UNIVERSITAT DE BARCELONA

Departament de Química Inorgànica

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# Notícies Inorgàniques

Any 2, Núm. 12, Novembre de 2003

## El Nobel, per a la Bioinorgànica

Roderick MacKinnon of Rockefeller University and Peter C. Agre of Johns Hopkins University, have been awarded this year's Nobel Prize in Chemistry for discoveries concerning channels in cell membranes (http://www.nobel.se).

The membrane-spanning proteins or "channels" that traffic water molecules and ions across cellular membranes control many physiological processes, including nerve function, muscle contraction, and urine production. Malfunctioning channels can cause neurological and cardiac diseases as well as cataracts and other disorders.

MacKinnon studies ion channels - membrane-spanning proteins that form a tunnel that allows specific inorganic ions to travel across cell membranes. Such ions channels generate the electrical signals that underlie brain function and the beating of your heart.

Scientists predicted the existence of channels for transporting water across membranes more that a century ago. But it was not until 1991 that Agre stumbled upon a small membrane-spanning protein in red blood cells that turned out to be the first class of a water channels that he dubbed aquaporins. Since then, he and others have shown that aquaporin proteins control water transport in most plants and nearly a dozen human tissues.

**Peter Agre**

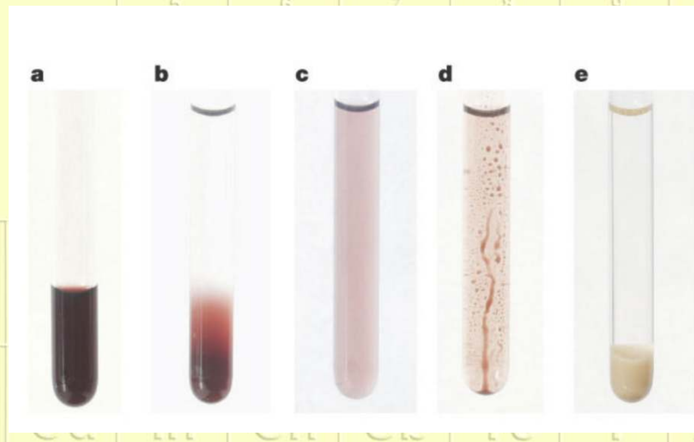
**Roderick MacKinnon**

## Un catalitzador homogeni reciclable

A major problem in homogeneous catalysis is the difficulty in separating the catalyst from the product. A catalyst that precipitates at the end of the reaction would offer a powerful solution.

Now R. Morris Bullock and coworkers at Brookhaven National Laboratory have demonstrated such a catalyst at work in the hydrosilylation of ketones [*Nature*, **424**, 530 (2003)]. Two cationic complexes, $[CpM(CO)_2(IMeS)]^+[B(C_6F_5)_4]^-$ (M = W or Mo), soluble in ketones but insoluble in non-polar hydrocarbon solvents, were prepared.

The reaction with aliphatic substrates yields a colourless solution in which none of the metal catalyst is soluble. The resulting yellow solid precipitate (catalyst) is easily separated from the liquid phase by decanting. The catalyst can be recycled up to 5 times with good activity.



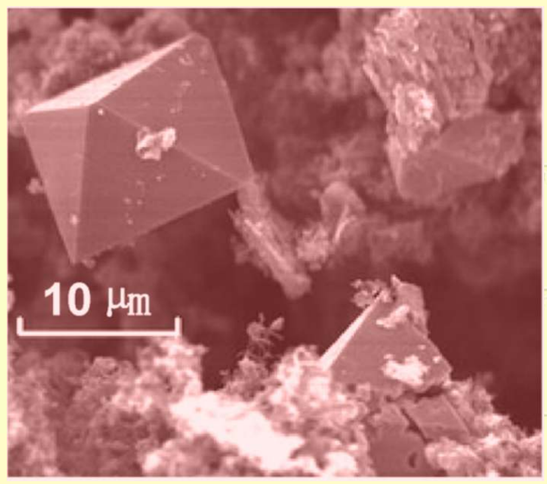

Photographs of the catalytic hydrosilylation of $Et_2C{=}O$ by $[CpW(CO)_2(IMes)]^+[B(C_6F_5)_4]^-$. **a**, Ketone complex **4W** before adding $HSiEt_3$. **b**, $HSiEt_3$ added, liquid not yet mixed. **c**, Mixed and homogeneous. **d**, Liquid clathrate formed. Reaction nearing completion. **e**, End of reaction. Catalyst has precipitated.

## Els diamants, més a l'abast

Qianwang Chen and coworkers from the University of Science & Technology of China, have reported two methods for the preparation of synthetic diamonds.

