

Matériaux

Bulletin de Veille - 21 avril 2020

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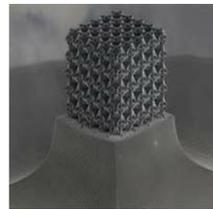
BIOMIMÉTIQUE

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GÉNÉRALITÉS - MATÉRIAUX

UCI-led team designs carbon nanostructure stronger than diamonds

16/04/2020 - www.spacedaily.com



Researchers at the University of California, Irvine and other institutions have architecturally designed plate-nanolattices - nanometer-sized carbon structures - that are stronger than diamonds as a ratio of strength to density. In a recent study in Nature Communications, the scientists report success in conceptualizing and fabricating the material, which consists of closely connected, closed-cell plates instead of the cylindrical trusses common in such structures over the past few decades. "Previous beam-based designs, while of great interest, had not been so efficient in terms of mechanical properties," said corresponding author Jens Bauer, a UCI researcher in mechanical and aerospace engineering. "This new class of plate-nanolattices ...

New "Intelligent Microsystem" for Faster, More Sustainable Industrial Chemistry

15/04/2020 - www.azom.com



Written by AZoMApr 15 2020 The synthesis of plastic precursors, such as polymers, involves specialized catalysts. However, the traditional batch-based method of finding and screening the right ones for a given result consumes liters of solvent, generates large quantities of chemical waste, and is an expensive, time-consuming process involving multiple trials. Ryan Hartman, professor of chemical and biomolecular engineering at the NYU Tandon School of Engineering, and his laboratory developed a lab-based "intelligent microsystem" employing machine learning, for modeling chemical reactions that shows promise for eliminating this costly process and minimizing environmental harm. In their research, "Combining automated ...

CAFE TECHNO : FRITTAGE FLASH (Spark Plasma Sintering): Nouvelles opportunités pour vos matériaux hautes performances | Aerospace Valley

09/04/2020 - www.aerospace-valley.com

Aerospace Valley a le plaisir de vous convier au Café Techno : FRITTAGE FLASH (Spark Plasma Sintering) : Nouvelles opportunités pour vos matériaux hautes performances, en partenariat avec NORIMAT, qui se déroulera en ligne le mardi 14 avril de 14h00 à 15h00. Le frittage flash est un procédé métallurgie des poudres qui permet de densifier vos matériaux très rapidement. Les autres principaux avantages de la technologie sont : de supprimer des liants organiques au sein des poudres, limitant les défauts liés au déliantage d'assurer à vos pièces des propriétés améliorées

Technique reveals how crystals form on surfaces

03/04/2020 - www.spacedaily.com

The process of crystallization, in which atoms or molecules line up in orderly arrays like soldiers in formation, is the basis for many of the

COMPOSITES

- Composite metal foams take the heat, move closer to widespread applications

NANOMATÉRIAUX

- Flatter Graphene Sheet can Help Electrons Move Faster
- Substances Inside van der Waals Nanobubbles Have Unusual Properties
- Pushing the limits of 2D supramolecules
- 3D reconstructions of individual nanoparticles

POLYMÈRES - ÉLASTOMÈRES

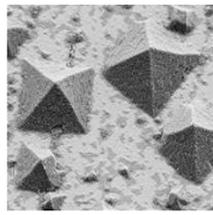
- New Comfortable Fabric can Heat and Cool the Skin
- Scientists in Japan develop decomposable plastic

REVÊTEMENTS

- Antimicrobial Copper 3D Printed onto Metal Surfaces
- Anodized Aluminum Surfaces May Help Minimize Surface Pathogen Collection

SEMI-CONDUCTEURS

- Advanced memory from advanced materials
- New Etching Technique Produces Far Smaller Semiconductors
- AI finds 2D materials in the blink of an eye
- High-efficiency laser for silicon chips



materials that define modern life, including the silicon in microchips and solar cells. But while many useful applications for crystals involve their growth on solid surfaces (rather than in solution), there has been a dearth of good tools for studying this type of growth. Now, a team of researchers at MIT and Draper has found a way to reproduce the growth of crystals on surfaces, but at a larger scale that makes the process much easier to study and analyze.

