

Matériaux

Bulletin de Veille - 14 janvier 2020

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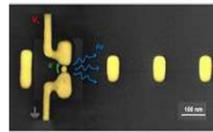
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A LA UNE

Nano antennas for data transfer

13/01/2020 - www.spacedaily.com



Directional antennas convert electrical signals to radio waves and emit them in a particular direction, allowing increased performance and reduced interference. This principle, which is useful in radio wave technology, could also be interesting for miniaturised light sources. After all, almost all Internet-based communication utilises optical light communication. Directional antennas for light could be used to exchange data between different processor cores with little loss and at the speed of light. To enable antennas to operate with the very short wavelengths of visible light, such directional antennas have to be shrunk to nanometre scale.

GÉNÉRALITÉS - MATÉRIAUX

Electroporator Built Using Piezoelectric Crystal from a Butane Lighter

10/01/2020 - www.azom.com

A simple method for developing a laboratory device called an electroporator from inexpensive components, such as a piezoelectric crystal taken from a butane lighter, has been created by researchers. The new device applies a jolt of electricity to open cell walls temporarily.

Five Techniques for Lightweighting: Doing More With Less

01/01/2020 - www.techbriefs.com



Manufacturers in almost every industry are looking to design lighter parts, whether for quicker cars, cheaper air travel, or providing that extra edge on the competition in a sporting event. But it's often difficult to know where to begin, with the endless combinations of materials, processes, and design tools available today. Whether you are interested in putting existing parts on a diet, or starting from a blank sheet, the following five approaches to light-weighting may help identify strategies that can work for you. First, let's clarify our objective in light-weighting: the word optimize is sometimes used loosely and can lead us astray.

NASA's Thirst for Water on Mars Quenched by Student Innovators

01/01/2020 - www.techbriefs.com



As America recently celebrated the 50th anniversary of the Moon landing, scientists and engineering students continue to set their sights on exploring our universe even further. Landing on the Moon is a historic achievement but many feel that the milestone belongs to a previous generation. Now, NASA and universities from across the country are focusing on the next challenge: supporting a continued human presence on the Moon and ultimately Mars. These drill components are part of

la résistance des pièces imprimées en 3D

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- Le plastique PETG en impression 3D

West Virginia University's MIDAS III, an autonomous ice drilling robot that captured first place in a national, university-level competition related to NASA's Moon to Mars mission.

2D materials: Arrangement of atoms measured in silicene

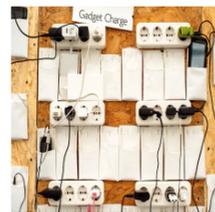
24/12/2019 - www.sciencedaily.com

Silicene consists of a single layer of silicon atoms. In contrast to the ultra-flat material graphene, which is made of carbon, silicene shows surface irregularities that influence its electronic properties. Now, physicists from the University of Basel have been able to precisely determine this corrugated structure. As they report in the journal PNAS, their method is also suitable for analyzing other two-dimensional materials. Since the experimental production of graphene, two-dimensional materials have been at the heart of materials research. Similar to carbon, a single layer of honeycombed atoms can be made from silicon.

MATÉRIAUX POUR L'ÉNERGIE

A new battery could keep your phone charged for five days

03/01/2020 - www.newscientist.com



New batteries could give us long-duration charges for phones and other gadgets. A new lithium-sulphur battery with an ultra-high capacity could lead to drastically cheaper electric cars and grid energy storage. Mahdokht Shaibani at Monash University in Melbourne, Australia, and her colleagues have developed a battery with a capacity five times higher than that of lithium-ion batteries. The battery maintains an efficiency of 99 per cent for more than 200 cycles, and a smartphone-sized version would be able to keep a phone charged for five days.

MATÉRIAUX POUR L'OPTIQUE

Jelena Vuckovic Granted £350K to Create Miniature On-Chip Laser

27/12/2019 - www.photonics.com

Jelena Vuckovic, a Jensen Huang Professor in Global Leadership and professor of electrical engineering at Stanford University, is the winner of the £350,000 IET A F Harvey Engineering Research Prize from The Institution of Engineering and Technology, London. The grant will be used to develop an on-chip integrated pulsed laser, which the institution believes will help revolutionize photonic technology and applications that require these lasers, such as medicine, optical communications, quantum computing, and self-driving cars.

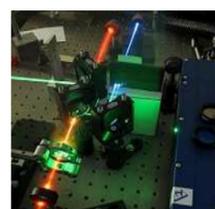
Silicon Quantum Bits Communicate over Relatively Long Distance

26/12/2019 - www.photonics.com

A Princeton University research team has shown that silicon quantum bits (qubits), mediated by a microwave photon, can interact even when spaced relatively far apart on a computer chip. The ability to transmit messages across relatively long distances on a silicon chip using multiple qubits could open new possibilities for quantum computing. The Princeton team, led by professor Jason Petta, connected the qubits via a narrow cavity that carried light in a way similar to the fiber optic cables that deliver internet signals to homes and businesses.

