UNIVERSITAT DE BARCELONA
Química Inorgànica

Notícies Inorgàniques

Any 8, Núm. 45, Maig de 2009

http://www.ub.es/inorgani/dqi.htm

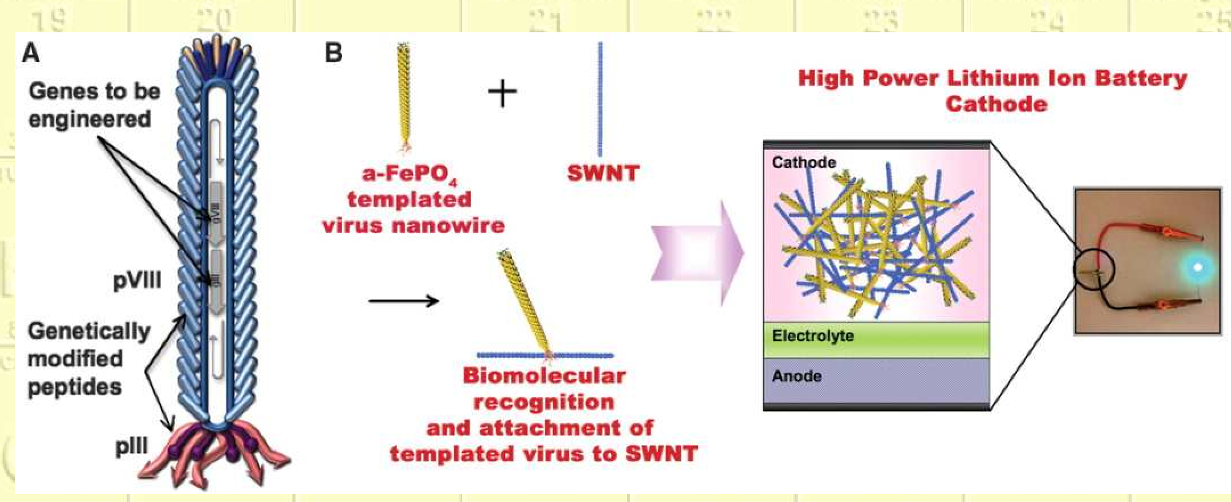
Editors: Gabriel Aullón, Ramón Bosque i Joaquim Sales. Correspondència: noticies@qi.ub.es

Resoldran els virus el problema energètic?

The next generation of batteries could be made with the help of an unusual manufacturing partner—a virus that infects bacteria. Using an environmentally benign process, scientists at Massachusetts Institute of Technology and Korea Advanced Institute of Science & Technology coaxed a genetically engineered virus into building and wiring the cathode of a lithium-ion battery (*Science*, **2009**, *324*, 1051).

MIT materials science professor Angela M. Belcher, who spearheaded the work, previously used genetically engineered viruses to fabricate the anode portion of a battery. Working with cathode materials proved to be more difficult because the material needs to be good at conducting both electrons and ions and also has to work well at high voltages. By tweaking one gene in the M13 virus, Belcher's team was able to get it to build itself a coat of amorphous iron phosphate, a promising material for lithium-ion batteries that's been hampered by low electronic conductivity.

To boost the system's conductivity, the team manipulated another gene in the virus so that it would latch onto a single-walled carbon nanotube. The nanotube acts as viral wiring, connecting the cathode to the battery's other components. The tighter the virus grabs the nanotube, the better the battery performs, the researchers found.

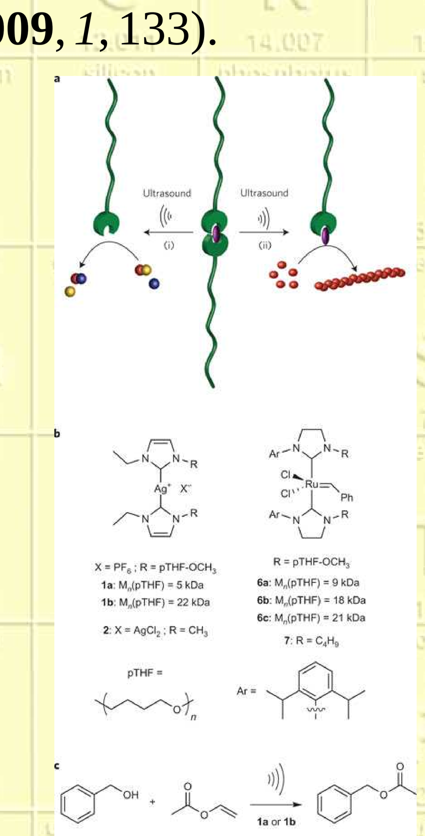


Catalitzador a la força

Mechanical force now joins light, heat, and chemicals on the short list of ways to activate a homogeneous catalyst.

