

Matériaux

Bulletin de Veille - 20 décembre 2018

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

SOMMAIRE

A LA UNE

- LLNL presents new class of 3D printed metamaterials that strengthen on demand

GÉNÉRALITÉS - MATÉRIAUX

- Developing new materials for the fusion reactor
- Researchers Develop the Stiffest Porous Lightweight Materials Ever
- Earth's cobalt deposits formed much later than previously believed
- Green production of chemicals for industry

MATÉRIAUX POUR L'ÉNERGIE

- Jiggly Jell-O to make powerful new hydrogen fuel catalyst
- Scientists maximize the effectiveness of platinum in fuel cells
- Focusing on the negative is good when it comes to batteries
- Microscopic 'sunflowers' for better solar panels

MATÉRIAUX POUR L'OPTIQUE

- Transparent lenses from an FDM 3D printer
- New type of low-energy nanolaser that shines in all directions

BIOMIMÉTIQUE

- Custom-made artificial mother-of-pearl
- New fuel cell concept brings biological design to better electricity generation

COLLAGES –ADHÉSIFS

- Novel Adhesive for Painless Removal of Band-Aid Using Light

COMPOSITES

- Benefits of 3D Printing Composite Tooling

CÉRAMIQUES

- Canon Announces Ceramic 3D Printing Materials

MÉTAUX

A LA UNE

LLNL presents new class of 3D printed metamaterials that strengthen on demand

11/12/2018 - [3dprintingindustry.com](#)

Like a "dancing" iron filing experiment, when a magnetic field is applied to this lattice, the particles realign, making the structure stiff and supportive of added weight. This newfound strength is demonstrated through a test in which a 10g weight is added to the top of the lattice. As the magnet beneath the lattice is moved away, the structure gradually gives way, and eventually drops the weight. Nominate 3D Printing Research Team of the Year and more now for the 2019 3D Printing Industry Awards.

GÉNÉRALITÉS - MATÉRIAUX

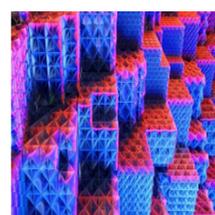
Developing new materials for the fusion reactor

13/12/2018 - [www.energy-daily.com](#)

The blanket, by absorbing the high-speed particles generated by the fusion reaction inside the plasma, releases heat and a higher temperature is achieved. At this time, the blanket is expected to be at the high temperature of between 700 and 800 degrees? The vanadium alloy, compared to the heat-resistant steel which is commonly used, combines various characteristics that are necessary for the fusion reactor blanket, such as high strength at high temperatures. As a result, we successfully developed a high purity vanadium alloy NIFS-HEAT-2.

Researchers Develop the Stiffest Porous Lightweight Materials Ever

13/12/2018 - [www.azom.com](#)



To put it differently, it is virtually impossible to create other material structures that are stiffer for the specified weight. "However, using computer calculations, theory, and experimental measurements, we have now established a new family of plate-lattice structures that are up to three times stiffer than truss-lattices of the same weight and volume. Lightweight construction, the current cost of which limits its practical use to aircraft manufacturing and space applications, could then also be used for a wide array of applications in which weight plays a role.

Earth's cobalt deposits formed much later than previously believed

12/12/2018 - [www.sciencedaily.com](#)

"Using this new knowledge of the timing of events that formed cobalt deposits, we can target regions for exploring known cobalt deposits and discovering new ones. Their results show that cobalt and copper mineralization occurred during a period of mountain building and deformation, between 610 and 470 million years ago, suggesting that the deposits formed 100 to 150 million years more recently than originally thought.

Green production of chemicals for industry

11/12/2018 - [www.sciencedaily.com](#)

"In the long term, such biocatalytic materials are to be used in automatic

- Researcher at Penn State demonstrates superiority of 3D printed superalloy

NANOMATÉRIAUX

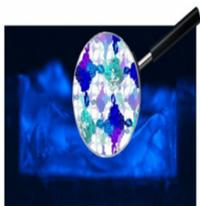
- Imploding hydrogel shrinks objects to the nanoscale - Physics World
- MIT team invents method to shrink objects to the nanoscale
- Pitt chemical engineers develop new theory to build improved nanomaterials
- Artificial synapses made from nanowires

POLYMÈRES - ÉLASTOMÈRES

- How clever chemistry is making plastic fantastic again
- Barely scratching the surface: A new way to make robust membranes
- Researchers Manipulate Liquid Crystal Elastomers to Move in Response to Different Stimuli

SEMI-CONDUCTEURS

- Method to transfer entire 2D circuits to any smooth surface
- For the First Time in History, Virus Used to Speed Up Modern Computers



production of value-added basic compounds without complex synthesis and cleaning steps and with a minimum amount of waste arising," says Professor Christof Niemeyer of KIT's Institute for Biological Interfaces. Similar to a two-component adhesive, the enzymes form a gel-type material.

