

Matériaux

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SOMMAIRE

GENERALITES

- How the Parker probe was built to survive close encounters with the sun
- Blue crystals in meteorites show that our sun went through the 'terrible twos'
- Japanese Researchers Develop Highly Elastic, Low-Cost Aerogels
- More mysteries of metallic hydrogen

AEROSPATIAL

- New solar sailing technology for NASA

MATERIAUX POUR L'ENERGIE

- Old mining techniques make a new way to recycle lithium batteries
- New 3D printing method could make your smartphone battery last longer
- Scientists Improve Performance Quality of Perovskites
- Replacing Part of Iron in Electrode Material with Cobalt Improves Conductivity
- What's causing the voltage fade in Lithium-rich NMC cathode materials?

METAUX

- New DryLyte technology enables electropolishing of metal parts without liquids

NANOMATERIAUX

- Nanotube 'rebar' makes graphene twice as tough
- Researchers use nanotechnology to improve the accuracy of measuring devices
- Archer Develops New Graphene-Based Inks
- Theorists find mechanism behind nearly pure nanotubes from the unusual catalyst
- A new 'periodic table' for nanomaterials
- Manufacturing a Carbon Revolution
- Physicists uncover why nanomaterial loses superconductivity
- Carbon nanotubes used to develop clothing that can double as batteries

POLYMERES - ELASTOMERES

- Light-controlled polymers can switch between sturdy and soft

SEMI-CONDUCTEURS

GENERALITES

How the Parker probe was built to survive close encounters with the sun

01/08/2018 - www.sciencenews.org

One way the Parker team mimicked the sun's heat was using actual sunlight. That's a big worry for Parker's twin telescopes, together called the Wide-field Imager for Solar Probe, or WISPR. The chamber, a cylinder standing 12 meters tall and 8 meters wide, was cooled to -180°C . A radiator glowing at about 315°C represented the heat coming from the back of the heat shield — but most of that heat never reached the scientific instruments since a titanium truss holds the heat shield at a safe distance from the spacecraft's main body.

Blue crystals in meteorites show that our sun went through the 'terrible twos'

31/07/2018 - www.spacedaily.com

Our Sun's beginnings are a mystery. Since the Sun is older than the Earth, it's hard to find physical objects that were around in the Sun's earliest days - materials that bear chemical records of the early Sun. "Almost nothing in the Solar System is old enough to really confirm the early Sun's activity, but these minerals from meteorites in the Field Museum's collections are old enough. Researchers have looked at meteorites for evidence of an early active Sun before. The bits of helium and neon provide the first concrete evidence of the Sun's long-suspected early activity.

Japanese Researchers Develop Highly Elastic, Low-Cost Aerogels

27/07/2018 - www.azom.com

Aerogels are delicate solids, which contain almost entirely air-filled pores. The team's materials are based on vinylmethyldimethoxysilane and vinyltrimethylmethoxysilane - monomers that are initially connected into polymer chains by a radical polymerization through the double bonds in their vinyl groups. The density of the ensuing cross-linking of the polymers (polyvinylpolydimethylsiloxane-polyvinylpolymethylsiloxane copolymers) relies on the ratio wherein both monomers were combined together.

More mysteries of metallic hydrogen

24/07/2018 - www.sciencedaily.com

"Zaghoo and Gilbert 'Rip' Collins, a professor of mechanical engineering and of physics and director of Rochester's high-energy-density physics program, studied the conductivity of metallic hydrogen to further unravel the mysteries of the dynamo effect -- the mechanism that generates magnetic fields on planets including Earth. Zaghoo and Collins focused their research on the relationship between metallic hydrogen and the onset of the dynamo action, including the depth where the dynamo of Jupiter forms.

AEROSPATIAL

New solar sailing technology for NASA

- Leti and CMP announce world's first multi-project wafer service with integrated silicon OxRAM
- FET fabrication from fins to nano-sheets

TERRES RARES

- Chinese Heavy Metal: How Beijing Could Use Rare Earths to Outplay America

19/07/2018 - www.sciencedaily.com

The Optical Society is hosting an incubator meeting, Metamaterial Films for In-Space Propulsion by Radiation Pressure

MATERIAUX POUR L'ENERGIE

Old mining techniques make a new way to recycle lithium batteries

03/08/2018 - www.sciencedaily.com

Lei Pan's team of chemical engineering students had worked long and hard on their research project, and they were happy just to be showing their results at the People, Prosperity and the Planet (P3) competition last April in Washington, DC. What they didn't expect was to be mobbed by enthusiastic onlookers.

