

Matériaux

Bulletin de Veille - 08 juin 2020

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GÉNÉRALITÉS - MATÉRIAUX

Researchers Discover High-Pressure Material with Attractive Properties

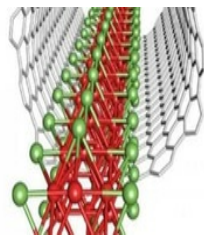
01/06/2020 - www.azom.com



In the periodic table of elements there is one golden rule for carbon, oxygen, and other light elements. Under high pressures they have similar structures to heavier elements in the same group of elements. Only nitrogen always seemed unwilling to toe the line. However, high-pressure researchers of the University of Bayreuth have actually disproved this special status. Out of nitrogen, they have created a crystalline structure which under normal conditions occurs in black phosphorus and arsenic. The structure contains two-dimensional atomic layers, and is therefore of great interest for high-tech electronics.

Unconventional High Temperature Superconductivity in 3D Materials

15/05/2020 - www.azom.com

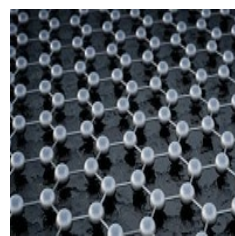


The problems of high temperature superconductor (HTSC) are important for the physics community and even the whole science area. Ever since its discovery, many researchers have conducted various studies, still lacking of widely accepted solutions. Recently, Prof. Jiangping Hu from Institute of Physics, Chinese of Science, proposed the "gene" theory of high temperature superconductivity based on the electronic properties of existing quasi-two dimensional HTSCs, and used it to search for new families of HTSCs.

MATÉRIAUX POUR L'ÉNERGIE

New Supercapacitor Electrode Made of Reduced Graphene Oxide, Aramid Nanofiber

05/06/2020 - www.azom.com



The explosion of mobile electronic devices, electric vehicles, drones and other technologies have driven demand for new lightweight materials that can provide the power to operate them. Researchers from the University of Houston and Texas A&M University have reported a structural supercapacitor electrode made from reduced graphene oxide and aramid nanofiber that is stronger and more versatile than conventional carbon-based electrodes.

Researchers develop viable sodium battery

01/06/2020 - www.sciencedaily.com

Washington State University (WSU) and Pacific Northwest National Laboratory (PNNL) researchers have created a sodium-ion battery that holds as much energy and works as well as some commercial lithium-ion battery chemistries, making for a potentially viable battery technology out of abundant and cheap materials. The team reports one of the best results to date for a sodium-ion battery. It is able to deliver a capacity similar to some lithium-ion batteries and to recharge successfully, keeping more than 80 percent of

NANOMATÉRIAUX

- Thermogalvanic hydrogel cools down electronic devices - Physics World
- New Technique to Test Structural Stability of Predicted 2D Materials
- Defective Graphene Has High Electrocatalytic Activity
- Tuning Structure, Properties of TiO₂ Films Filled with Gold Nanoparticles
- Tungsten Oxide Nanoparticles Used as Photothermal Sensitizers 3D Printing

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- Les alternatives au meltblown, le matériau filtrant des masques sanitaires menacé de pénurie
- New Method to Visualize Variations in Polymers that Arise with Age

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- Graphene and 2D materials could move electronics beyond 'Moore's Law'
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its charge after 1,000 cycles.

Study of Battery Interfaces Could Help Create Improved Batteries

28/05/2020 - www.azom.com



Researchers from the Skoltech Center for Energy Science and Technology (CEST) visualized the formation of a solid electrolyte interphase on battery-grade carbonaceous electrode materials using in situ atomic force microscopy (AFM). This will help researchers design and build batteries with higher performance and durability. A solid electrolyte interphase (SEI) is a thin layer of electrolyte reduction products formed on the surface of a lithium-ion battery anode during several initial cycles. It prevents further electrolyte decomposition, stabilizing the electrode/electrolyte interface, and ensures a long battery life.

