

Matériaux

Bulletin de Veille - 25 mars 2020

Retrouvez tous les bulletins de Veille dans [l'espace Galaxi du pôle Veille](#)

SOMMAIRE

GÉNÉRALITÉS - MATÉRIAUX

- New Superhydrophobic Material can Purify Water Effectively from Oil Products

AÉROSPATIAL

- Saint-Gobain Seals Exhibiting at Space Symposium, Sharing Expanded Polymer & Metal Seal Solutions Portfolio that Handle Cryogenic, High Temperature & Pressure Challenges

MATÉRIAUX POUR L'ÉNERGIE

- New material developed could help clean energy revolution
- Emergence of crucial interphase in lithium-ion batteries is observed by researchers - Physics World
- 'Spillway' for electrons could keep lithium metal batteries from catching fire
- Chasing lithium ions on the move in a fast-charging battery
- Replacing Graphite-Based Anodes with Li Metal Offers a New, Promising Approach
- New Electrode Design May Lead to More Powerful Batteries
- Fast-Charging Supercapacitor is an Energy Storage Breakthrough
- Researchers Develop All-Solid-State Lithium-Sulfur Batteries Using Sulfur-CNF Composite
- Potassium metal battery emerges as a rival to lithium-ion technology
- Avec Modalis², l'Ifpen veut développer la boîte à outils numériques des batteries du futur

MATÉRIAUX POUR L'OPTIQUE

- Precision mirrors poised to improve sensitivity of gravitational wave detectors
- Gold-coated fabric that emits own light could be ultimate safety gear
- Using light to put a twist on electrons

BIOMIMÉTIQUE

- What's New in 3D Bioprinting?
- New biomaterial discovery enables 3D printing of vascular structures

GÉNÉRALITÉS - MATÉRIAUX

New Superhydrophobic Material can Purify Water Effectively from Oil Products

07/03/2020 - www.azom.com

A novel material with the ability to effectively purify water from oil products has been developed by researchers at Tomsk Polytechnic University in collaboration with the University of Lille (France). This material is based on a usual household polyurethane sponge. The material samples. Image Credit: Tomsk Polytechnic University. The researchers made it superhydrophobic, that is, it repels water, while absorbing oil product molecules effectively. The study outcomes were reported in the Separation and Purification Technology journal. New oil production methods, especially the ones related to production on the seabed and ocean floor, raise up the risk of spills.

AÉROSPATIAL

Saint-Gobain Seals Exhibiting at Space Symposium, Sharing Expanded Polymer & Metal Seal Solutions Portfolio that Handle Cryogenic, High Temperature & Pressure Challenges

29/02/2020 - www.azom.com



Saint-Gobain Seals, a designer, engineer and manufacturer of critical, engineered seals and polymer material solutions, will be exhibiting at the 36th Space Symposium at Booth #1172, sharing their expanded sealing solutions portfolio that now includes both polymer seals and metal seals. Recent acquisitions of American Seal & Engineering and HTMS businesses, specialists in metal sealing technology for a combined 60 years, have strengthened Saint-Gobain Seals' portfolio and provides access to a complete system of polymer and metal seal solutions that address extreme temperature and pressure challenges often encountered in the space industry.

MATÉRIAUX POUR L'ÉNERGIE

New material developed could help clean energy revolution

23/03/2020 - www.sciencedaily.com

Fuel cells and water electrolyzers that are cheap and efficient will form the cornerstone of a hydrogen fuel based economy, which is one of the most promising clean and sustainable alternatives to fossil fuels. These devices rely on materials called electrocatalysts to work, so the development of efficient and low-cost catalysts is essential to make hydrogen fuel a viable alternative. Researchers at Aalto university have developed a new catalyst material to improve these technologies.