High-efficiency laser for silicon chips

25/03/2020 - www.sciencedaily.com

Transistors in computer chips work electrically, but data can be transmitted more quickly by using light. For this reason, researchers have long been looking for a way to integrate lasers directly in silicon chips. Scientists from Forschungszentrum Jülich have now come a step closer to achieving this. Together with researchers from Centre de Nanosciences et de Nanotechnologies (C2N) in Paris and the French company STMicroelectronics as well as CEA-LETI Grenoble, they have developed a compatible semiconductor laser made of germanium and tin, whose efficiency is comparable with conventional GaAs semiconductor lasers on Si.

AÉROSPATIAL

NASA develops unique materials for the next generation of aircraft

15/04/2020 - www.spacedaily.com



As NASA looks to the future of flight, the agency is investing in technologies aimed at changing the aviation industry as we know it. These developments vary from basic materials to full-scale experimental aircraft, all designed to increase efficiency and reliability, while decreasing weight and cost. NASA engineers are developing innovative new materials that can be used to manufacture better parts for aircraft engines and related systems. One of these materials is Silicon Carbide (SiC) Fiber-Reinforced SiC Ceramic Matrix Composites (SiC/SiC CMCs). This lightweight and reusable fiber material is ideal for high-performance machinery, like aircraft engines, operating for extended periods of time in punishing conditions. SiC fibers can ...

Army Researchers Explore New Structural Materials for Unmanned Vehicles

14/04/2020 - www.azom.com

Materials used for a Soldier's personal protection gear may be tough enough for vehicles too, according to a new Army study. Findings, released April 10 in the journal Polymer, show that polymers filled with carbon nanotubes could potentially improve how unmanned vehicles dissipate energy. A team led by the U.S. Army's Combat Capabilities Development Command's Army Research Laboratory is conducting theoretical research through computer modeling. Our motivation for this research is that there could potentially be a use, as matrix material, for incorporation into lightweight composites in unmanned vehicle systems."

MATÉRIAUX POUR L'ÉNERGIE

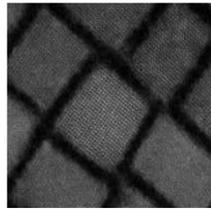
Seeing 'under the hood' in batteries

16/04/2020 - www.sciencedaily.com

From next-gen smartphones to longer-range electric cars and an improved power grid, better batteries are driving tech innovation. And to push batteries beyond their present-day performance, researchers want to see "under the hood" to learn how the individual ingredients of battery materials behave beneath the surface. This could ultimately lead to battery improvements such as increased capacity and voltage.

Shedding light on dark traps

16/04/2020 - www.solardaily.com



In the last decade, perovskites - a diverse range of materials with a specific crystal structure - have emerged as promising alternatives to silicon solar cells, as they are cheaper and greener to manufacture, while achieving a comparable level of efficiency. However, perovskites still show significant performance losses and instabilities, particularly in the specific materials that promise the highest ultimate efficiency. Most research to date has focused on ways to remove these losses, but their actual physical causes remain unknown. Now, in a paper published in Nature, researchers from Dr. Sam Stranks's group at Cambridge University's Department of Chemical Engineering and Biotechnology and Cavendish Laboratory, and Professor Keshav ...

NREL Six-Junction Solar Cell Sets Two World Records for Efficiency - Semiconductor Digest

15/04/2020 - www.semiconductor-digest.com

Scientists at the National Renewable Energy Laboratory (NREL) have fabricated a solar cell with an efficiency of nearly 50%. The six-junction solar cell now holds the world record for the highest solar conversion efficiency at 47.1%, which was measured under concentrated illumination. A variation of the same cell also set the efficiency record under one-sun illumination at 39.2%. "This device really demonstrates the extraordinary potential of multijunction solar cells," said John Geisz, a principal scientist in the High-Efficiency Crystalline Photovoltaics Group at NREL and lead author of a new paper on the record-setting cell. The paper, "Six-junction III-V solar cells with 47.1% conversion efficiency under 143 suns concentration," ...