Computer vision helps scientists study lithium ion batteries

08/05/2020 - www.sciencedaily.com

Lithium-ion batteries lose their juice over time, causing scientists and engineer to work hard to understand that process in detail. Now, scientists at the Department of Energy's SLAC National Accelerator Laboratory have combined sophisticated machine learning algorithms with X-ray tomography data to produce a detailed picture of how one battery component, the cathode, degrades with use. The new study, published May 8 in Nature Communications, focused on how to better visualize what's going on in cathodes made of nickel-manganese-cobalt, or NMC.

Un procédé montre le potentiel des MXenes pour les batteries à forte puissance

06/05/2020 - www.industrie-techno.com

Une équipe internationale incluant des chercheurs de l'Université Paul Sabatier de Toulouse et du réseau sur le stockage électrochimique de l'énergie (RS2E) a développé un procédé innovant pour fabriquer des matériaux MXenes utilisables dans les électrodes négatives de systèmes de stockage électrochimique. Leurs travaux ont été publiés dans la revue Nature Materials le 13 avril dernier. Découverts en 2011, les MXenes sont des matériaux en 2D synthétisés à partir de précurseurs dits « MAX ». M désigne un métal de transition (Titane, Indium,...), A un élément des colonnes 13 à 16 du tableau de Mendeleïev (Aluminium, Silicium,...), et X du Carbone ou de l'Azote.

MATÉRIAUX POUR L'OPTIQUE

Configurable circuit technology poised to expand silicon photonic applications

28/05/2020 - www.sciencedaily.com

Researchers have developed a new way to build power efficient and programmable integrated switching units on a silicon photonics chip. The new technology is poised to reduce production costs by allowing a generic optical circuit to be fabricated in bulk and then later programmed for specific applications such as communications systems, LIDAR circuits or computing applications. "Silicon photonics is capable of integrating optical devices and advanced microelectronic circuits all on a single chip," said research team member Xia Chen from the University of Southampton. "

Avalanche photodiode breaks performance record for LiDAR receivers

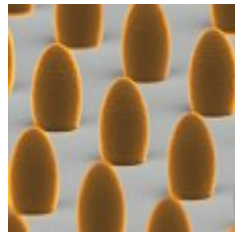
27/05/2020 - www.sciencedaily.com

Electrical and computer engineers at the University of Virginia and University of Texas-Austin have developed an avalanche photodiode that achieved record performance and has the potential to transform next generation night-vision imaging and Light Detection and Ranging (LiDAR) receivers. For LiDAR, the team's low-noise, two-micrometer avalanche photodiode enables higher-power operation that is eye-safe. The peer reviewed paper, "Low-noise high-temperature AlInAsSb/GaSb avalanche photodiodes for 2-µm applications," was published May 18, 2020, in Nature Photonics, a monthly

journal of the best research from all areas of light generation, manipulation and detection.

3D printed lenses enable ultra-long-distance spectroscopy

14/05/2020 - 3dprintingindustry.com



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New Tiny Lenses can be Formed on Various Materials by Laser 3D Printing

08/05/2020 - www.azom.com



Additive manufacturing is a technique in which the final three-dimensional object is produced by successively adding new layers of building material to those that have already been deposited. Recently, the commercially available 3D printers have been experiencing rapid development and so do the 3D-printers materials, including transparent media of high optical quality. These advancements open up new possibilities in many fields of science and technology including biology, medicine, metamaterials studies, robotics and micro-optics.