New 3D printing method could make your smartphone battery last longer

31/07/2018 - www.3ders.org

Engineers at the Carnegie Mellon University have developed a new method of 3D printing battery electrodes that creates a 3D microlattice structure with controlled porosity. Rahul Panat, an associate professor of mechanical engineering at Carnegie Mellon University, and a team of researchers from Carnegie Mellon in collaboration with Missouri University of Science and Technology have developed a new method of fabricating battery electrodes using aerosol jet 3D printing, and their results are published in the journal Additive Manufacturing.

Scientists Improve Performance Quality of Perovskites

27/07/2018 - www.azom.com

Solar cells are devices that absorb photons from sunlight and turn their energy to move electrons - enabling the generation of clean energy and providing a reliable route to help fight climate change. But a majority of solar cells used commonly today are fragile, thick, and stiff, which restricts their application to flat surfaces and increases the cost to manufacture the solar cell.

Replacing Part of Iron in Electrode Material with Cobalt Improves Conductivity

27/07/2018 - www.azom.com

Researchers have substituted cobalt in the place of some of the iron atoms in the composition $\text{Nd}_{0.5}\text{Ba}_{0.5}\text{FeO}_{3-\delta}$, at the same time increasing the conductivity and minimizing the thermal expansion of the material. In order to replace part of the iron, cobalt (Co), nickel (Ni), and copper (Cu) were added to the starting material. The material with copper was the best choice to enhance the thermal expansion, the material with cobalt was the best with respect to ionic conductivity.

What's causing the voltage fade in Lithium-rich NMC cathode materials?

16/07/2018 - www.sciencedaily.com

Researchers led by a University of California San Diego team have published work in the journal *Nature Energy* that explains what's causing the performance-reducing "voltage fade" that currently plagues a promising class of cathode materials called Lithium-rich NMC (nickel magnesium cobalt) layered oxides.

METAUX

New DryLyte technology enables electropolishing of metal parts without liquids

26/07/2018 - www.metal-am.com

The company's DryLyte® process is said to be the first dry electropolishing system, which uses no liquid as the electrolyte, and is suitable for steel, stainless steel, aluminium and titanium components. DLyte has established partnerships with a number of companies in the Additive Manufacturing industry, among them EOS, Renishaw, SLM Solutions and 3D Systems, as they look to offer a complete solution for customers and develop polishing solutions for the different materials and applications within the metal AM Industry.

NANOMATERIAUX

Nanotube 'rebar' makes graphene twice as tough

05/08/2018 - www.nanodaily.com

On the two-dimensional scale, the material is stronger than steel, but because graphene is so thin, it is still subject to ripping and tearing. Rebar graphene is the nanoscale analog of rebar (reinforcement bars) in concrete, in which embedded steel bars enhance the material's strength and durability. Both the lab's mechanical tests and molecular dynamics simulations by collaborators at Brown University revealed the material's toughness. He said the rebar graphene results are a first step toward the characterization of many new materials.

Researchers use nanotechnology to improve the accuracy of measuring devices

31/07/2018 - www.nanodaily.com

The scientists synthesized multi-layered copper and nickel nanowires, in order to study their characteristics, which depend on the layers' composition and geometry. Today, we are 'choosing' the method of nanowire synthesis, in order to get this effect', said Iliia Doludenko, Moscow Institute of Electronics and Mathematics (MIEM HSE) graduate and one of the authors. The nanowire length was determined by the number of deposition cycles; one nickel layer and one copper layer were deposited in each cycle.

30/07/2018 - www.azom.com

Archer Exploration Limited, in collaboration with The University of Adelaide, has developed graphene-based conductive inks derived from Archer's Campoona graphite deposit. The inks produced were used to print electronic circuits with an inkjet printer, later using a laser-scribed printer for the preparation of basic electrode patterns.