New laser technique images quantum world in a trillionth of a second

18/12/2019 - www.spacedaily.com



For the first time, researchers have been able to record, frame-by-frame, how an electron interacts with certain atomic vibrations in a solid. The technique captures a process that commonly causes electrical resistance in materials while, in others, can cause the exact opposite - the absence of resistance, or superconductivity. "The way electrons interact with each

other and their microscopic environment determines the properties of all solids," said MengXing Na, a University of British Columbia (UBC) PhD student and co-lead author of the study, published last week in Science. "

BIOMIMÉTIQUE

Membrane inspired by bone and cartilage efficiently produces electricity from saltwater

18/12/2019 - www.sciencedaily.com

Inspired by membranes in the body tissues of living organisms, scientists have combined aramid nanofibers used in Kevlar with boron nitride to construct a membrane for harvesting ocean energy that is both strong like bone and suited for ion transport like cartilage. The research, published December 18 in the journal Joule, overcomes major design challenges for technologies that harness osmotic energy (pressure and salinity gradient differences between freshwater and ocean water) to generate an eco-friendly and widely available form of renewable energy.

COLLAGES –ADHÉSIFS

The Future is Orange - Techsil Launch New Biocompatible Plastics Adhesive Which Fluoresces Orange

10/01/2020 - www.azom.com



Adhesive specialists Techsil introduce a new orange, fluorescing, UV curing adhesive designed for bonding plastics. Manufactured by Panacol, Vitralit® 7311 FO is certified according to USP Class VI standards. A perfect adhesive for medical devices but it can also be used in electronics, optics and general assembly. Vitralit® 7311 FO is a transparent acrylic adhesive that cures under UV or visible light. It offers very high bond strength to many plastics including PC, PVC, PMMA or ABS, and also glass and stainless steel. With low viscosity and capillary flow characteristics, Vitralit® 7311 FO can bond large surfaces and applications with narrow gaps.

COMPOSITES

New nano-barrier for composites could strengthen spacecraft payloads

27/12/2019 - www.spacedaily.com



The University of Surrey has developed a robust multi-layered nano-barrier for ultra-lightweight and stable carbon fibre reinforced polymers (CFRPs) that could be used to build high precision instrument structures for future space missions. CFRP is used in current space missions, but its applications are limited because the material absorbs moisture. This is often released as gas during a mission, causing the material to expand and affect the stability and integrity of the structure. Engineers try to minimise this problem with CFRP by performing long, expensive procedures such as drying, recalibrations and bake-out- all of which may not completely resolve the issue.

CÉRAMIQUES

Environmental Barrier Coatings for Ceramic Matrix Composites

01/01/2020 - www.techbriefs.com



Innovators at NASA's Glenn Research Center have developed two durable environmental barrier coatings (EBCs) for use with ceramic matrix composite (CMC) components. CMCs are lightweight composites used to reduce fuel consumption in advanced gas turbines and other high-temperature, high-stress environments (up to 1482 °C). Glenn's breakthrough EBCs are the only coatings that can withstand such temperatures, protecting CMCs from increased wear and corrosion,

oxidation, and water vapor recession in extreme environments. In addition, these EBCs can be fabricated with simpler and lower-cost methods than conventional coating processes such as plasma spraying.

New Ceramic Nanocomposite Demonstrates High IR Transmittance, Thermal Stability

27/12/2019 - www.photonics.com

A research team that includes scientists from Russia, Ukraine, and China has developed a Y2O3-MgO fine-grained composite ceramic material that transmits over 70% of light in the infrared (IR) range with wavelengths up to 6000 nm. Ceramic nanocomposites are considered promising materials for operations in the IR range and are known for their advanced thermal stability, thermal conductivity, and mechanical stability, the researchers said. The mechanical and optical properties of the Y2O3-MgO nanocomposite with uniform distribution of two phases surpass its single-phase commercial analogs, Y2O3 and MgO.

MÉTAUX

Exploring the 'dark side' of a single-crystal complex oxide thin film

06/01/2020 - www.sciencedaily.com

Analysis from a team led by Argonne researchers reveals never-before-seen details about a type of thin film being explored for advanced microelectronics. Research from a team led by scientists at the U.S. Department of Energy's (DOE) Argonne National Laboratory offers a new, nanoscopic view of complex oxides, which are promising for advanced microelectronics. Complex oxides are multifunctional materials that could eventually lead to energy-efficient, advanced electronic memory components and quantum computing devices. Generally, these materials are produced layer-by-layer on an atomically matched substrate, a process known as epitaxial growth. "

Un alliage cuivre-titane pour accroître la résistance des pièces imprimées en 3D

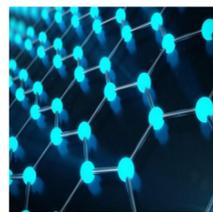
18/12/2019 - www.industrie-techno.com

Une équipe de chercheurs de l'université RMIT de Melbourne (Australie) a mis au point un nouvel alliage métallique dédié à la fabrication additive. Composé de titane et de cuivre, il permet de produire des pièces nettement plus résistantes que celles réalisées avec un alliage de titane traditionnel. Les résultats de ces travaux ont été publiés, début décembre, dans la revue Nature.

