

Matériaux

Bulletin de Veille - 05 février 2020

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MATÉRIAUX POUR L'ÉNERGIE

New electrode design may lead to more powerful batteries

03/02/2020 - www.sciencedaily.com

New research by engineers at MIT and elsewhere could lead to batteries that can pack more power per pound and last longer, based on the long-sought goal of using pure lithium metal as one of the battery's two electrodes, the anode. The new electrode concept comes from the laboratory of Ju Li, the Battelle Energy Alliance Professor of Nuclear Science and Engineering and professor of materials science and engineering. It is described in the journal Nature, in a paper co-authored by Yuming Chen and Ziqiang Wang at MIT, along with 11 others at MIT and in Hong Kong, Florida, and Texas.

Engineers examine lithium battery defects

24/01/2020 - www.sciencedaily.com

Historically, as in decades ago, rechargeable lithium metal batteries were dangerous. These batteries were quickly abandoned in favor of Li-ion batteries which contain no metallic lithium and are now widely used. In efforts to continue to drive energy density up and costs down, we are again exploring how to efficiently and safely use lithium metal in batteries. Solid state batteries, free of flammable liquids, may be the solution. However, progress has been slowed because lithium metal still finds a way to short circuit the battery and limit cycle life.

MOF Coating Prevents Electronics from Overheating and Keeps Them Cooler

24/01/2020 - www.azom.com

Mammals are known to regulate their body temperatures through sweating. Now, scientists at Shanghai Jiao Tong University based in China are investigating whether the same process could also be mimicked by phones. The study was published in the Joule journal on January 22nd, 2020, where the authors have demonstrated a new type of coating for electronics that dissipates heat from running devices by discharging water vapor. This novel thermal management technique can prevent overheating in electronics and thus keep them cooler when compared to present strategies.

Will the future's super batteries be made of seawater?

23/01/2020 - www.sciencedaily.com

We all know the rechargeable and efficient lithium ion (Li-ion) batteries sitting in our smartphones, laptops and also in electric cars. Unfortunately, lithium is a limited resource, so it will be a challenge to satisfy the worlds' growing demand for relatively cheap batteries. Therefore, researchers are now looking for alternatives to the Li-ion battery. A promising alternative is to replace lithium with the metal sodium -- to make Na-ion batteries. Sodium is found in large quantities in seawater and can be easily extracted from it. "

MATÉRIAUX POUR L'OPTIQUE

Laser Diode Emits Deep UV Light

- Photoluminescent Polymer Detects Stress Quickly

REVÊTEMENTS

- Indium Corporation Features Metal Thermal Interface Materials for Burn-In and Test at TestConX
- New Ultrasonic Coating System Advances Spray-On EMI Shielding Capabilities

SEMI-CONDUCTEURS

- Method Detects Defects in 2D Materials for Future Electronics and Sensors
- New Method Gives Robust Transistors

THERMOPLASTIQUES

- Les TPE en impression 3D : Pollen AM s'affranchit des limites de dureté

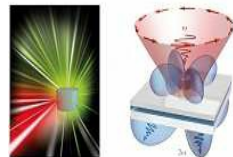
31/01/2020 - www.techbriefs.com



Far field pattern of UV-C laser projected onto a fluorescent screen. ((c) 2019 Asahi Kasei Corp. and Nagoya University) Nagoya University scientists have succeeded in designing a laser diode that emits deep-ultraviolet light. It emits the world's shortest lasing wavelength, at 271.8 nanometers, under pulsed electric current injection at room temperature. They could be used for disinfection in healthcare, for treating skin conditions such as psoriasis, and for analyzing gases and DNA. The Nagoya University deep-ultraviolet laser diode overcomes several issues encountered by scientists in their work towards the development of these semiconducting devices.