BIOMIMÉTIQUE

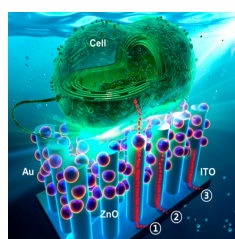
New Self-Assembling Composites Exhibit Unique Electrical Properties

05/06/2020 - www.azom.com

Sometimes, breaking rules is not a bad thing. Especially when the rules are apparent laws of nature that apply in bulk material, but other forces appear in the nanoscale. "Nature knows how to go from the small, atomic scale to larger scales," said Melik Demirel, professor of engineering science and mechanics and holder of the Lloyd and Dorothy Foehr Huck Chair in Biomimetic Materials. "Engineers have used mixing rules to enhance properties, but have been limited to a single scale. We've never gone down to the next level of hierarchical engineering.

Cyanobacteria and nanomaterials give solar cell a boost - Physics World

03/06/2020 - physicsworld.com



Strategically designed nanomaterials have been used to optimize the performance of a solar cell that incorporates photosynthesizing cyanobacteria. The work was done by Jae Ryoun Youn, Young Seok Song and colleagues at Seoul National University and Dankook University in South Korea. What is especially impressive about their new technology is that it exploits a broad region of the solar spectrum while simultaneously boosting the photosynthetic activity of the cyanobacteria.

The Sun offers a supply of clean and renewable energy, but how to utilize this limitless yet decentralized energy source as efficiently and practically as possible is a significant engineering challenge. The Korean team is pursuing a biological solution to this problem in cyanobacteria, which are ancient organisms that carry out photosynthesis and respiration in almost every environment on Earth.

COLLAGES –ADHÉSIFS

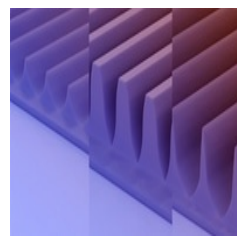
[NASA Low Outgassing Rated Epoxy Features Enhanced Chemical Resistance](#)

11/05/2020 - www.azom.com

EP42-2LV Black is a two part epoxy with low viscosity and good flow. It withstands prolonged immersion in many acids, bases, solvents, fuels and oils. This versatile system can be used for bonding, sealing, coating and casting, where a strong chemical resistance profile is required. This compound has an easy to use mix ratio of 100 to 40 by weight or 100 to 50 by volume with Part A being black and Part B being light amber. The viscosity of the mixed system is around 1,000-2,000 cps, and it has a long working life of 60 to 90 minutes per 100 gram batch. EP42-2LV Black cures optically opaque at room temperature in 2 to 3 days or at elevated temperatures of 200°F in 2 to 3 hours.

[New Method of Making Low-Cost, Mass-Produced Adhesive Materials](#)

08/05/2020 - www.azom.com



Why did the gecko climb the skyscraper- Because it could; its toes stick to about anything. For a few years, engineers have known the secrets of gecko stickiness and emulated it in strips of rubbery materials useful for picking up and releasing objects, but simple mass production for everyday use has been out of reach until now. Researchers at the Georgia Institute of Technology have developed, in a new study, a method of making gecko-inspired adhesive materials that is much more cost-effective than current methods. It could enable mass production and the spread of the versatile gripping strips to manufacturing and homes.

MÉTAUX

[Tuning the surface gives variations to metal foils](#)

27/05/2020 - www.sciencedaily.com

Just as cloning in biology allows for the creation of one or more replicas of the exact same genes, seeded growth in chemistry can produce a very large metal foil with the exact same surface texture as that of a seeded one. Seeded growth is very popular in synthesizing three-dimensional (3D) single crystals: 3D crystals are always grown into the same shapes, just as salts are invariably cubic single crystals.

[Longer Lifetimes, Lower Costs: The 94 AU 30000 Material Advantage](#)

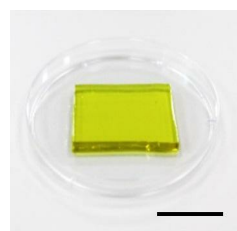
27/05/2020 - www.techbriefs.com

Seals are the workhorses of hydraulic systems, and the demands placed on seals can be extreme in today's increasingly rugged industrial applications. Challenges such as higher temperatures, fluctuating pressures, aggressive media, difficult terrain, longer working hours, and fewer maintenance intervals can lead to seal extrusions and leakage. The result is system failure and downtime.