Emergence of crucial interphase in lithium-ion batteries is observed by researchers - Physics World

23/03/2020 - physicsworld.com

What happens in a lithium-ion battery when it first starts running? A complex series of events, it turns out – from electrolytic ion

COLLAGES –ADHÉSIFS

- Epoxy Features Exceptional Chemical and Heat Resistance
- Engineers zap and unstick underwater smart glue

MÉTAUX

- Metallic glasses bear up better under strain - Physics World

NANOMATÉRIAUX

- Honeywell says it will soon release 'the most powerful quantum computer yet' - Physics World
- Oxford Advanced Surfaces and 2-DTech Sign Collaboration Agreement on Graphene Enabled Surface Treatments
- Water-free way to make MXenes could mean new uses for the promising nanomaterials
- New DNA origami motor breaks speed record for nano machines
- Nanowire device generates electricity from ambient humidity - Physics World
- Atomic vacancy as quantum bit

POLYMÈRES - ÉLASTOMÈRES

- Polymer films pass electron gun test

REVÊTEMENTS

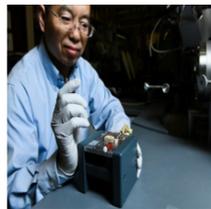
- Corr-Paint CP3015-BL Coats High Temperature Structures to 1500 oF

SEMI-CONDUCTEURS

- Magnetic whirls in future data storage devices
- Low-Inductance DC Power Bus

THERMOPLASTIQUES

- KRAIBURG TPE is Supplying a Skin-Friendly Thermoplastic Elastomer for an Innovative Protos Headset



reorganization to a riot of chemical reactions. To explore this early part of a battery's life, researchers in the US have monitored a battery's chemical evolution at the electrode surface. Their work could lead to improved battery design by targeting the early stages of device operation. The solid-electrolyte interphase is the solid gunk that materializes around the anode. Borne from the decomposition of the electrolyte, it is crucial for preventing further electrolyte degradation by blocking electrons while allowing lithium ions to pass through to complete the electrical circuit. The solid-electrolyte interphase does not appear immediately. When a lithium ion battery first charges up, the anode repels anions and attracts positive lithium ions, separating oppositely charged ions into two distinct layers. This electric double layer dictates the eventual composition and structure of the solid-electrolyte interphase.

'Spillway' for electrons could keep lithium metal batteries from catching fire

13/03/2020 - www.energy-daily.com



Nanoengineers at the University of California San Diego developed a safety feature that prevents lithium metal batteries from rapidly heating up and catching fire in case of an internal short circuit. The team made a clever tweak to the part of the battery called the separator, which serves as a barrier between the anode and cathode, so that it slows down the flow of energy (and thus heat) that builds up inside the battery when it short circuits. The researchers, led by UC San Diego nanoengineering professor Ping Liu and his Ph.D. student Matthew Gonzalez, detail their work in a paper published in *Advanced Materials*.

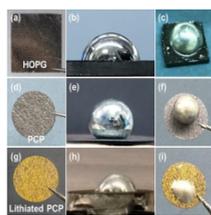
Chasing lithium ions on the move in a fast-charging battery

12/03/2020 - www.sciencedaily.com

A team of scientists led by the U.S. Department of Energy's (DOE) Brookhaven National Laboratory and Lawrence Berkeley National Laboratory has captured in real time how lithium ions move in lithium titanate (LTO), a fast-charging battery electrode material made of lithium, titanium, and oxygen. They discovered that distorted arrangements of lithium and surrounding atoms in LTO "intermediates" (structures of LTO with a lithium concentration in between that of its initial and end states) provide an "express lane" for the transport of lithium ions.

Replacing Graphite-Based Anodes with Li Metal Offers a New, Promising Approach

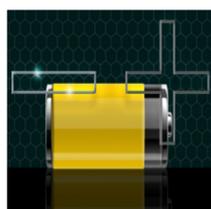
12/03/2020 - www.azom.com



The late 1970s saw the discovery of the "Rock-chair" Li-ion battery (LIB), which was later commercialized by Sony in 1991. This battery has become the preferred mode of storing portable energy nowadays. Contact angle experiments of Li metal and graphite materials: (a-c) highly oriented pyrolytic graphite (HOPG); (d-f) porous carbon paper (PCP); (g-i) lithiated porous carbon paper (lithiated PCP). Image Credit: ©Science China Press. The 2019 Nobel Prize in chemistry was given to three well-known researchers (John B. Goodenough, M. Stanley Whittingham, and Akira Yoshino) to acknowledge their contribution in "creating a rechargeable world."