Physicists trap light in nanoresonators for record time

24/01/2020 - www.spacedaily.com



An international team of researchers from ITMO University, the Australian National University, and Korea University have experimentally trapped an electromagnetic wave in a gallium arsenide nanoresonator a few hundred nanometers in size for a record-breaking time. Earlier attempts to trap light for such a long time have only been successful with much larger resonators. In addition, the researchers have provided experimental proof that this resonator may be used as a basis for an efficient light frequency nanoconverter. The results of this research have raised great interest among the scientific community and were published in *Science*, one of the world's leading academic journals.

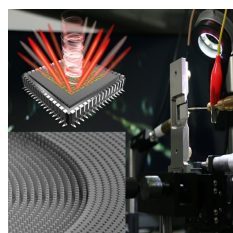
Color Superlensing Could Break Through Diffraction Barrier

23/01/2020 - www.photonics.com

Researcher Sergey Kharinsev and his team at Kazan Federal University recently published a paper in *Optics Letters* where they detail the design of a new type of metalens capable of imaging beyond the optical diffraction limit. Schematic of the working principle of a disordered TiN/TiO₂ Courtesy of Kazan University A metalens described in the article is a thin composite metal-dielectric film placed on a dielectric substrate; the width is several dozen nanometers."

Metasurfaces help shape laser beams - Physics World

23/01/2020 - physicsworld.com

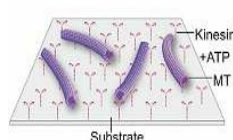


Vertical-cavity surface-emitting lasers (VCSELs) have emerged as a highly versatile light source over the past 30 years, with applications in areas from optical communications to instrumentation, manufacturing and sensing. A team of researchers in France and China has now augmented the VCSEL's capabilities by integrating a nano-patterned beam-shaping structure into each laser during wafer-scale processing. This approach could make it possible to create light wavefronts designed to order, and thus construct devices such as ultra-compact programmable laser-on-chip arrays with whatever beam profiles are required.

BIOMIMÉTIQUE

Deep-sea osmolyte makes biomolecular machines heat-tolerant

24/01/2020 - www.nanodaily.com



Researchers have discovered a method to control biomolecular machines over a wide temperature range using deep-sea osmolyte trimethylamine N-oxide (TMAO). This finding could open a new dimension in the application of artificial machines fabricated from biomolecular motors and other proteins. Biomolecular motors are the smallest natural machines that keep living organisms dynamic. They can

generate force and perform work on their own by consuming chemical energy. In recent years, reconstructed biomolecular motors have appeared as promising substitutes of synthetic motors and expected to be key components in biomimetic artificial micro- or nano-devices.

Living Concrete Developed from Sand and Bacteria

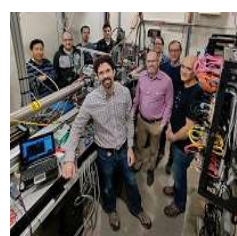
17/01/2020 - www.azom.com

Over the centuries, concrete production has mostly remained unchanged: from the Roman concrete to modern construction methods, it involves a process of combining hard materials such as sand with various binders, including water and cement. However, by mixing photosynthetic bacteria in with the sand, an interdisciplinary team at the University of Colorado, Boulder, has developed living concrete that is capable of reproduction. Image Credit: Slavica Stajic/Shutterstock.com Using a mold to shape the bricks, the team first made a scaffold using sand and hydrogel for the bacteria to grow.

COMPOSITES

AFRL, partners develop innovative tools to accelerate composites certification

03/02/2020 - www.spacedaily.com



In partnership with industry, a team of Air Force Research Laboratory/Cornell High Energy Synchrotron Source (CHESS) personnel are developing the capability to accelerate certification of advanced manufactured composite structures. Creating a new materials characterization subfacility, known as the Materials Solutions Network, will drive composite manufacturing into a physics-based exact science that can be predicted and modeled in ways impossible until now, allowing faster implementation of low-cost, short-term and limited-life technologies. The newly upgraded CHESS facility will allow breakthroughs in materials, processes and designs for aerospace and military components.