NANOMATÉRIAUX

[Thermogalvanic hydrogel cools down electronic devices - Physics World](#)

05/06/2020 - physicsworld.com



A new thermogalvanic hydrogel can simultaneously cool down electronic devices and convert the waste heat they produce into electricity. The material, developed by a team of researchers at Wuhan University in China and the University of California Los Angeles (UCLA) in the US, decreases the temperature of a mobile phone battery by 20°C and retrieves 5 μ W of electricity at fast discharging

rates. This reduced working temperature ensures that the battery operates safely, while the amount of electricity harvested is enough to power the hydrogel's cooling system.

Many electronic devices — including solar cells and light-emitting diodes as well as phone batteries – generate significant amounts of heat during normal operation. Not only is most of this heat wasted, it can also lead to localized overheating, which decreases the devices' efficiency and lifespan. In some cases, the excess heat can even cause devices to explode or catch fire.

New Technique to Test Structural Stability of Predicted 2D Materials

28/05/2020 - www.azom.com

An international team of researchers from Russia, Sweden and South Korea has proposed a new way to test the structural stability of predicted 2D materials. The testing revealed a number of materials erroneously proposed earlier. The scholars believe that the use of the new method will further help to avoid mistakes in the development of two-dimensional nanomaterials that are in high demand in the modern world. The results were published in the international journal Physical Chemistry Chemical Physics. The existence of two-dimensional structures, which are the thinnest films consisting of one layer of the crystal lattice of atoms, has been widely discussed since the mid 20th century.

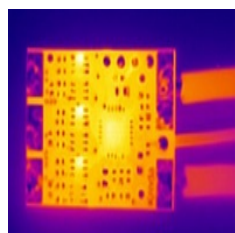
Defective Graphene Has High Electrocatalytic Activity

12/05/2020 - www.azom.com

Scientists from the Moscow Institute of Physics and Technology, Skoltech, and the Russian Academy of Sciences Joint Institute for High Temperatures have conducted a theoretical study of the effects of defects in graphene on electron transfer at the graphene-solution interface. Their calculations show that defects can increase the charge transfer rate by an order of magnitude. Moreover, by varying the type of defect, it is possible to selectively catalyze the electron transfer to a certain class of reagents in solution.

Tuning Structure, Properties of TiO₂ Films Filled with Gold Nanoparticles

11/05/2020 - www.azom.com



Oxides of different metals often serve as photocatalysts in various systems such as air purification, reactions of water decomposition and even in the production of self-cleaning surfaces for glass and mirrors. The physical-chemical properties of such materials can be improved by adding nanoparticles, which turn an ordinary oxide into a nanomaterial with new capabilities. To successfully perform this, however, it is necessary to understand the processes going on as a nanocomposite is being formed, and to be able to control them.

Tungsten Oxide Nanoparticles Used as Photothermal Sensitizers 3D Printing

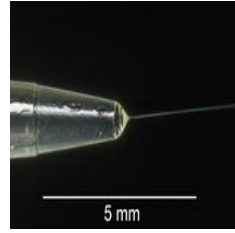
08/05/2020 - www.azom.com

Selective powder sintering for 3D printing has recently become an increasingly affordable solution for manufacturing made-to-order elements of almost any shape or geometry. This technique involves heating a bed of powder (such as polyamide, PA12) to just below its melting point, using an IR light source to selectively melt a cross section of the powder, then adding more powder and repeating to form a 3D object. To reduce costs and increase printing speed, a photothermal sensitizer is often added to the powders.