The reduction of magnesium carbonate with sodium at 500 °C results in the pyrolysis of $MgCO_3$ leading to MgO and $CO_2$. Sodium subsequently reacts with the $CO_2$ to form $Na_2CO_3$ and elemental carbon. The carbon exists in both graphite and diamond forms, with the yield of diamonds being about 6.6% with respect to carbonate. The diamond crystals are found to be as large as 510 µm [*Angew. Chem. Int. Ed.*, **42**, 4501 (2003)].

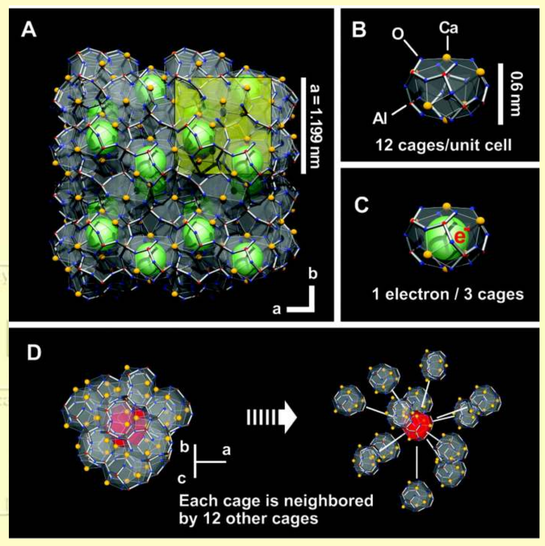
In the second method, the diamonds were made by reduction of dense carbon dioxide with metallic sodium at 440 °C and 800 atm in an autoclave. The resulting cubic diamonds are of high quality and this low-temperature diamond synthesis technique could be used to prepare large-size gems with readily available $CO_2$ as the carbon source [*J. Am. Chem. Soc.*, **125**, 9302 (2003)].




## Electrurs tèrmicament estables

Electrides are materials in which electrons are trapped at stoichiometric concentrations, effectively becoming the smallest possible anions.

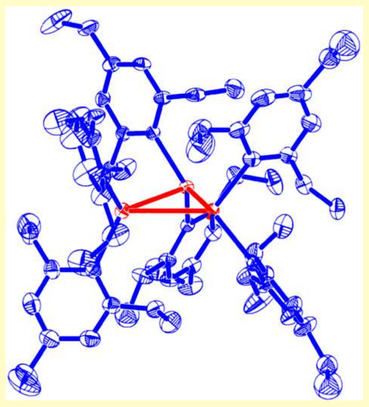
Hideo Hosono at the Tokyo Institute of Technology, and his coworkers have formed a room-temperature, air-stable inorganic electride [*Science*, **301**, 626 (2003)]. They make the electride from a single crystal of $12CaO{\cdot}7Al_2O_3$. The unit cell, which has two molecules and 12 cages, can be represented as $[Ca_{24}Al_{28}O_{64}]^{4+} + 2O^{2-}$. The oxide ions are extracted by reacting them with Ca metal, forming a CaO coating that can be mechanically removed. The resulting electride has a formula of $[Ca_{24}Al_{28}O_{64}]^{4+}(4e^-)$.




## El primer compost homocíclic de plom

Manfred Weidenbruch of the University of Oldenburg, in Germany, and coworkers have synthesized the first lead compound with a homocyclic ring system *[J. Am. Chem. Soc.*, **125**, 10172 (2003)].

The X-ray structure reveals longer than expected Pb-Pb bonds and shows that the phenyl groups are 37° out of their ideal positions, suggesting that the lead bonds are not classic single bonds but instead are weak interactions between three singlet plumbylene molecules ($PbR_2$).



## Breus

- El Dr. Santiago Alvarez, catedràtic del Departament, i el Dr. Michel Verdaguer (Université Pierre et Marie Curie), professor visitant d'aquest Departament, han estat guardonats per les Societats de Química espanyola i francesa, respectivament.
- Amb motiu del seu 80è aniversari, la revista *Chemical & Engineering News* ha publicat un número especial dedicat a la Taula Periòdica, que pot consultar-se a l'adreça http://pubs.acs.org/cen/80th/elements.html
- La separació manual dels enantiòmers del tartrat d'amoni i sodi, duta a terme per Pasteur, és l'experiment més bonic de la història de la Química, segons una enquesta practicada entre els químics [*Chem. Eng. News*, **81**(34), 27 (2003)].
- S'ha publicat el Llibre de la Ciència de Harry Potter [R. Highfield, *The Science of Harry Potter: How Magic Really Works*, Penguin, 2003].

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L'element número **12**, **magnesi**, va ser preparat per H. Davy l'any 1755. El seu nom prové de la paraula grega Magnhsia, que designa una regió de Tessàlia.