getting Kicked

IEEE Spectrum, 08MAY2012

University of Tokyo researchers have developed a high-torque, high-speed robotic leg based on a novel electrical actuation system. Their robot uses high-voltage and high-current liquid-cooled motor drivers that get their power from a 13.5-farad capacitor system. Why a capacitor? Because it can supply lots of current very fast and reliably, something that batteries are not good at. VIDEO

Tags: Autonomous systems & robotics, S&T Japan

sFly Quadrotors Navigate Outdoors All By Themselves

IEEE Spectrum, 08MAY2012

The only thing that sFly has to go on is an IMU and an onboard camera (and an integrated computer), and a very efficient onboard inertial-aided visual simultaneous localization and mapping algorithm. sFly is capable of navigating all by itself. And if you have a fleet of sFly quadrotors, you can use them to make cooperative 3D maps of the environment. VIDEO

Tags: Autonomous systems & robotics

Flying 3-D eye-bots

EurekAlert, 07MAY2012

These UAVs are a kind of mini-helicopter, with a wingspan of around two meters. They have a propeller on each of their two variable-geometry side wings, which lends them rapid and precise maneuverability. In operation over the playing field, their cameras and sensors capture urgently-needed images and data, and transmit them to the control center. A CMOS sensor developed by researchers at the Fraunhofer Institute for Microelectronic Circuits and Systems IMS in Duisburg lies at the heart of the anti-collision technology.

Tags: Autonomous systems & robotics, Microrobots, S&T Germany

Robot cars get ready to roll

KurzweilAI, 07MAY2012

In the US, laws are already being debated, and approved, to allow the vehicles to drive themselves on regular roads. In Nevada, for example, the government has begun to draft a set of regulations that will allow these vehicles on its roads. One of the proposals is for robotic cars to be identified by red license plates. VIDEO

Tags: Autonomous systems & robotics

Video Friday: Robot Termites, Dust Puppies, and Serious Social Issues

IEEE Spectrum, 07MAY2012

Watch robot termites build a building, try and figure out what iRobot was thinking with a 1997 Roomba prototype, and check out a panel from the We Robot conference. AILA Robofoot; Sewer Snake; Algorithmic Self-assembly

Tags: Autonomous systems & robotics, Robotics

BIG DATA

Microsoft's New Lab Hunts for Value in User Data

MIT Technology Review, 03MAY2012

Microsoft has begun a new effort to understand how people interact and spread information online—and how such social interactions could be valuable to the company. The New York lab will search for patterns in aggregated user data, and suggest new revenue sources for Microsoft's existing products.

Tags: Big data, Data analytics

BIOTECHNOLOGY

Robot reveals the inner workings of brain cells

EurekAlert, 07MAY2012

Researchers at MIT and Georgia Tech have shown that a robotic arm guided by a cell-detecting computer algorithm can identify and record from neurons in the living mouse brain with better accuracy and speed than a human experimenter.

Tags: Biotechnology, Neuroscience

Penn scientists develop large-scale simulation of human blood

EurekAlert, 02MAY2012

A team of biomedical engineers and hematologists at the University of Pennsylvania has made large-scale, patient-specific simulations of blood function under the flow conditions found in blood vessels, using robots to run hundreds

continued...

"Science can amuse and fascinate us all, but it is engineering that changes the world." ANONYMOUS

of tests on human platelets responding to combinations of activating agents that cause clotting.
Tags: Biotechnology, Medical technology

COMMUNICATIONS TECHNOLOGY

Life-size 3-D hologram-like telepods may revolutionize videoconferencing in the future

EurekAlert, 07MAY2012

Researchers at the Queen's Human Media Lab have developed technology called TeleHuman that looks like something from the Star Trek holodeck. Two people simply stand infront of their own life-size cylindrical pods and talks to a 3D hologram-like images of each other. Cameras capture and track 3D video and convert into the life-size image.
Tags: Communications Technology, Autonomous Systems & Robotics, S&T UK

ENERGY

Can minor vibrations replace batteries in power sensors, radio transmitters and GPS modules?