New Electrode Design May Lead to More Powerful Batteries

10/03/2020 - www.techbriefs.com

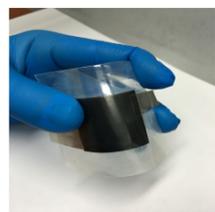


New research by engineers at MIT and elsewhere could lead to batteries that can pack more power per pound and last longer. (Credit: MIT News) New research by engineers at MIT and elsewhere could lead to batteries that can pack more power per pound and last longer, based on the long-

sought goal of using pure lithium metal as one of the battery's two electrodes, the anode. Their design is part of a concept for developing safe all-solid-state batteries, dispensing with the liquid or polymer gel usually used as the electrolyte material between the battery's two electrodes.

Fast-Charging Supercapacitor is an Energy Storage Breakthrough

10/03/2020 - www.techbriefs.com



New bendable supercapacitor developed by UCL researchers. (Credit: UCL) A new bendable supercapacitor made from graphene, which charges quickly and safely stores a record-high level of energy for use over a long period, has been developed and demonstrated by UCL and Chinese Academy of Sciences researchers. While still at the proof-of-concept stage, it shows enormous potential as a portable power supply in practical applications including electric vehicles, smart phones and smart wearable technology.

Researchers Develop All-Solid-State Lithium-Sulfur Batteries Using Sulfur-CNF Composite

06/03/2020 - www.azom.com

Researchers have successfully created an active sulfur material and carbon nanofiber (CNF) composite using a simple and low-cost liquid phase process. Schematic images and electron microscope photograph of sulfur-carbon composites (upper).

Potassium metal battery emerges as a rival to lithium-ion technology

02/03/2020 - www.sciencedaily.com

From cell phones, to solar power, to electric cars, humanity is increasingly dependent on batteries. As demand for safe, efficient, and powerful energy storage continues to rise, so too does the call for promising alternatives to rechargeable lithium-ion batteries, which have been the dominant technology in this space. .

Avec Modalis², l'Ifpen veut développer la boîte à outils numériques des batteries du futur

02/03/2020 - www.industrie-techno.com

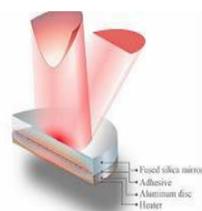


L'IFP Energies nouvelles (Ifpen) a officialisé le lancement du projet européen Modalis²; (pour Modelling of advanced Lithium Storage Systems) le 27 février. Avec neuf partenaires et pour une durée de trois ans, l'objectif sera de développer des outils numériques pour modéliser et concevoir les futures générations de batteries. L'IFP Energies nouvelles (Ifpen) a officialisé le lancement du projet Modalis²; (pour Modelling of advanced Lithium Storage Systems) le 27 février.

MATÉRIAUX POUR L'OPTIQUE

Precision mirrors poised to improve sensitivity of gravitational wave detectors

19/03/2020 - www.spacedaily.com



Researchers have developed a new type of deformable mirror that could increase the sensitivity of ground-based gravitational wave detectors such as the Advanced Laser Interferometer Gravitational-Wave Observatory (LIGO). Advanced LIGO measures faint ripples in space time called gravitational waves, which are caused by distant events such as collisions between black holes or neutron stars. "

Gold-coated fabric that emits own light could be ultimate safety gear

04/03/2020 - www.newscientist.com

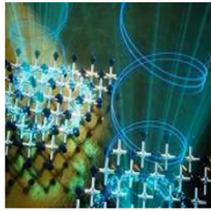
The Carmichael Lab Stretchable, light-emitting clothing made from fabric



coated in gold could be a smart alternative to high-visibility gear – not to mention a bold fashion statement. Tricia Carmichael at the University of Windsor, Canada, and her colleagues started with a fabric that is 87 per cent nylon and 13 per cent spandex. They then added a very thin coating of gold to act as an electrode and send power to a light-emitting material made of zinc sulphide, copper and silicone. The fabric as a whole is semi-transparent, so light can shine through it easily.

