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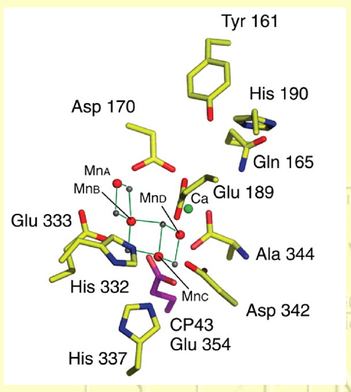
L'aigua i l'hidrogen, font contínua de notícies

Un nou pas cap a la comprensió de la fotosíntesi

A new window on the structure of the metal cluster that splits water into O_2, H^+, and electrons during photosynthesis should help those aiming to mimic nature's ability to harvest energy from the sun (*Science* **2006**, *314*, 821). Previous structural and spectroscopic studies have failed to nail down the structure of photosystem II's Mn_4Ca cluster. Johannes Messinger of Max Planck Institute for Bioinorganic Chemistry in Mülheim, Germany; Athina Zouni of the Technical University Berlin; and Vittal K. Yachandra of Lawrence Berkeley National Laboratory now provide a more satisfying snapshot of the cluster. They obtained the structure by first using the protein's X-ray diffraction pattern to align a single crystal in an X-ray beam and then using X-ray absorption fine-structure spectroscopy to measure Mn-Mn and Mn-Ca vectors. The team plans to use the same method to probe subtle changes in the cluster during catalysis.

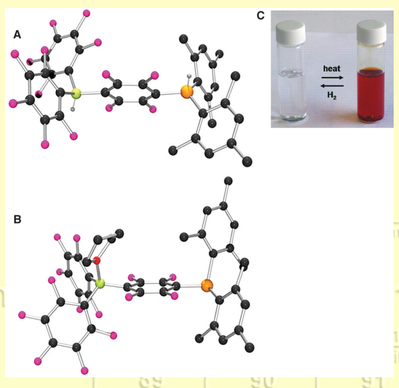


Hidrogen activat sense metalls...

In a promising development for industrial hydrogenation and the storage and production of hydrogen for fuel cells, researchers have synthesized a lightweight, nonmetal compound that readily breaks apart and recombines H_2 molecules.

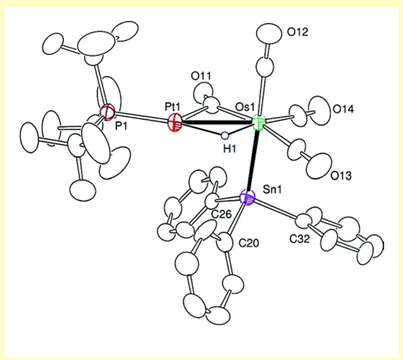
Douglas W. Stephan, and colleagues at the University of Windsor, in Ontario, synthesized the compound, a phosphonium borate that, when heated, readily gives off H_2 to form a phosphine borane. The borane then reacts with H_2 at room temperature, regenerating the borate (*Science* **2006**, *314*, 1124).

On the phosphonium borate, a proton is bound to the phosphorus, and a hydride sits a distance away on the boron. The researchers believe the proton migrates across the molecule's arene linker to the hydride, and the two combine and sail off as H_2. In the reverse reaction, the H_2 likely attaches to the boron, then a proton splits off and migrates to the phosphorus.



... i activat amb dos metalls

The mechanism for how two metal centers can work synergistically to improve a hydrogenation reaction has been shown "in unprecedented detail and clarity" by R.D. Adamsand coworkers of the University of South Carolina, Columbia (*J. Am. Chem. Soc.* **2006**, *128*, 13672). In heterogeneous catalysis, two metals are commonly used together to improve reactivity and selectivity. But little is known about the possible mechanism of this "bimetallic cooperativity." Using a model hydrogenation system, the researchers first noted that an osmium complex, $OsH(CO)_4Sn(C_6H_5)_3$, doesn't react with phenylacetylene. But when the reaction is carried out in the presence of a platinum complex, Pt[P(tert-butyl)$_3$]$_2$, alkyne insertion into the Os-H bond proceeds smoothly. The structure of an intermediate unveiled how the platinum complex activates the osmium complex by forming Pt-H-Os and Pt-CO-Os bridges. In addition, the platinum atom has an empty d orbital, which provides an initial bonding site for the alkyne and sets the stage for it to insert into the Pt-H-Os bridge and form a new C-H bond.