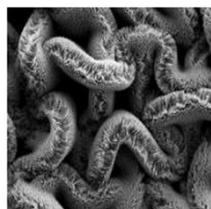
Researchers Develop New Synthesis Technique for Lithium Metal Batteries

14/04/2020 - www.azom.com

Written by AZoMApr 13 2020 A novel technique has been developed by scientists from Tokyo Metropolitan University to create ceramic-based flexible electrolyte sheets for lithium metal batteries. The team says that the mechanical robustness and operability of the flexible composite sheet at a wide range of temperatures makes it a promising electrolyte for Li-metal batteries. Image Credit: Tokyo Metropolitan University By integrating a polymer binder, an ionic liquid, and a garnet-type ceramic, the scientists successfully created a quasi-solid-state sheet electrolyte. The ceramic-based flexible electrolyte was synthesized at room temperature, and this process needs considerably less energy when compared to that of the current prevalent ...

Stretchable supercapacitors to power tomorrow's wearable devices

06/04/2020 - www.spacedaily.com



Researchers at Duke University and Michigan State University have engineered a novel type of supercapacitor that remains fully functional even when stretched to eight times its original size. It does not exhibit any wear and tear from being stretched repeatedly and loses only a few percentage points of energy performance after 10,000 cycles of charging and discharging. The researchers envision the supercapacitor being part of a power-independent, stretchable, flexible electronic system for applications such as wearable electronics or biomedical devices. The results appear online March 19 in Matter, a journal from Cell Press.

MATÉRIAUX POUR L'OPTIQUE

Revolutionary light-emitting silicon

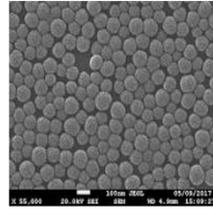
08/04/2020 - www.sciencedaily.com

Emitting light from silicon has been the 'Holy Grail' in the microelectronics industry for decades. Solving this puzzle would revolutionize computing, as chips will become faster

than ever. Researchers from Eindhoven University of Technology now succeeded: they have developed an alloy with silicon that can emit light. The results have been published in the journal Nature. The team will now start creating a silicon laser to be integrated into current chips. Every year we use and produce significantly more data. But our current technology, based on electronic chips, is reaching its ceiling.

On-demand glass is right around the corner

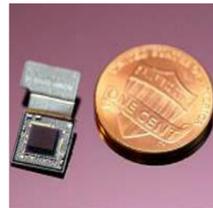
06/04/2020 - www.spacedaily.com



Newsletters :: SpaceDaily :: SpaceWar :: TerraDaily :: Energy Daily XML Feeds :: Space News :: Earth News :: War News :: Solar Energy News (DSI's 2nd DoD Hypersonic Capabilities Symposium April 22-23, 2020 Alexandria, VA) Tempur-Pedic Mattress Comparison & Memory Foam Mattress Review.

Ultrathin but fully packaged high-resolution camera

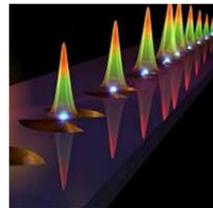
06/04/2020 - www.spacedaily.com



The unique structures of biological vision systems in nature inspired scientists to design ultracompact imaging systems. A research group led by Professor Ki-Hun Jeong have made an ultracompact camera that captures high-contrast and high-resolution images. Fully packaged with micro-optical elements such as inverted micro-lenses, multilayered pinhole arrays, and gap spacers on the image sensor, the camera boasts a total track length of 740 um and a field of view of 73 degrees. Inspired by the eye structures of the paper wasp species *Xenos peckii*, the research team completely suppressed optical noise between micro-lenses while reducing camera thickness.