Using light to put a twist on electrons

02/03/2020 - www.spacedaily.com



Some molecules, including most of the ones in living organisms, have shapes that can exist in two different mirror-image versions. The right- and left-handed versions can sometimes have different properties, such that only one of them carries out the molecule's functions. Now, a team of physicists has found that a similarly asymmetrical pattern can be induced and measured at will in certain exotic materials, using a special kind of light beam to stimulate the material. In this case, the phenomenon of "handedness," known as chirality, occurs not in the structure of the molecules themselves, but in a kind of patterning in the density of electrons within the material.

BIOMIMÉTIQUE

What's New in 3D Bioprinting?

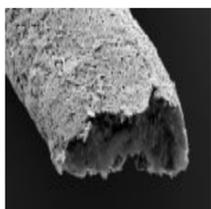
17/03/2020 - www.engineering.com



The amazingly regenerative Axolotl. (Though found in different areas of the animal kingdom, the degree to which humans can regenerate limbs, organs and tissue due to serious injury is very low (one exception is the liver), especially compared to animals like the amazing Axolotl. Scientific research into using 3D bioprinting to re-create and regenerate human limbs and organs from patient-specific DNA is progressing slowly but surely. The implications and potential for organ transplant patients with life-threatening prognoses is profound.

New biomaterial discovery enables 3D printing of vascular structures

04/03/2020 - 3dprintingindustry.com



A new study, published in Nature Communications, details the 3D printing of graphene oxide with a protein which can organise into tubular structures that replicate vascular tissues. The research is led by Professor Alvaro Mata at the University of Nottingham and Queen Mary University of London. Professor Mata explains: "This work offers opportunities in biofabrication by enabling simultaneous top-down 3D bioprinting and bottom-up self-assembly of synthetic and biological components in an orderly manner from the nanoscale. Here, we are biofabricating micro-scale capillary-like fluidic structures that are compatible with cells, exhibit physiologically relevant properties, and have the capacity to withstand flow.

COLLAGES –ADHÉSIFS

Epoxy Features Exceptional Chemical and Heat Resistance

12/03/2020 - www.azom.com

Master Bond EP35SP is a two part epoxy system for bonding and sealing applications, providing resistance to many chemicals such as oils, acids, bases, water, fuels, and especially petrochemicals. It features both a high glass transition temperature (Tg) and a broad service temperature range. Its Tg measures 215-220°C and its serviceability

extends from -62°C to $+288^{\circ}\text{C}$ (-80°F to 550°F). EP35SP has notable dielectric properties with a dielectric constant of 4.5 at 60 Hz and a volume resistivity greater than 10^{14} ohm-cm. It bonds well to a wide array of substrates including metals, several plastics, ceramics, glass and composites. Upon curing, this system offers low shrinkage and good dimensional stability.

Engineers zap and unstick underwater smart glue

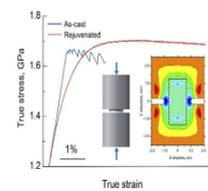
03/03/2020 - www.sciencedaily.com

With a small zap of electricity, biomedical engineers at Michigan Technological University take an underwater smart glue prototype from sticky to not in seven seconds. Turning adhesion on and off is what makes a glue smart. It's one thing to do this in the open air and quite another under water. Inspired by nature, catechols are synthetic compounds that mimic the wet-but-still-sticky proteins secreted by mussels and offer promise for smart adhesives that work in water. The technology could help with underwater glue, wound dressings, prosthetic attachments or even making car parts and in other manufacturing.