NANOMATÉRIAUX

Sublimation, Not Melting: Graphene Surprises Researchers Again

09/01/2020 - www.semiconductor-digest.com

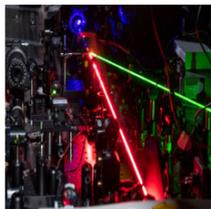


Physicists from the Moscow Institute of Physics and Technology and the Institute for High Pressure Physics of the Russian Academy of Sciences have used computer modeling to refine the melting curve of graphite that has been studied for over 100 years, with inconsistent findings. They also found that graphene "melting" is in fact sublimation. The results of the study came out in the journal Carbon. Graphite is a material widely used in various industries – for example in heat shields for spacecraft – so accurate data on its behavior at ultrahigh temperatures is of paramount importance. Graphite melting has been studied since the early 20th century.

Laser Pulse Creates Nonlinear Effects in Amorphous Dielectric Material

08/01/2020 - www.photonics.com

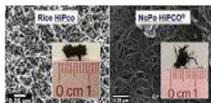
A new, all-optical technique for creating second-order nonlinear effects in materials that normally do not support them could lead to new options for creating these effects for optical computers, high-speed data processors,



and bioimaging. A research group from Georgia Institute of Technology (Georgia Tech) developed the technique, using a red laser to create the nonlinear effects. For their experiment, the researchers created an array of tiny plasmonic gold triangles on the surface of a centrosymmetric titanium dioxide (TiO₂) slab in their lab. They illuminated the TiO₂/gold structure with a pulse of red laser light.

New production method for carbon nanotubes gets green light

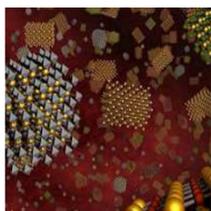
08/01/2020 - www.nanodaily.com



A new method of producing carbon nanotubes - tiny molecules with incredible physical properties used in touchscreen displays, 5G networks and flexible electronics - has been given the green light by researchers, meaning work in this crucial field can continue. Single-walled carbon nanotubes are among the most attractive nanomaterials for a wide range of applications ranging from nanoelectronics to medical sensors. They can be imagined as the result of rolling a single graphene sheet into a tube. Their properties vary widely with their diameter, what chemists call chirality - how symmetrical they are - and by how the graphene sheet is rolled.

A quantum breakthrough brings a technique from astronomy to the nano-scale

07/01/2020 - www.nanodaily.com



Researchers at Columbia University and University of California, San Diego, have introduced a novel "multi-messenger" approach to quantum physics that signifies a technological leap in how scientists can explore quantum materials. The findings appear in a recent article published in Nature Materials, led by A. S. McLeod, postdoctoral researcher, Columbia Nano Initiative, with co-authors Dmitri Basov and A. J. Millis at Columbia and R.A. Averitt at UC San Diego.

POLYMÈRES - ÉLASTOMÈRES

New polymer material may help batteries become self-healing, recyclable

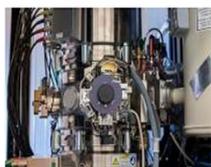
23/12/2019 - www.sciencedaily.com

Lithium-ion batteries are notorious for developing internal electrical shorts that can ignite a battery's liquid electrolytes, leading to explosions and fires. Engineers at the University of Illinois have developed a solid polymer-based electrolyte that can self-heal after damage -- and the material can also be recycled without the use of harsh chemicals or high temperatures. The new study, which could help manufacturers produce recyclable, self-healing commercial batteries, is published in the Journal of the American Chemical Society.

SEMI-CONDUCTEURS

New method gives robust transistors

08/01/2020 - www.spacedaily.com



A new method to fit together layers of semiconductors as thin as a few nanometres has resulted in not only a scientific discovery but also a new type of transistor for high-power electronic devices. The result, published in Applied Physics Letters, has aroused huge interest. The achievement is the result of a close collaboration between scientists at Linköping University and SweGaN, a spin-off company from materials science research at LiU. The company manufactures tailored electronic

components from gallium nitride. Gallium nitride, GaN, is a semiconductor used for efficient light-emitting diodes.

THERMOPLASTIQUES

Le plastique PETG en impression 3D

18/12/2019 - www.3dnatives.com

Le plastique PETG, ou polyester glycolisé, est un thermoplastique répandu sur le marché de la fabrication additive, alliant à la fois la simplicité d'impression du PLA et la résistance de l'ABS. C'est un plastique amorphe, qui peut être recyclable à 100%, possédant la même composition chimique que le polytéréphtalate d'éthylène, plus connu son acronyme PET. On y a ajouté du glycol afin de réduire son aspect cassant et donc sa fragilité. Nous vous proposons aujourd'hui de revenir sur les caractéristiques du plastique PETG en impression 3D, ses paramètres d'impression et ses principales applications. Avant tout chose, il nous paraît important de revenir sur le PET lui-même.

Service Information Numérique - Pôle Veille

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