POLYMÈRES - ÉLASTOMÈRES

Les alternatives au meltblown, le matériau filtrant des masques sanitaires menacé de pénurie

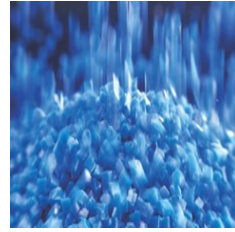
11/05/2020 - www.industrie-techno.com



Craignant la pénurie de meltblown, le matériau filtrant des masques chirurgicaux et FFP2, la Direction générale des entreprises (DGE) a appelé les industriels français à se mobiliser pour trouver des solutions alternatives. Deux méthodes pourraient concurrencer le procédé d'extrusion-soufflage utilisé pour fabriquer le meltblown : l'électrofilage et le cardage-hydroliage.

New Method to Visualize Variations in Polymers that Arise with Age

07/05/2020 - www.azom.com



Modern society relies on polymers, such as polypropylene or polyethylene plastic, for a wide range of applications, from food containers to automobile parts to medical devices. However, like people, polymers age, and when they do, the materials become prone to cracking or breaking. Now, researchers reporting in ACS Central Science have developed a method to visualize variations in polymers that arise with age. Heat, sunlight, oxygen and humidity can all cause polymers to degrade over time. At early stages, polymer chains break, producing functional groups, such as hydroxyl groups, and generating free radicals that speed up the aging process.

REVÊTEMENTS

New Porous Ceramic Coatings Improves Gas Sensing Performance of Devices

04/06/2020 - www.azom.com



Many common household items and devices have a coating that improves performance. For example, the thin Teflon coating on cookware helps prevent food from sticking to the surface. However, it's difficult to prepare--at room temperature--the strongly adhering, high-performance ceramic coatings that are commonly used in many applications, such as electronics. Now, researchers from Japan have solved this problem.

Clean without scrubbing and using chemicals

27/05/2020 - www.sciencedaily.com

For several years, scientists at TU Dresden and Fraunhofer IWS have been developing functionalised surfaces by means of laser-based manufacturing processes. Now, they have created a periodic surface structure that is not only water and ice repellent, but also remove dirt particles solely by rolling water drops. In this context, they particularly focussed on the material aluminium. "This material is used in many industrial branches - either in the automotive sector, aircraft construction or the food industry.

SEMI-CONDUCTEURS

Graphene and 2D materials could move electronics beyond 'Moore's Law'

03/06/2020 - www.sciencedaily.com

A team of researchers based in Manchester, the Netherlands, Singapore, Spain, Switzerland and the USA has published a new review on a field of computer device development known as spintronics, which could see graphene used as building block for next-generation electronics. Recent theoretical and experimental advances and phenomena in studies of electronic spin transport in graphene and related two-dimensional (2D) materials have emerged as a fascinating area of research and development.

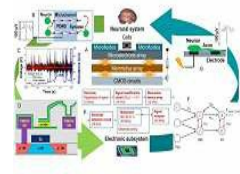
Tiny Gallium Oxide-Based Transistor can Handle More than 8,000 Volts

01/06/2020 - www.azom.com

People love their electric cars. But not so much the bulky batteries and related power systems that take up precious cargo space. Help could be on the way from a gallium oxide-based transistor under development at the University at Buffalo. In a study published in the June edition of IEEE Electron Device Letters, electrical engineers describe how the tiny electronic switch can handle more than 8,000 volts, an impressive feat considering it's about as thin as a sheet of paper.

The concept of creating brain-on-chip revealed

31/05/2020 - www.robodaily.com



Lobachevsky University scientists in collaboration with their colleagues from Russia, Italy, China and the United States have proposed the concept of a memristive neurohybrid chip to be used in compact biosensors and neuroprostheses. The concept is based on the existing and forward-looking solutions at the junction of neural cellular and microfluidic technologies that make it possible to grow a spatially ordered living neural network. In combination with CMOS-compatible technologies for creating microelectrode matrices and arrays of memristive devices, this integrated approach will be used for registering, processing and stimulation of bioelectrical activity in real time.

Service Information Numérique - Pôle Veille

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