A funnel of light

01/04/2020 - www.spacedaily.com



Professor Ronny Thomale holds a chair for theoretical condensed matter physics, the TP1, at the Julius-Maximilian University of Wurzburg. The discovery and theoretical description of new quantum states of matter is a prime objective of his research. "Developing a theory for a new physical phenomenon which then inspires new experiments seeking after this effect is one of the biggest moments in a theoretical physicist's practice", so he says. In an ideal case, such an effect would even unlock unexpected technological potential. All this has come together with a recent project which Thomale pursued together with the optical experimental group of Professor Alexander Szameit at the University of Rostock the results of which have now been ...

BIOMIMÉTIQUE

Researchers 3D print bionic coral structures to cultivate algae

16/04/2020 - 3dprintingindustry.com



A joint research team from the University of Cambridge and UC San Diego has 3D bioprinted coral-mimicking structures capable of growing communities of microscopic algae. The study, published in the journal Nature Communications, aims to provide a method of eventually reducing greenhouse gas emissions and fine-tuning the cultivation of algae for bioproducts in developing countries. 3D bioprinted coral structure with algae. Photo via the University of Cambridge. The symbiotic relationship between algae and coral On the sea bed, coral and algae rely on each other to flourish. The coral acts as a habitat for the algae, and the algae produce glucose for the coral through photosynthesis. Through this relationship, the coral reef is maintained – ...

Nanoscale structures give some butterflies 'ultra-black' wings - Physics World

01/04/2020 - physicsworld.com



Many male butterflies have exceptionally black wings with optical properties that have long-puzzled scientists. Now researchers in the US found that the wings of at least ten species have nanoscale structures that increase light absorption and scattering that create the "ultra-black" appearance. These structures may have evolved to enhance the contrast of colour patches used in courtship displays, according to the researchers. Understanding why the wings are so dark could lead to the development of ultra-black synthetic materials. Butterfly wings are made of scales that usually consist of two chitin layers. One layer is a smooth, flat plate. The other layer has ridges that are connected by cross ribs to form a honeycomb-like structure. The two layers are connected by pillars known as trabeculae. It has been suggested that the size of the nanoscale holes in the honeycomb-like structure on the upper scales could be responsible for the extreme light-absorbing properties of some butterflies. But when [Alex Davis](#) at Duke University and colleagues examined the scales of ten butterfly species that are exceptionally black, they found that that was not the case.

Singaporean research details the 3D printing of chitinous bio-composites

01/04/2020 - 3dprintingindustry.com



A recent study from the Singapore University of Technology and Design (SUTD) explores the 3D printing of chitin-based bio-composites prepared via urban food waste bioconversion. The paper, published in the journal *Scientific Reports*, aims to develop a more sustainable circular manufacturing cycle by utilizing ubiquitous, biodegradable raw materials. Bioinspired manufacturingThe research team believes that bioinspired manufacturing – copying the natural life cycle – could potentially aid in the shift to a more sustainable society. Most polymers used in FFF systems today are not biodegradable and cause significant environmental damage over time.

Turning Cells into Mini Factories for Materials

25/03/2020 - www.azom.com



A new study has demonstrated how buildings could be constructed, maintained, and repaired by living materials. A team at the University of Colorado Boulder published their findings this week in the journal *Matter*, where they describe how they used genetic engineering to develop structural building material from photosynthetic cyanobacteria.

COMPOSITES

Composite metal foams take the heat, move closer to widespread applications

06/04/2020 - www.spacedaily.com



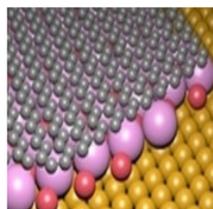
North Carolina State University researchers have demonstrated that composite metal foams (CMFs) can pass so-called "simulated pool fire testing" with flying colors, moving the material closer to use in applications such as packaging and transportation of hazardous materials. In addition, researchers used this experimental data to develop a model for predicting how variations in the CMF would affect its

performance. Simulated pool fire testing is not a computational simulation. It's an experimental test that materials must pass in order to be considered for use in manufacturing rail tank cars that transport hazardous materials.

