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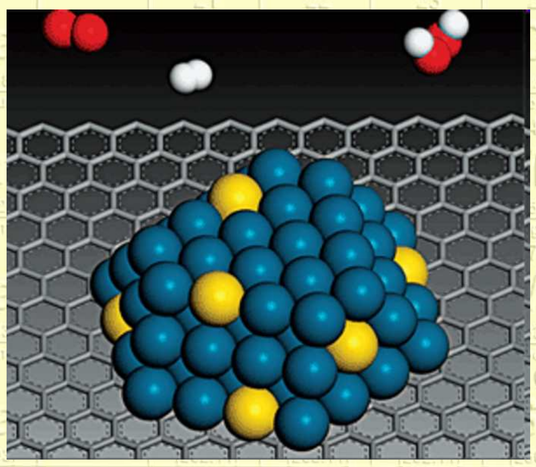
Editors: Gabriel Aullón, Ramón Bosque i Joaquim Sales. Correspondència: noticies@qi.ub.es

Síntesi ideal: $H_2 + O_2 \rightarrow H_2O_2$

Pretreating the support for a gold-palladium catalyst used to produce hydrogen peroxide from H_2 and O_2 could provide a simpler, more direct method than that now used to prepare the commodity chemical, reports a research group led by Graham J. Hutchings, a professor of chemistry at Cardiff University, in Wales (*Science* **2009**, *323*, 1037).

H_2O_2 is used commercially for disinfection and bleaching; the global market for the chemical is expected to reach 3.8 million tons this year. The current method to produce H_2O_2 is an indirect process that involves sequential hydrogenation and oxidation of an anthraquinone. Direct methods tend not just to hydrogenate O_2 into H_2O_2 but also to convert H_2O_2 into water.

Hutchings and colleagues, however, have now found that pretreating an activated carbon support with either nitric or acetic acid, then drying the support before adding gold and palladium, results in a reusable catalyst that produces H_2O_2 with minimal conversion to H_2O.The researchers propose that acid pretreatment of the catalyst support leads to smaller and better dispersed Au-Pd nanoparticles. The improved nanoparticle dispersion somehow shuts down sites that would convert H_2O_2 into water.

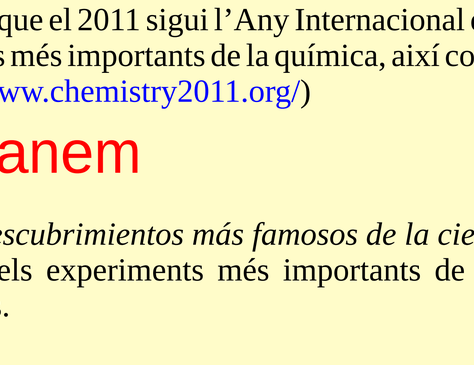


Un altre bor

Wedged between metals and nonmetals on the periodic table, boron adopts a range of structures, all of which are sensitive to impurities. As a result, researchers don't have a complete picture of boron's elemental forms.

A. R. Oganov, a theoretical crystallographer at the State University of New York, led a multi-institution team that synthesized the new entity *(Nature* **2009**, *457*, 863). Although it takes shape only at elevated pressure, this new form remains stable under a wide range of temperatures and pressures.

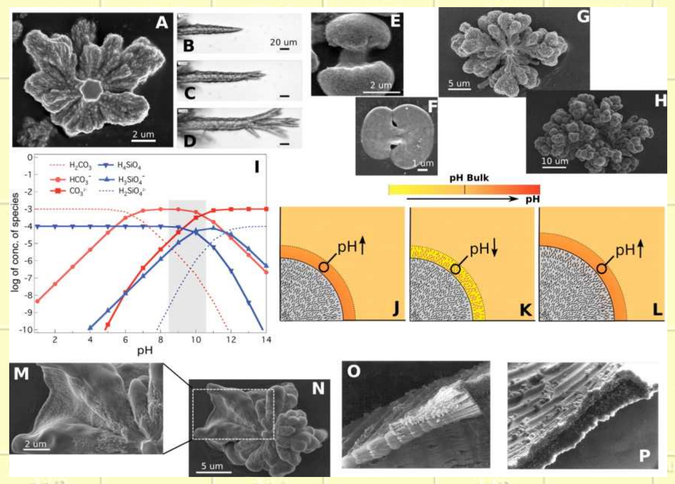
The structure of the all-boron lattice is shown in the figure. The team determined through computer simulations that it comprises clusters of 12 boron atoms interspersed with pairs of boron atoms. Each piece of the lattice transfers charges to the other, with the B_{12} units (purple) carrying a partial negative charge and the B_2 (orange) units a partial positive charge.