MÉTAUX

Metallic glasses bear up better under strain - Physics World

11/03/2020 - physicsworld.com



Compressing metallic glasses could make them less prone to fracture, greatly increasing their potential for structural applications. So say researchers from the University of Cambridge in the UK and the Institute of Metal Research in Shenyang, China, who have succeeded in strain-hardening these metastable materials to a degree hitherto thought impossible. Metallic glasses are materials with the properties of both metals and glasses. They contain metallic bonds and are thus conducting, but their atoms are disordered like in a glass, not ordered as in a crystal. They are produced by heating certain substances to above their melting points and then quenching them in a way that prevents them from crystallizing. While the exceptional strength of metallic glasses makes them promising materials for structural engineering applications, they have one major drawback: they can soften when deformed, which makes them brittle. This contrasts with normal polycrystalline metals and alloys, in which stress produces strain-hardening: under increased loading, plastic deformation in normal metals starts locally, but then spreads uniformly, allowing the material to “stretch”.

NANOMATÉRIAUX

Honeywell says it will soon release ‘the most powerful quantum computer yet’ - Physics World

20/03/2020 - physicsworld.com



Honeywell says that it will release the world's most powerful commercial quantum computer by mid-2020. The US-based manufacturer of scientific and commercial equipment says that the device is based on trapped ions, which is a different technology than that being pursued by most other commercial developers including Google and IBM. Honeywell researchers have published details of a smaller version of the machine that has a “quantum volume” of 16 and say that it should be straightforward to scale this up to 64. The fundamental requirement for quantum computation is a set of quantum bits (qubits) that can interact to form quantum logic gates that process quantum information. In principle, quantum computers can perform certain computational task much faster than conventional computers. However, qubits tend to be very fragile so creating practical quantum computers is a significant

scientific and technological challenge.

Oxford Advanced Surfaces and 2-DTech Sign Collaboration Agreement on Graphene Enabled Surface Treatments

17/03/2020 - www.azom.com



Oxford Advanced Surfaces (OAS), a pioneer and market leader in the surface treatment of polymeric, plastic and composite materials by the application of highly reactive carbene chemistry, has entered into a collaboration agreement with 2-DTech Limited, a subsidiary of Versarien plc. The aim is to develop a new range of products that incorporate nano-materials, such as graphene, into OAS' proprietary Onto™ chemistry platform to deliver enhanced mechanical performance and improved electrical and thermal conductivity.

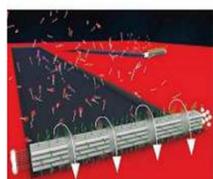
Water-free way to make MXenes could mean new uses for the promising nanomaterials

13/03/2020 - www.sciencedaily.com

Ten years after producing the first sample of the now widely studied family of nanomaterials, called MXenes, Drexel University researchers have discovered a different way to make the atom-thin material that presents a number of new opportunities for using it. The new discovery removes water from the MXene-making process, which means the materials can be used in applications in which water is a contaminant or hampers performance, such as battery electrodes and next-generation solar cells.

New DNA origami motor breaks speed record for nano machines

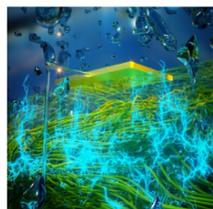
04/03/2020 - www.nanodaily.com



Through a technique known as DNA origami, scientists have created the fastest, most persistent DNA nano motor yet. Angewandte Chemie published the findings, which provide a blueprint for how to optimize the design of motors at the nanoscale - hundreds of times smaller than the typical human cell. "Nanoscale motors have tremendous potential for applications in biosensing, in building synthetic cells and also for molecular robotics," says Khalid Salaita, a senior author of the paper and a professor of chemistry at Emory University. "DNA origami allowed us to tinker with the structure of the motor and tease out the design parameters that control its properties."