Theorists find mechanism behind nearly pure nanotubes from the unusual catalyst

27/07/2018 - electroiq.com

Growing a batch of carbon nanotubes that are all the same may not be as simple as researchers had hoped, according to Rice University scientists. Rice materials theorist Boris Yakobson and his team bucked a theory that when growing nanotubes in a furnace, a catalyst with a specific atomic arrangement and symmetry would reliably make carbon nanotubes of like chirality, the angle of its carbon-atom lattice. We don't yet know how this will be applicable to other materials, but we're working on it.

A new 'periodic table' for nanomaterials

24/07/2018 - www.nanodaily.com

It involves connecting the chemical properties of molecules with the nanostructures that form as a result of their interaction. Fabricating nanomaterials using a bottom-up approach requires finding 'precursor molecules' that interact and align correctly with each other as they self-assemble. This showed that attaching hydrogen molecules to bianthracene led to the development of strong one-dimensional nano-chains. The researchers recommend applying the data at low temperatures where the effect of the functional groups' chemical properties on nano-shapes are most clear.

Manufacturing a Carbon Revolution

24/07/2018 - www.engineering.com

This article looks at the new forms of carbon, such as nanotubes and graphene, and considers whether we may be on the verge of a carbon revolution.

Physicists uncover why nanomaterial loses superconductivity

17/07/2018 - www.nanodaily.com

His work, however, inspired the young theoretical physicist Adrian Del Maestro, a graduate student at Harvard at the time, to develop a complete critical theory of the quantum phase transition. To test the quantum phase transitions, Rogachev brought the wires to Benjamin Sacepe and Frederic Gay at the Institut Neel in Grenoble where their facility is capable of cooling the material to 50 millikelvin, applying magnetic field of various strengths and measuring the wires' resistance to describe how the superconductivity breaks down.

Carbon nanotubes used to develop clothing that can double as batteries

10/07/2018 - www.sciencedaily.com

Carbon nanotubes will replace copper wire in cars and planes to reduce weight and improve fuel efficiency. Carbon will replace polyester and other synthetic fibers. "As much as one-third of the weight they carry is just batteries to power all of their equipment," Haase said. "Research has found that in high or acute exposure, carbon nanotubes can cause lung damage similar to asbestos. In this way, it can conduct 100 times as many experiments in the same time as human researchers, he said.

POLYMERES - ELASTOMERES

Light-controlled polymers can switch between sturdy and soft

18/07/2018 - www.sciencedaily.com

MIT researchers have designed a polymer material that can change its structure in response to light, converting from a rigid substance to a softer one that can heal itself when damaged. Johnson and his colleagues realized that a type of material they designed a few years ago, known as polymer metal-organic cages, or polyMOCs, was a promising candidate for this approach. In this paper, the researchers used the polymer polyethylene glycol (PEG) to make their material, but they say this approach could be used with any kind of polymer.

SEMI-CONDUCTEURS

Leti and CMP announce world's first multi-project wafer service with integrated silicon OxRAM

02/08/2018 - electroiq.com

Leti's MAD platform is dedicated to advanced non-volatile memories, bringing both versatility and robustness for material and interface assessment, and allowing in-depth exploration of memory performance from technology and design perspectives. These include material engineering and analysis, developing critical memory modules, evaluation of memory cells coupled with electrical tests, modeling and innovative design techniques to comply with circuit design opportunities and constraints.

FET fabrication from fins to nano-sheets

11/07/2018 - electroiq.com

As the commercial IC fabrication industry continues to shrink field-effect transistor (FET) sizes, 2D planar structures evolved into 3D fins which are now evolving into 3D stacks of 2D nano-sheets. While some researchers continue to work on integrating non-silicon "alternate channel" materials into finFETs for next generation logic ICs, published results from labs around the world now show that nano-wires or nano-sheets of silicon will likely follow silicon finFETs in high-volume manufacturing (HVM) fabs.

TERRES RARES

Chinese Heavy Metal: How Beijing Could Use Rare Earths to Outplay America

03/08/2018 - blogs.scientificamerican.com

As the United States and China begin imposing tit-for-tat tariffs upon tens of billions of dollars' worth of traded goods, America has swept one of its own national security vulnerabilities into the mix: rare-earth elements (REE). The Trump administration has added rare earths and cobalt to its [retaliatory tariff list](#). REEs, as well as other [critical minerals](#) like cobalt and lithium, are necessary ingredients for advanced clean technologies, particularly in the defense and clean energy sectors. Why rare-earths were included is unclear, but the United States is [highly](#) reliant on China for those raw materials.

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