Hi ha fòssils inorgànics?

When Juan M. García Ruiz, a crystallographer at University of Granada, first reported the existence of beaker-made biomorphs in 2003, the elegant inorganic crystals ignited a debate among paleobiologists. It turns out that some of the biomorph crystals look like 3.5 billion-year-old fossils from Warrawoona, Australia. Some paleobiologists believe the fossils are among the earliest records of microorganisms and thus provide an estimate of the origin of life on Earth. The similarity fed concerns among paleobiologists that the Warrawoona fossils were perhaps the result of inorganic depositions and not early life, and it sparked controversy.

Now, García Ruiz, coworker Emilio Melero-Garcia, and Stephen T. Hyde, a mathematician at the Australian National University, in Canberra, are proposing a mechanism for how these biomorphs might crystallize on their own. They argue that the deposition of alternating layers of silicate and barium carbonate rely on pH oscillations at the surface of the growing crystal (*Science* **2009**, *323*, 362).

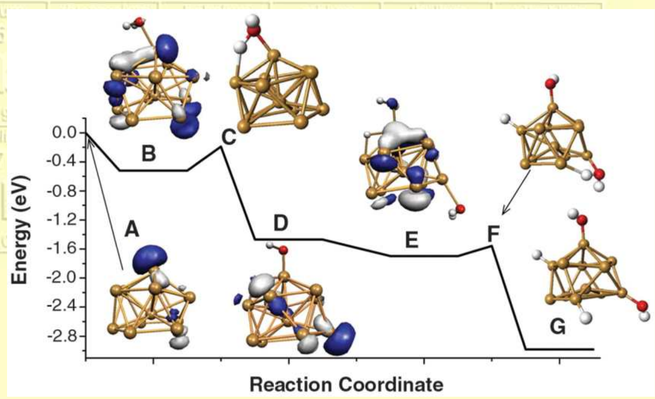


L'alumini treballa en parella

Pairs of complementary atoms in small aluminum cluster anions are responsible for the clusters' reactivity with water, according to a research team led by A. Welford Castleman Jr. of Pennsylvania State University (*Science* **2009**, *323*, 492).

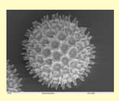
Using a combination of experimental and computational methods, the researchers found that a lone pair of electrons on the oxygen atom of a water molecule can serve as a nucleophile in an attack on a specific metal site of an Al_{12}^- cluster, forming an $Al_{12}H_2O^-$ intermediate. An adjacent Al atom then pulls a hydrogen atom away from the water, forming an Al–H bond. For slightly larger clusters—Al_{16}^-, Al_{17}^-, and Al_{18}^-—the researchers observed that the complexes evolve H_2.

The researchers propose that water is dissociatively adsorbed at two sites on these clusters so that the intermediate species (one shown) have enough thermal energy to recombine the surface-bound hydrogens and release H_2.



Breus

• La mort d'una estudiant a un laboratori de l'UCLA per cremades produïdes pel *tert*-butil liti ha revifat el debat sobre la seguretat en els laboratoris (*C&EN Online Latest News*, Jan. 22).



• L'ús de l'espectroscopia Raman per identificar els diferents tipus de pol·len pot ser d'interés per lluitar contra les al·lèrgies (J. Kneipp *et al*., *Anal. Chem*. **2008**, *80*, 9551).

• L'ONU ha decidit que el 2011 sigui l'Any Internacional de la Química. L'objectiu és subratllar els èxits més importants de la química, així com la seva contribució a la Humanitat (http://www.chemistry2011.org/)

Avui recomanem

El llibre *Los diez descubrimientos más famosos de la ciencia*, de G. Johnson (Ed. Ariel) relata deu dels experiments més importants de la Història, i explica la biografia dels autors.

L'element

L'element número **44**, **ruteni,** fou descobert i aïllat el 1844 pel químic rus Karl Klauss de la Universitat de Kazan, en uns dipòsits de platí natiu abundants als Urals. El nom prové del llatí *ruthenia* que vol dir Rússia. És un element de l'anomenat grup del platí, i degut a la capacitat d'endurir platí i pal·ladi, s'addiciona a aliatges d'aquests elements que s'empren en contactes elèctrics resistents al desgast.

Els seus compostos tenen moltes aplicacions com a catalitzadors, entre les que destaquen els processos d'eliminació de H_2S del petroli i la metàtesis d'olefines, reacció que fou reconeguda amb el Premi Nobel el 2005.

En el camp de la medicina, el ^{106}Ru s'empra en radioteràpia en tractaments de tumors als ulls i alguns derivats organometàl·lics tenen una certa activitat antitumoral.