NANOMATÉRIAUX

Flatter Graphene Sheet can Help Electrons Move Faster

17/04/2020 - www.azom.com



Bumps on a road slow down our pace, so do corrugations in graphene to travelling electrons. By flattening the corrugations out, we help electrons move effectively faster through a graphene sheet. The sample quality of graphene has been improved significantly since its discovery. One factor that limited further improvements has not been investigated directly so far, namely corrugations in the graphene sheet, i.e. microscopic distortions that form even when placed on atomically flat surfaces. Such corrugations can scatter the electrons when moving through an electronic device.

Substances Inside van der Waals Nanobubbles Have Unusual Properties

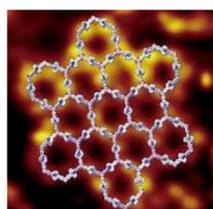
17/04/2020 - www.azom.com



Skoltech scientists modeled the behavior of nanobubbles appearing in van der Waals heterostructures and the behavior of substances trapped inside the bubbles. In the future, the new model will help obtain equations of state for substances in nano-volumes, opening up new opportunities for the extraction of hydrocarbons from rock with large amounts of micro- and nanopores. The van der Waals nanostructures hold much promise for the study of tiniest samples with volumes from 1 cubic micron down to several cubic nanometers.

Pushing the limits of 2D supramolecules

17/04/2020 - www.spacedaily.com



Scientists at the University of South Florida have reached a new milestone in the development of two-dimensional supramolecules - the building blocks that make areas of nanotechnology and nanomaterial advancement possible. Since the 2004 discovery of graphene, the world's thinnest (one-atom-thick) and strongest (200 times stronger than steel) material, researchers have been working to further develop similar nanomaterials for industrial, pharmaceutical and other commercial uses. Thanks to its conductive properties and strength, graphene can be used in microelectronics to fortify mechanical materials and has recently enabled precise 3D imaging of nanoparticles..

3D reconstructions of individual nanoparticles

02/04/2020 - www.sciencedaily.com

Want to find out how to design and build materials atom by atom? A new liquid phase electron microscopy will advance full control of nanoengineering. Far more than that, nanotechnologists will say, in a new study published in the journal Science. Whether a material catalyzes chemical reactions or impedes any molecular response is all about how its atoms are arranged. The ultimate goal of nanotechnology is centered around the ability to design and build materials atom by atom, thus allowing scientists to control their properties in any given scenario.

POLYMÈRES - ÉLASTOMÈRES

New Comfortable Fabric can Heat and Cool the Skin

17/04/2020 - www.azom.com



Imagine a single garment that could adapt to changing weather conditions, keeping its wearer cool in the heat of midday but warm when an evening storm blows in. In addition to wearing it outdoors, such clothing could also be worn indoors, drastically reducing the need for air conditioning or heat. Now, researchers reporting in ACS Applied Materials & Interfaces have made a strong, comfortable fabric that heats and cools skin, with no energy input. "Smart textiles" that can warm or cool the wearer are nothing new, but typically, the same fabric cannot perform both functions.

Scientists in Japan develop decomposable plastic

07/04/2020 - www.spacedaily.com



Japanese scientists say they have developed plastic that can disintegrate at sea within 30 days. The Asahi Shimbun reported the plastic contains cassava, a raw material used to make tapioca, and cellulose found in wood pulp, originating from tropical climates. The new material is the result of collaboration between an Osaka University-led engineering team and Japan Food Research Laboratories, according to the report. The plant material is not expensive to make, scientists say. The starch and cellulose were dissolved in water, rolled out into a thin layer, and then turned into a transparent sheet after applying heat.