Science Daily, 08MAY2012

Sensors, radio transmitters and GPS modules all feature low power consumption. All it takes is a few milliwatts to run them. Energy from the environment—from sources such as light or vibrations—may be enough to meet these requirements. A new measurement device can determine whether or not the energy potential is high enough.
Tags: Energy

China is planning two hydro dams, each twice as large the Three Gorges

Next Big Future, 08MAY2012

The scale of China's hydroelectric ambitions has regional and global political implications. India and others downstream have issues. China is using hydro power for clean electricity and for their own water security. China has stepped up its reengineering of river flows in two ways: by portentously shifting its focus from internal rivers to international rivers; and by graduating from building large dams to building megadams.
Tags: Energy, S&T China

Mining for heat

EurekAlert, 03MAY2012

Abandoned mine tunnels might ferry geothermal energy from deep underground to help heat homes and offices. A group of researchers from McGill University in Canada has taken a systematic look at how such heat might be put to use once mines are closed. They calculate that each kilometer of a typical deep underground mine could produce 150 kW of heat, enough to warm 5 to 10 Canadian households during off-peak times.
Tags: Energy

The Intersection of Information and Energy Technologies

MIT Technology Review, 03MAY2012

Two talks at the TED conference this year formed, back to back, a sort of debate about the future of our planet. First, Paul Gilding gave a talk entitled The Earth Is Full, about how we are using up all Earth's resources, with possibly devastating consequences. Next, X Prize creator Peter Diamandis gave a presentation entitled Abundance is our Future, about how we will invent innovative ways to solve the challenges that loom before us.
Tags: Energy, Forecasting, Information technology

ENVIRONMENTAL SCIENCE

First 'microsubmarines' designed to help clean up oil spills

EurekAlert, 03MAY2012

Scientists are reporting development and successful testing of the first self-propelled "microsubmarines" designed to pick up droplets of oil from contaminated waters and transport them to collection facilities. The report concludes that these tiny machines could play an important role in cleaning up oil spills.
Tags: Environmental science

GOVERNMENT S&T

First light: NIST researchers develop new way to generate superluminal pulses

EurekAlert, 06MAY2012

NIST researchers have developed a novel way of producing light pulses that are "superluminal"—in some sense they travel faster than the speed of light. The new method could be used to improve the timing of communications signals and to investigate the propagation of quantum correlations.
Tags: Government S&T, Communications Technology

High-Speed Plunge Transforms Robo-Copter Into a Plane (w/video)

Wired, 06MAY2012

The U.S. Navy has doubled down on an effort to build a hybrid flying robot that takes off like a helicopter and cruises like an airplane. The Flexrotor represents at least the fourth attempt to duplicate the skills of the crash-prone V-22 Osprey tiltrotor, but without the Osprey's design flaws. VIDEO *Tags: Government S&T, Autonomous Systems & Robotics, NRL*

continued...

New protocol enables wireless and secure biometric acquisition with web services

EurekAlert, 06MAY2012

NIST researchers have developed and published a new protocol for communicating with biometric sensors over wired and wireless networks. The new protocol, called WS-Biometric Devices (WS-BD), allows desktops, laptops, tablets and smartphones to access sensors that capture biometric data such as fingerprints, iris images and face images using web services.

Tags: Government S&T, Biometrics

Can automated deep natural-language analysis unlock the power of inference

DARPA News, 03MAY2012

Overwhelmed by deadlines and the sheer volume of available foreign intelligence, analysts may miss crucial links, especially when meaning is deliberately concealed or otherwise obfuscated. DEFT is attempting to create technology to make reliable inferences based on basic text. We want the ability to mitigate ambiguity in text by stripping away filters that can cloud meaning and by rejecting false information. SOLICITATION

Tags: Government S&T, DARPA

Report warns of rapid decline in US Earth observation capabilities; next-generation missions hindered by budget shortfalls, launch failures

e! Science News, 02MAY2012

A new National Research Council report says that budget shortfalls, cost-estimate growth, launch failures, and changes in mission design and scope have left U.S. earth observation systems in a more precarious position than they were five years ago. The report cautions that the nation's earth observing system is beginning a rapid decline in capability, as long-running missions end and key new missions are delayed, lost, or cancelled. NRC REPORT