Nanowire device generates electricity from ambient humidity - Physics World

03/03/2020 - physicsworld.com



Scientists in the US claim to have developed a device that can generate electricity from moisture in the air. The device, based around a thin film of electrically conductive protein nanowires, can produce continuous electrical power for around 20 hr, before self-recharging. The researchers say that such technology could provide clean energy without the restrictions on location and environmental conditions of other renewable energy solutions such as solar cells. The device consists of a roughly 7 μm thin film of protein nanowires, harvested from the microorganism *Geobacter sulfurreducens*, deposited on a gold electrode with an area of around 25 mm^2 . A smaller, roughly 1 mm^2 , electrode is placed on top of the nanowire film.

Atomic vacancy as quantum bit

02/03/2020 - www.sciencedaily.com

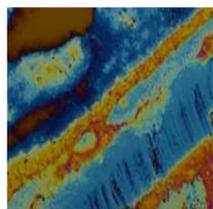
Although boron nitride looks very similar to graphene in structure, it has completely different optoelectronic properties. Its constituents, the elements boron and nitrogen,

arrange -- like carbon atoms in graphene -- a honeycomb-like hexagonal structure. They arrange themselves in two-dimensional layers that are only one atomic layer thick. The individual layers are only weakly coupled to each other by so-called van der Waals forces and can therefore be easily separated from each other.

POLYMÈRES - ÉLASTOMÈRES

Polymer films pass electron gun test

19/03/2020 - www.spacedaily.com



HSE researchers, jointly with colleagues from the RAN Institute of Organoelement Compounds and the RAN Institute of Physical Chemistry and Electrochemistry, have studied the properties of a polyarylene ether ketone-based copolymer (co-PAEK) for potential space applications. Co-PAEK films are highly resistant to electrostatic discharges caused by ionizing radiation and can thus be used as protective coating for spacecraft electronics. The study findings have been published in *Polymers*. Spacecraft electronics are continuously exposed to the ambient space plasma. I

REVÊTEMENTS

Corr-Paint CP3015-BL Coats High Temperature Structures to 1500 oF

06/03/2020 - www.azom.com

Corr-Paint™ CP3015-BL, a new ultra-high temperature, black pigmented and ceramic filled coating developed by Aremco Products, Inc., is now used to coat automotive, truck and industrial exhaust headers for applications to 1500 oF. Aremco's Corr-Paint™ CP3015-BL is a new high temperature coating system used to inhibit oxidation of carbon steel and cast-iron exhaust headers used in automotive, truck and industrial applications to 1500 oF. Corr-Paint™ CP3015-BL is formulated using an advanced, waterborne, proprietary silicate binder system filled with a blend of ceramic corrosion inhibiting pigments.

SEMI-CONDUCTEURS

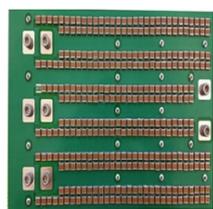
Magnetic whirls in future data storage devices

04/03/2020 - www.spacedaily.com

Magnetic (anti)skyrmions are microscopically small whirls that are found in special classes of magnetic materials. These nano-objects could be used to host digital data by their presence or absence in a sequence along a magnetic stripe.

Low-Inductance DC Power Bus

01/03/2020 - www.techbriefs.com



Sandia National Laboratories, Albuquerque, New Mexico A new generation of power electronic conversion systems is being enabled by wide-bandgap (WBG) devices. Applications in civilian and defense sectors are already realizing improved power density and efficiency in power converters that utilize silicon carbide (SiC) and/or gallium nitride (GaN) switches; however, as semiconductor switches become capable of greater hold-off voltage, higher switching frequency, and higher junction temperature, limits on converter performance will depend on the remainder of the system: device packaging, filter components, and thermal management, as examples. The assembled bus board.

THERMOPLASTIQUES

KRAIBURG TPE is Supplying a Skin-Friendly Thermoplastic Elastomer for an Innovative Protos Headset

05/03/2020 - www.azom.com



The Austria-based company Pfanner Schutzbekleidung GmbH is having the headband for its Protos® Headset Integral manufactured by injection molding of a thermoplastic elastomer (TPE) from KRAIBURG TPE. The material provides excellent processability and ensures high wearing comfort.

Service Information Numérique - Pôle Veille

Pour toute information, merci de [nous contacter](#)