REVÊTEMENTS

Antimicrobial Copper 3D Printed onto Metal Surfaces

15/04/2020 - www.engineering.com

(Image courtesy of Spee3D.) Australian company SPEE3D has announced the development of a fast and affordable way to 3D print anti-microbial copper onto metal surfaces. According to the company, laboratory tests have shown that touch surfaces modified by this process 'contact kills' 96% of SARSCoV-2, the virus that causes COVID-19, in just two hours. The process, known as ACTIVAT3D copper, has been developed by modifying SPEE3D's additive manufacturing technology, using new algorithms for controlling their metal printers to allow existing metal parts to be coated with copper. Copper parts are difficult to produce using traditional methods and the company believes that 3D printing may be the only tool available to rapidly deploy ...

Anodized Aluminum Surfaces May Help Minimize Surface Pathogen Collection

15/04/2020 - www.azom.com

During this health emergency, material engineers have been actively discussing materials that may help to prevent the ability of bacteria and germs to cling to surfaces. Some interesting studies have come to light – which we think may be useful to those planning projects and investigating what type of material to use for surfaces. One of the most interesting references appeared in the Cornell Chronical in 2015. The article discusses a new tech application that keeps bacteria from sticking to surfaces; a technology that uses anodization which can help minimize biofilm formation. The technology was developed by researchers from Cornell University and Rensselaer Polytechnic Institute. The article detailing the groundbreaking research ...

SEMI-CONDUCTEURS

Advanced memory from advanced materials

20/04/2020 - www.sciencedaily.com

Researchers successfully demonstrated a method to switch a novel material between two different nonvolatile states at very high speeds and with great accuracy. The physical constituents of the device in question are significantly robust against external influences such as magnetic fields. These facts together mean a high-speed and high-capacity memory device could be created. Such a device would also be extremely energy efficient.

In 1929, theoretical physicist Hermann Weyl was exploring the newly derived Dirac equation, which describes many things in particle physics and led to the discovery of antimatter. He noticed the equation implied the existence of a massless particle which became known as the Weyl fermion. This was once believed to ...

New Etching Technique Produces Far Smaller Semiconductors

03/04/2020 - www.techbriefs.com



Microelectronics like semiconductor devices are at the heart of the technologies we use each day. As we move into an era where we are stretching the limits of Moore's Law, it is essential to find new ways to continue to pack more circuitry into each individual device in order to increase the speed and capability of our computers. Researchers at the U.S. Department of Energy's (DOE) Argonne National Laboratory have developed a new technique that could potentially help make these increasingly small but complex devices.

AI finds 2D materials in the blink of an eye

01/04/2020 - www.sciencedaily.com

Researchers at the Institute of Industrial Science, a part of The University of Tokyo, demonstrated a novel artificial intelligence system that can find and label 2D materials in microscope images in the blink of an eye. This work can help shorten the time required for 2D material-based electronics to be ready for consumer devices. Two-dimensional materials offer an exciting new platform for the creation of electronic devices, such as transistors and light-emitting diodes. The family of crystals that can be made just one atom thick include metals, semiconductors, and insulators. Many of these are stable under ambient conditions, and their properties often differ significantly from those of their 3D counterparts

High-efficiency laser for silicon chips

25/03/2020 - www.sciencedaily.com

Transistors in computer chips work electrically, but data can be transmitted more quickly by using light. For this reason, researchers have long been looking for a way to integrate lasers directly in silicon chips. Scientists from Forschungszentrum Jülich have now come a step closer to achieving this. Together with researchers from Centre de Nanosciences et de Nanotechnologies (C2N) in Paris and the French company STMicroelectronics as well as CEA-LETI Grenoble, they have developed a compatible semiconductor laser made of germanium and tin, whose efficiency is comparable with conventional GaAs semiconductor lasers on Si.

Service Information Numérique - Pôle Veille

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