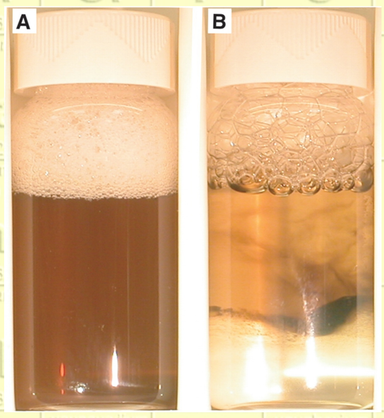


Nanorovell que purifica l'aigua

Rust, olive oil, and a handheld magnet could someday be all that's needed to remove arsenic from drinking water, according to researchers at Rice University. The low-tech solution to a serious problem for developing countries stems from basic research on the magnetic behavior of magnetite (Fe_3O_4) nanoparticles (*Science* **2006**, *314*, 964).

Having just figured out how to make Fe_3O_4 nanoparticles in various sizes and keep them from clumping by coating them with oleic acid, chemistry professor Vicki L. Colvin and colleagues decided to see how strong a magnet would be needed to pull their new nanoparticles out of solution. "We were surprised to find that we didn't need large electromagnets to move our nanoparticles, and in some cases, handheld magnets could do the trick," she says. “In this instance, it turns out that the nanoparticles actually exert forces on each other."

Iron oxides are known to bind arsenic, so Colvin's team decided to see if size, and therefore surface area, made a difference in arsenic remediation. They found that Fe_3O_4 particles 12 nm in diameter removed nearly all the arsenic from solution, but the same mass of 300-nm Fe_3O_4 particles eliminated less than 30% of the poison.



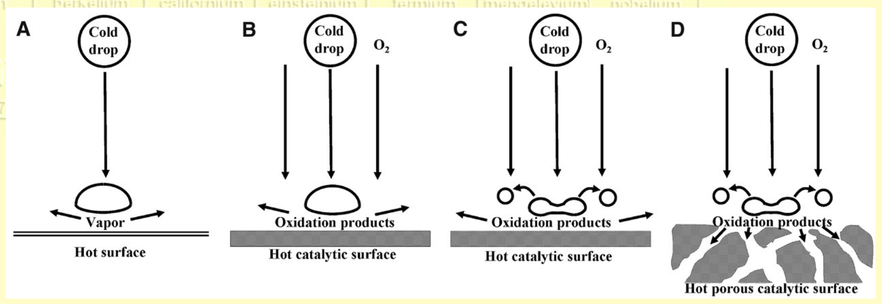
L'oli i el sucre, generadors inexhauribles d'hidrogen

US researchers have developed an efficient way of turning renewable resources like vegetable oils – and potentially biomass - into hydrogen-rich gas. The gas could be converted to synthetic fuels and industrial chemicals, or used in fuel cells (J Salge *et al*, *Science*, **2006**, *314*, 801).

The catalytic process avoids problems that had discouraged previous researchers - like an unwanted buildup of soot which would clog reactors and deactivate catalysts.

The scientists spray oil droplets onto a ceramic foam cylinder coated with a rhodium-cerium catalyst heated above 800°C. As the droplets hit the surface, high temperatures rip apart the oil’s triglyceride components into smaller vapourised compounds. These flow through the porous cylinder, together with injected oxygen, to become ‘synthesis gas’ (hydrogen and carbon monoxide). The rapid vapourisation leaves no time for droplets to be burnt to soot, while oxidising reactions generate enough energy to make the process self-heating.

From these oily beginnings, the researchers hope to extend their method to convert cellulose, starch, and lignin (from woody plants).



Breus

- Dins del projecte *Scriptorium* de l'Institut d'Estudis Catalans, s'ha traduït al català el llibre de text *Anàlisi química quantitativa* de D. C. Harris.
- L'extranya mort d'un exespia rus ha fet del poloni un element químic omnipresent en els mitjans de comunicació (*Chem. Eng. News* **2006**, 4 desembre, 15).
- El C_6H^- és el primer anió poliatòmic descobert a l'espai (*Astrophys. J.* **2006**, *652*, L141).
- Un compost d'europi funciona com a sensor luminiscent d'anions en condicions fisiològiques (*Chem. Commun* **2007**, 129).

L’element número **31**, **gal·li,** que correspon a l'ekaalumini predit per Mendelejev l'any 1871, va ser descobert el 1875 per P.E. Lecoq de Boisbaudran. El seu nom prové del m ot llatí *gallus,* que de fet és el nom del propi descobridor.