Chemists are intrigued by the possibilities of the new mechanical approach, which was developed by Rint P. Sijbesma and coworkers at Eindhoven University of Technology, in the Netherlands. Coupling catalyst activity to a mechanical force is in principle completely orthogonal to the use of light, heat, or chemical activation. One can imagine systems of multiple catalysts where one catalyst can be controlled specifically by force while others are controlled by more conventional stimuli.

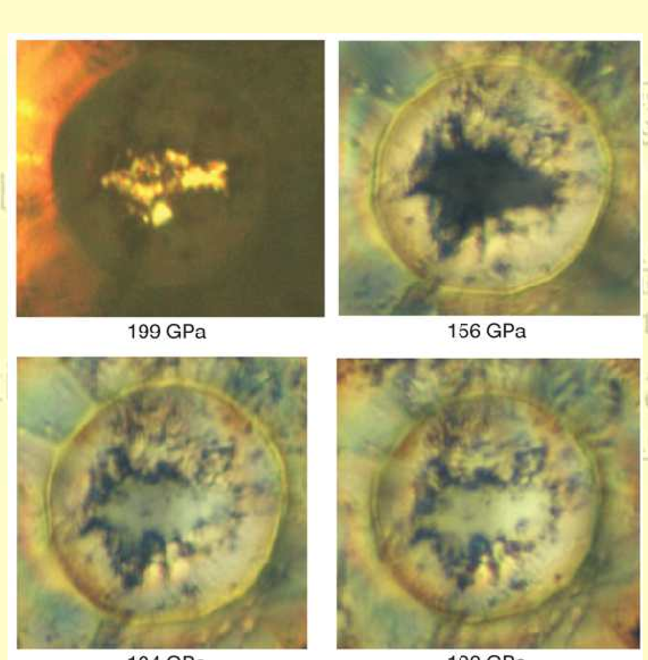
The researchers report two different metal-carbene catalysts that can be activated by mechanical force. They demonstrate that ultrasound-generated force triggers a silver-based catalyst to perform transesterification and a ruthenium-based catalyst to facilitate olefin metathesis (*Nat. Chem.*, **2009**, *1*, 133).



Sodi: ser o no ser metall?

Under extreme pressure, sodium metal becomes optically transparent and transforms into a dielectric insulator (*Nature*, **2009**, *458*, 192). Yanming Ma of Jilin University, in China, and collaborators used diamond-anvil cells to condense sodium samples approximately fivefold, which forced the deep-core electrons in the samples' atoms to overlap, collapsing the metallic structure.

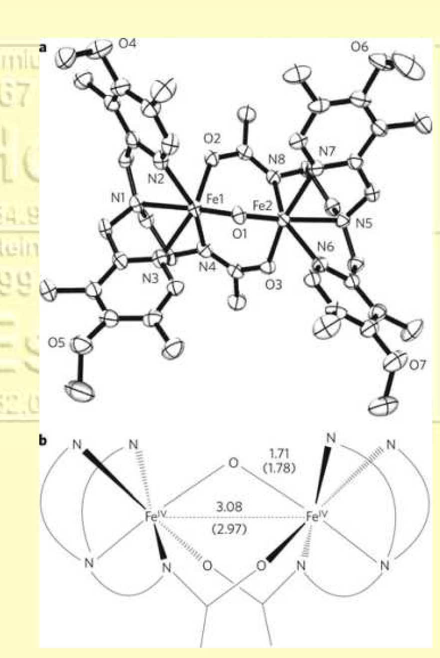
At atmospheric pressure, sodium is silver in color, opaque, and exhibits a body-centered cubic packing structure. The team observed that sodium samples exposed to 2 million atmospheres (~200 GPa) of pressure first turned black and then became transparent. Combining spectroscopic and X-ray diffraction data collected from the dense samples with computational data, the researchers determined that the new transparent phase has a six-coordinate, highly distorted double-hexagonal close-packed structure. They attribute the insulating properties "to p-d hybridizations of valence electrons and their repulsion by core electrons into the lattice interstices."