Tags: Government S&T, Space technology

Featured Resource

Asia Research News

ResearchSEA is Asia's first research news portal, a one-stop centre where journalists and members of the public can gain access to news and local experts from the research world in Asia. RSS Science, Technology

INFORMATION TECHNOLOGY

Apple patent applications hint of next-gen plan

KurzweilAI, 07MAY2012

Apple has filed 14 new patent applications, including an advanced new haptics system, a new battery design, a new camera feature, and some modifications to the Mac mini and high-speed cables, reports Patently Apple. The system would allow an iPad, iPhone, or iPod Touch's display to deform to make a button, an arrow, or a map pop out of the screen to give it three-dimensional depth. The tiered haptic display could also be pressure sensitive, a significantly beneficial feature for drawing and painting apps, for example.

Tags: Information Technology

MATERIALS SCIENCE

The energy efficient soldier

EurekAlert, 07MAY2012

The Army Research Laboratory has awarded a University of Utah-led consortium almost $15 million to use computer simulations to help design materials for lighter-weight, energy efficient devices and batteries. The new research effort is based on the idea that by using powerful computers to simulate the behavior of materials on multiple scales—from the atomic and molecular nanoscale to the large or "bulk" scale—new, lighter, more energy efficient power supplies and materials can be designed and developed. Improving existing materials also is a goal.

Tags: Materials science, Government S&T

Thanks for the memory: More room for data in 'phase-change' material

e! Science News, 06MAY2012

The research is focused on an inexpensive phase-change memory alloy composed of germanium, antimony and tellurium, called GST, for short. The material is already used in rewritable optical media, including CD-RW and DVD-RW discs. But by using diamond-tipped tools to apply pressure to the materials, the Johns Hopkins-led team uncovered new electrical resistance characteristics that could make GST even more useful to the computer and electronics industries.

Tags: Materials science

Materials science: Perfecting the defect

R&D Magazine, 03MAY2012

Simulations of defects inside copper point the way to making stronger metals. Results show that there are many different deformation mechanisms occurring in nano-structured materials like nanotwinned copper. Understanding each of them will allow scientists to tune material properties.

Tags: Materials science

continued...

Superconducting strip could become an ultra-low-voltage sensor

R&D Magazine, 03MAY2012

An international team of researchers studying a superconducting strip have observed an intermittent motion of magnetic flux which carries vortices inside the regularly spaced weak conducting regions carved into the superconducting material. These tiny interactions help govern the electronic behavior of superconductors, offering potential applications in gate devices used to control various modes of on/off states in electrical systems which operate in specific windows of temperature, applied magnetic field, current and voltage.

Tags: Materials science

MICROELECTRONICS

Performance boost for microchips through next-generation EUV lithography

Nanowerk, 08MAY2012

The favorite of the Next-Generation lithography is EUV—light with wavelengths in the extreme ultraviolet range. German scientists of the Fraunhofer Institutes developed the first prototypes of the EUV source as early as 2006. There is now a beta version that is already being used to expose chips in industrial applications. The concept is based on the rapid, pulsed discharge of electrically stored energy. In the process, a small amount of tin is vaporized using a laser and excited with a high current to an emission at 13.5 nm—many thousands of times per second.

Tags: Microelectronics

Fast, low-power, all-optical switch

Science Daily, 07MAY2012

The JQI at NIST has developed a switch which can steer a beam of light from one direction to another in only 120 picoseconds, requiring very little power, only about 90 attojoules (90 x 10-18 joules). At the wavelength used, in the near infrared (921 nm), this amounts to about 140 photons.

Tags: Microelectronics, Government S&T

NEUROSCIENCE

Multiple Thought Channels May Help Brain Avoid Traffic Jams

Newswise, 06MAY2012

An international team of researchers report that neurological and psychiatric conditions are likely to involve problems with signaling in brain network. Examining the temporal structure of brain activity from this perspective may be especially helpful in understanding psychiatric conditions. They found that different brain networks ticked at different frequencies, like clocks ticking at different speeds.

Tags: Neuroscience

PHOTONICS

Laser fusion on the horizon

Nature Photonics, 08MAY2012

Researchers at the NIF have just reported that the facility can finally operate at its design specifications, firing all 192 laser beams in unison to deliver an incredible 1.875 MJ of energy in 23 billionths of a second. The milestone shot, which took place on 15 March 2012, means that the NIF is now the world's first 2 MJ ultraviolet laser, capable of generating 100 times more energy than any other laser in operation.