MATÉRIAUX POUR L'ÉNERGIE

Jiggly Jell-O to make powerful new hydrogen fuel catalyst

15/12/2018 - www.sciencedaily.com

To create the catalyst, the researchers followed a recipe nearly as simple as making Jell-O from a box. That is because the water has to be in contact with the surface of the catalyst in order to do its job, and the large surface area of the sheets mean that the metal carbides are extremely efficient for their weight. Because the recipe is so simple, it could easily be scaled up to produce large quantities of the catalyst, the researchers say.

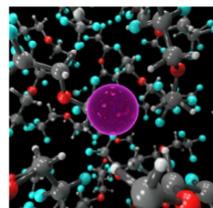
Scientists maximize the effectiveness of platinum in fuel cells

13/12/2018 - www.sciencedaily.com

Using metal-organic frameworks as precursors, Liu and his colleagues were able to prepare a cobalt-nitrogen-carbon composite substrate in which the catalytically active centers are uniformly distributed near to the platinum-cobalt particles. The study included computational modeling and advanced structural characterization done in part at Argonne's Advanced Photon Source and Center for Nanoscale Materials, both DOE Office of Science User Facilities.

Focusing on the negative is good when it comes to batteries

06/12/2018 - www.sciencedaily.com



Moving multiply charged metal cations is difficult, but a similar result can be achieved by moving several singly charged anions, which travel with comparative ease," says Jones, who does research at JPL on power sources needed for spacecraft.

Microscopic 'sunflowers' for better solar panels

04/12/2018 - www.sciencedaily.com

Such programmed shape changes could be used to create encrypted messages that are only revealed when heated to a specific temperature, actuators for tiny soft robots, or adhesive materials whose stickiness can be switched on and off. This type of self-regulated motion allows LCEs to deform in response to their environment and continuously reorient themselves to autonomously follow the light.

MATÉRIAUX POUR L'OPTIQUE

Transparent lenses from an FDM 3D printer

17/12/2018 - www.3ders.org



This is because FDM printers don't create 100% solid parts, partly for material usage reasons and partly for technical limitations. Even when setting the infill to 100%, there will usually be slight voids and gaps between the lines of plastic extrusion that inhibit the passage of light. It's likely that these 3D prints are also stronger due to their homogeneous molecular structures, which is its own totally separate benefit to printing 100% solid parts. .

New type of low-energy nanolaser that shines in all directions

17/12/2018 - www.sciencedaily.com

Researchers in Eindhoven have developed a new type of low-energy, nanoscale laser that shines in all directions. To achieve laser emission an electrical current is usually injected

through the medium, or it is illuminated with high energy light. The TU/e-DIFFER researchers have now discovered a new kind of polariton laser that consists of a regular pattern of silver nanostripes covered with colored PMMA-polymer whose dye comprises organic emitting molecules.

BIOMIMÉTIQUE

Custom-made artificial mother-of-pearl

11/12/2018 - www.sciencedaily.com

The materials scientists use a special process developed by them to produce such mother-of-pearl-like materials. In a rotating magnetic field, the researchers align the magnetized plates dissolved in aqueous solution as desired in one direction, and under high pressure and temperatures of around 1000 degrees Celsius they solidify the material with the addition of a resin. In order to make the artificial mother-of-pearl even more stable and harder, the team now used such plates coated with titanium oxide.

New fuel cell concept brings biological design to better electricity generation

05/12/2018 - www.techbriefs.com

In a new approach, inspired by biology, a University of Wisconsin–Madison team has designed a fuel cell using cheaper materials and an organic compound that shuttles electrons and protons. The team's solution was to pack a lower-cost metal, cobalt, into a reactor nearby, where the larger quantity of material doesn't interfere with its performance.

COLLAGES –ADHÉSIFS

Novel Adhesive for Painless Removal of Band-Aid Using Light

17/12/2018 - www.azom.com



A new type of adhesive designed by the scientists from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) and Xi'an Jiaotong University in China can strongly adhere wet materials—such as living tissue and hydrogel—and be easily detached using a specific frequency of light. The adhesive consists of an aqueous solution of polymer chains spread between two, non-sticky materials—similar to jam between two slices of bread.

COMPOSITES

Benefits of 3D Printing Composite Tooling

15/12/2018 - www.stratasysdirect.com

Benefits of 3D Printing Composite Tooling Reduce Cost & Lead Times Build tools in days versus weeks or months for traditional tooling with more than 90% cost savings. (composite tooling) An Alternative Approach to Composite Tooling 3D printing offers the capability to make composite tooling that's lighter, faster to produce and easily adaptable to design changes.

CÉRAMIQUES

Canon Announces Ceramic 3D Printing Materials

05/12/2018 - www.engineering.com



Canon announced new ceramic 3D printer materials. "Canon Inc. announced today that the company has developed a manufacturing technology for the highly accurate 3D printing of ceramic parts with complex geometries using a proprietary ceramic material for 3D printers.

..