Additive Composite and Add North 3D develop 3D printing filament with neutron shielding capabilities

29/01/2020 - 3dprintingindustry.com



Swedish 3D printing material developers Additive Composite Uppsala and Add North 3D have collaborated to develop a polymer composite material for radiation shielding applications. The material, named Addbor N25, is a combination of boron carbide and nylon, and has been developed and produced as filament optimized for 3D printing. The radiation shielding capabilities are provided by the boron carbide element, which provides effective absorption against neutrons. Additive Composite explains that the material can therefore be useful in research facilities, in the nuclear industry or other places that use radiation sources.

MÉTAUX

New Technique Helps Create Nickel with High Mechanical Strength

31/01/2020 - www.azom.com

Nickel is a metal that is extensively utilized in the manufacturing sector for both sophisticated and industrial material processes. Purdue University innovators have created a hybrid technique to fabricate a new form of nickel. Researchers at Purdue University have developed a new hybrid approach to create an entirely different kind of nickel that shows promise for producing sophisticated devices, lifesaving medical devices, and vehicles that have excellent corrosion-resistant protection, in the days to come.

Human exposure to aluminum linked to familial Alzheimer's disease

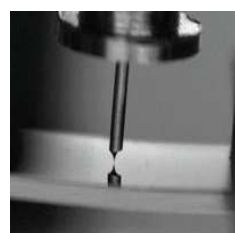
21/01/2020 - www.sciencedaily.com

A new study published in the Journal of Alzheimer's Disease (JAD) supports a growing body of research that links human exposure to aluminum with Alzheimer's disease (AD). Researchers found significant amounts of aluminum content in brain tissue from donors with familial AD. The study also found a high degree of co-location with the amyloid-beta protein, which leads to early onset of the disease. "This is the second study confirming significantly high brain accumulation in familial Alzheimer's disease, but it is the first to demonstrate an unequivocal association between the location of aluminum and amyloid-beta in the disease.

NANOMATÉRIAUX

How proximity affects the resistance of graphene

02/02/2020 - www.spacedaily.com



Graphene is often seen as the wonder material of the future. Scientists can now grow perfect graphene layers on square centimetre-sized crystals. A research team from the University of Gottingen, together with the Chemnitz University of Technology and the Physikalisch-Technische Bundesanstalt Braunschweig, has investigated the influence of the underlying crystal on the electrical resistance of graphene. Contrary to previous assumptions, the new results show that the process known as the 'proximity effect' varies considerably at a nanometre scale. The results have been published in Nature Communications.

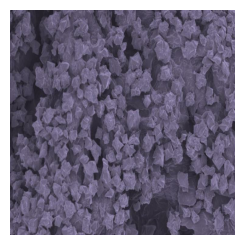
Well-designed substrates make large single crystal bi-/tri-layer graphene possible

21/01/2020 - www.sciencedaily.com

Researchers of the Center for Multidimensional Carbon Materials (CMCM) within the Institute for Basic Science (IBS, South Korea) have reported in Nature Nanotechnology the fabrication and use of single crystal copper-nickel alloy foil substrates for the growth of large-area, single crystal bilayer and trilayer graphene films. The growth of large area graphene films with a precisely controlled numbers of layers and stacking orders can open new possibilities in electronics and photonics but remains a challenge. This study showed the first example of the synthesis of bi- and trilayer graphene sheets larger than a centimeter, with layers piled up in a specific manner, namely AB- and ABA-stacking. "

Nanomaterial-coated fabric destroys chemical warfare agents - Physics World

20/01/2020 - physicsworld.com



A textile coated with metal-organic frameworks (MOFs) could make an efficient anti-nerve agent material, according to experiments by researchers at Northwestern University in the US. The MOFs, which are based on zirconium, could act as catalysts to degrade chemical warfare agents such as VX and soman (GD) much faster than existing technologies, which are based on activated carbon and metal-oxide blends. The composite material, which might be used in protective suits and face masks for soldiers on the battlefield, does not require liquid water to work either, as previously thought.