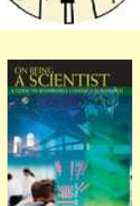
El Fe(IV) ho trenca tot

A novel diiron(IV) complex exceeds the bond-breaking capabilities of its predecessors by being able to cleave strong C–H and O–H bonds, reports a research team led by Lawrence Que Jr. of the University of Minnesota (*Nat. Chem.*, **2009**, *1*, 145). The chemists note that the complex is the first iron complex that can activate the O–H bonds of aliphatic alcohols. They obtained the complex, which has a bridging oxo group between the iron atoms, by electrochemically oxidizing a diiron(III) precursor.

The diiron(IV) complex cleaves C–H bonds with bond energies as high as 100 kcal/mol. For example, under anaerobic conditions the complex oxidizes cyclohexane to cyclohexene and 1,3-cyclohexadiene. The lack of a hydroxylated product is probably due to the bridging oxo group, because forming an alcohol would require breaking both Fe–O bonds. As for cleaving O–H bonds, oxidation of tert-butyl alcohol to form acetone indicates that the diiron complex targets the hydroxyl group instead of one of the weaker C–H bonds.



Breus



• Investigadors del Caltech han descobert perquè la nicotina té més tendència a unir-se fortament als receptors de les neurones però no d'altres cèl·lules, ajudant així a dissenyar noves eines en la lluita contra l'addicció al tabac (X. Xiu *et al.*, *Nature*, **2009**, *458*, 534).

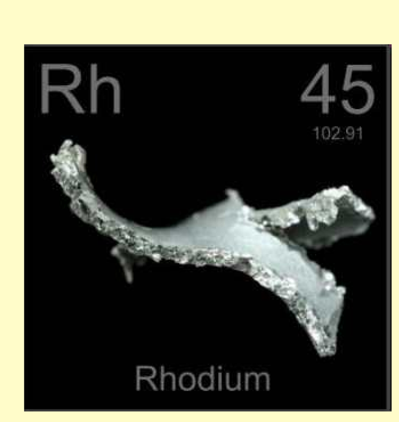
• Per ajudar als joves científics a tenir un comportament responsable, les acadèmies nacionals dels Estats Unit han publicat una guía de conducta. (http://www.nap.edu/catalog.php?record_id=12192#toc)

• L'increment de la quantitat d'oxígen a l'atmosfera, que va ser crucial per al desenvolupament de la vida, fou degut probablement a la disminució del níquel disponible en els microorganismes (K Konhauser *et al.*, *Nature*, **2009**, *458*, 750).

Avui recomanem

Wolfram|Alpha (http://www.wolframalpha.com) és un buscador de respostes, que pot arribar a revolucionar la manera en què es fa la cerca d'informació per Internet.

L'element



L'element número **45**, **rodi**, fou descobert i aïllat l'any 1803 pel químic anglès William Hyde Wollaston, en uns minerals de platí d'Amèrica del Sud. El nom prové del grec *rhodon* (ροδον) que vol dir *rosa*, atès el color de les solucions aquoses de les sals.

És un element poc abundant a la naturalesa i la seva principal aplicació és com a catalitzador en els automòbils, per eliminar l'emissió d'òxids de nitrogen (NO_x) a l'atmosfera.

Alguns dels seus compostos són també bons catalitzadors, com l'anomenat catalitzador de Wilkinson, $[RhCl(PPh_3)_3]$, que fou el compost pioner en la hidrogenació d'olefines a baixes pressions, el $[Rh(DIOP)]^+$ en la síntesis asimètrica de L-DOPA –medicament efectiu en el tractament de la malaltia de Parkinson– i el $[RhI_2(CO)_2]^-$ en la fabricació industrial d'àcid acètic pel mètode Monsanto.