MÉTAUX

Researcher at Penn State demonstrates superiority of 3D printed superalloy

13/12/2018 - www.3ders.org

For the study, cylindrical specimens were extracted from the 3D printed Inconel 625 sample and the conventionally processed Inconel 625 plate and then subjected to uniaxial compression tests at room temperature, 600 °C, and 700 °C. The 3D printed sample was produced using laser-based directed energy deposition (DED), where a laser melts a stream of pre-alloyed metallic powder as it's delivered to the melt pool via a nozzle; the conventional plate came from Special Metals Corporation.

NANOMATÉRIAUX

Imploding hydrogel shrinks objects to the nanoscale - Physics World

14/12/2018 - physicsworld.com

Thank you for registering with Physics World. If you'd like to change your details at any time, please visit My account.

MIT team invents method to shrink objects to the nanoscale

14/12/2018 - www.nanodaily.com



"It's a way of putting nearly any kind of material into a 3-D pattern with nanoscale precision," says Edward Boyden, an associate professor of biological engineering and of brain and cognitive sciences at MIT. Boyden, who is also a member of MIT's Media Lab, McGovern Institute for Brain Research, and Koch Institute for Integrative Cancer Research, is one of the senior authors of the paper, which appears in the Dec. "It's a bit like film photography - a latent image is formed by exposing a sensitive material in a gel to light.

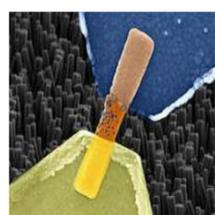
Pitt chemical engineers develop new theory to build improved nanomaterials

12/12/2018 - www.nanodaily.com

The study, "Thermodynamic Stability of Ligand-Protected Metal Nanoclusters" (DOI: 10.1021/acs.jpcclett.8b02679) was featured on the cover of the ACS Journal of Physical Chemistry Letters. Co-authors are Giannis Mpourmpakis, the Bicentennial Alumni Faculty Fellow and Assistant Professor of Chemical and Petroleum Engineering at the Swanson School, and PhD candidate and NSF Graduate Fellow Michael Taylor. "In particular, Ligand-protected Au (gold) nanoclusters are a class of nanomaterials where the precise control of their size has been achieved.

Artificial synapses made from nanowires

06/12/2018 - www.nanodaily.com



For years memristive cells have been ascribed the best chances of being capable of taking over the function of neurons and synapses in bioinspired computers. They alter their electrical resistance depending on the intensity and direction of the electric current flowing through them. In contrast to conventional transistors, their last resistance value remains intact even when the electric current is switched off. The metals function as electrodes, and in addition, release ions triggered by an appropriate electric current.

POLYMÈRES - ÉLASTOMÈRES

How clever chemistry is making plastic fantastic again

17/12/2018 - www.newscientist.com

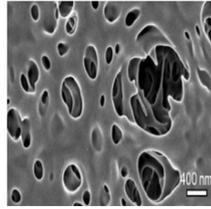


One simple solution is to change the colouring used in some plastics. In 2016, the world's consumers bought 480 billion plastic bottles: that's a million bottles a minute, most of them made of polyethylene terephthalate (PET). The broken polymer chains this creates means that recycled PET

isn't strong enough to be made into more bottles. These are molecules that attach to the broken polymer chains and stick them back together: a kind of molecular superglue. It's a vision that the Ellen MacArthur Foundation has crystallised as its "Circular Economy 100" programme.

Barely scratching the surface: A new way to make robust membranes

13/12/2018 - www.sciencedaily.com



In their proof of concept, Darling and colleagues used SIS to plant the "seeds" for aluminum oxide and grew it within polyethersulfone (PES) ultrafiltration (UF) membranes, making them more resilient without compromising filtration ability.

Researchers Manipulate Liquid Crystal Elastomers to Move in Response to Different Stimuli

05/12/2018 - www.azom.com

Programmed shape changes such as these can be applied to create encrypted messages that are revealed only when heated to a particular temperature, adhesive materials the stickiness of which can be switched on and off, or actuators for tiny soft robots.

SEMI-CONDUCTEURS

Method to transfer entire 2D circuits to any smooth surface

06/12/2018 - www.sciencedaily.com

The benefit is that these sensors can now be imbedded into such fibers where they can monitor performance without adding weight or hindering the signal flow. Raw 2D materials are often moved with a layer of polymethyl methacrylate (PMMA), more commonly known as Plexiglas, on top, and the Rice researchers make use of that technique. (The PMMA is also removed when the circuit reaches its destination.

For the First Time in History, Virus Used to Speed Up Modern Computers

06/12/2018 - www.azom.com

A binary-type material, for example, gallium antimonide, could be used to create a better version of phase-change memory, but the use of this material can increase power consumption and it can experience material separation at about 620 K. Hence, it is difficult to add a binary-type material into existing integrated circuits, because it can separate at standard manufacturing temperatures at about 670 K.. The traditional process of making minute wires can reach a temperature of about 720 K, a heat that makes a binary-type material to separate.

Service Information Numérique - Pôle IES

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