POLYMÈRES - ÉLASTOMÈRES

Photoluminescent Polymer Detects Stress Quickly

30/01/2020 - www.photonics.com

A new stress-detecting polymer that shines brighter when stretched could be used to measure the performance of synthetic polymers and track deterioration in materials that are used in engineering and construction. Scientists from the Okinawa Institute of Science and Technology Graduate University (OIST) integrated copper complexes

(copper atoms linked to organic molecules) into the polymer polybutylacrylate. They found that the copper complexes glowed when exposed to ultraviolet light. When the polymer was stretched, the copper complexes emitted light at a greater intensity, leading to a brighter glow.

REVÊTEMENTS

Indium Corporation Features Metal Thermal Interface Materials for Burn-In and Test at TestConX

23/01/2020 - www.azom.com

Indium Corporation's wide portfolio of metal-based TIMs offers proven solutions for a wide variety of applications and process challenges:

New Ultrasonic Coating System Advances Spray-On EMI Shielding Capabilities

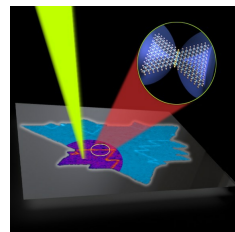
17/01/2020 - www.azom.com

Sono-Tek Corporation announces the release of a new ultrasonic coating system, the FlexiCoat EMI, specifically designed for conformal spraying of EMI (Electromagnetic Interference) shielding material onto semiconductor packages. This new market is seeing growing interest and activity as a result of smaller devices requiring improved EMI shielding protection properties. Conventional techniques such as shield cans and SMT clips are inadequate for newer small devices. Ultrasonic coating is a cost-effective, faster and simpler alternative to expensive sputtering-based coating equipment.

SEMI-CONDUCTEURS

Method Detects Defects in 2D Materials for Future Electronics and Sensors

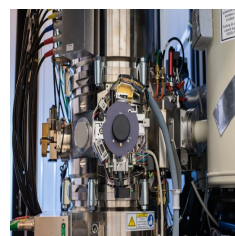
31/01/2020 - www.techbriefs.com



A laser beam (yellow) reflects off a 2D material (orange) highlighting a grain boundary defect in the atomic lattice. (Image: MRI/Penn State) To further shrink electronic devices and to lower energy consumption, the semiconductor industry is interested in using 2D materials, but manufacturers need a quick and accurate method for detecting defects in these materials to determine if the material is suitable for device manufacture. A team of Penn State researchers has developed a technique to quickly and sensitively characterize these defects. Two-dimensional materials, the most well-known being graphene — a single-atom-thick layer of carbon atoms — are atomically thin.

New Method Gives Robust Transistors

31/01/2020 - www.techbriefs.com



An important part of the work has been conducted on one of the world's most outstanding transmission electron microscopes, Arwen, at Linköping University. (Image: Magnus Johansson) Scientists at Linköping University (Linköping, Sweden) have described a method to manufacture transistors using gallium nitride and aluminum nitride that have the ability to withstand voltages as high as 1800 volts. Gallium nitride is a semiconductor used for efficient light-emitting diodes.

THERMOPLASTIQUES

Les TPE en impression 3D : Pollen AM s'affranchit des limites de dureté

30/01/2020 - www.3dnatives.com



Le fabricant français Pollen AM propose une technologie de fabrication additive qui permet aujourd'hui d'imprimer la plus large gamme de thermoplastiques élastomères (TPE) du marché, quelle que soit leur dureté. En extrudant la matière sous forme de granules industriels, l'entreprise s'affranchit de certaines contraintes propres aux filaments et

peut créer des pièces sans limite de dureté. Un procédé qui présente de nombreux avantages pour plusieurs secteurs d'activité, notamment l'automobile ou l'équipement sportif.

Service Information Numérique - Pôle Veille

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