Tags: Photonics, Energy

QUANTUM SCIENCE

Keeping One Step Ahead of Errors - Viewpoint

American Physical Society, 30APR2012

An international team of researchers have collaborated to study two families of topological codes and determine how much protection they provide against the most symmetric type of errors. They do this by making a connection between the error-correcting codes and certain purely classical systems. The low-error regime, where the quantum code functions, corresponds to the low-temperature ordered phase in the classical system. Statistical mechanical models are the key to understanding the performance of error correction in topological quantum computers.

Tags: Quantum science, Mathematics

S&T POLICY

H5N1 research censorship 'problematic'

BBC News, 02MAY2012

Speaking for the first time on the issue, Dr. Campbell, Editor in Chief of Nature, said that the current process for establishing whether medical research should be censored was "very, very problematic". "If we are to go down the censorship route, how do you decide which researchers should get the sensitive information? And how can you realistically ensure that once it is in a university environment that it won't go further?"

Tags: S&T policy

SCIENCE WITHOUT BORDERS

Animation: explaining things better or just helping us miss the point?

The Economist, 07MAY2012

Animations certainly have the potential to help us understand things. But recent research suggests there can be downsides. One problem is that our perceptual system is tuned to preferentially pick up information that contrasts with its surroundings. Most of the informative animations produced today are designed on the basis of personal intuition rather than according to research-based principles

continued...

that reflect human information processing. This is because research into how people process animations began only relatively recently.

Tags: Science without borders

The secrets of the system

MIT News, 07MAY2012

As the United States seeks to reinvigorate its job market and move past economic recession, MIT News examines manufacturing's role in the country's economic future through this series on work at the Institute around manufacturing.

Tags: Science without borders

Freezing liquids help to predict properties of prime numbers

R&D Magazine, 03MAY2012

The same freezing which is responsible for transforming liquids into glasses can help to predict some patterns observed in prime numbers, according to a team of scientists from Queen Mary, University of London and Bristol University. The teams hope is that understanding freezing could help mathematicians make progress in attacking some of the grand challenges of number theory.

Tags: Science without borders, Mathematics

SENSORS

Electronic nanotube nose out in front

Science Daily, 08MAY2012

Chemical sensors are exceedingly good at detecting a single substance or a class of chemicals. Biological noses are more versatile and capable of discriminating subtle cues. A new DNA-based chemical sensor appears to be both extremely sensitive and discerning, making it an important stride on the path to an all-electronic nose. A new nanotube super sensor is able to detect subtle differences with a single sniff at concentrations as low as 25 parts per billion.

TECHNICAL ARTICLE

Tags: Sensors

Revolutionary technology enables objects to know how they are being touched (w/video)

Nanowerk, 04MAY2012

A new sensing technique called Touché is a form of capacitive touch sensing, the same principle underlying the types of touchscreens used in most smartphones. But instead of sensing electrical signals at a single frequency, like the typical touchscreen, Touché monitors capacitive signals across a broad range of frequencies. This Swept Frequency Capacitive Sensing (SFCS) makes it possible to not only detect a "touch event," but to recognize complex configurations of the hand or body that is doing the touching. VIDEO

STEM

Dresden research partners support next generation of nanoelectronic scientists

Nanowerk, 07MAY2012

The International Helmholtz Research School NANONET is a structured doctoral program which promotes the education of the next generation of scientists in molecular electronics while at the same time striving to advance this field of research.

Tags: STEM ■

About This Publication

The appearance of external hyperlinks in this publication does not constitute endorsement by the United States Department of Defense (DoD) of the linked web sites, nor the information, products or services contained therein. In addition, the content featured does not necessarily reflect DoD's views or priorities.

To subscribe (or unsubscribe), visit https://tin-ly.sainc.com/ASDRE. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com.

This publication is authored and distributed by:

Dr. Melissa Flagg
Director, Office of Technical Intelligence (OTI)

Ms. Hema Viswanath
OTI Corporate Librarian