

El CO₂ atmosfèric no para de créixer

Ice cores drilled at Vostok Station in East Antarctica provide evidence of Earth's temperatures and greenhouse gases for the past 440,000 years. Now, data from a new ice core called EPICA Dome C, drilled roughly 600 miles from Vostok, extends that record back another 210,000 years.

A study by Thomas F. Stocker of the Physics Institute at the University of Bern, in Switzerland, and colleagues describes Dome C core data that reveal the relationship between global temperatures and atmospheric carbon dioxide concentrations for the period 390,000 to 650,000 years before present (*Science* **2005**, *310*, 1313). The data indicate that the current concentration of CO₂, at 380 ppm, is 27% higher than the preindustrial level and higher than any level attained during the past 650,000 years.

A second study based on Dome C data, also by Stocker and colleagues, lays out the relationship between global temperatures and the greenhouse gases methane and nitrous oxide (*Science* **2005**, *310*, 1317). It shows that methane levels over the past 650,000 years were never higher than they are today.



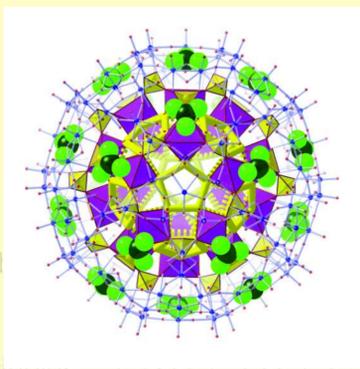
Cèl·lules artificials inorgàniques

Chemists in Germany have constructed artificial cells with stoppered pores that open for the uptake of calcium ions and then close. The process resembles the functioning of gated calcium channels in biological cell membranes.

The cells-spherical nanoscale polyoxomolybdate clusters-were constructed by Achim Müller and coworkers at the University of Bielefeld (*Angew. Chem. Int. Ed.*, **2005**, *44*, 7757). Each cell has 20 Mo₃O₆ pores that are noncovalently bonded to protonated urea ions that act as stoppers.

The Bielefeld team added Ca²⁺ ions to an aqueous solution of the molybdate capsules and examined the precipitated product by X-ray crystallography. The analysis revealed not only that Ca²⁺ had entered the capsules but also that the urea stoppers had closed the pores after ion entry.

This type of investigation could yield information about the functioning of cell membrane calcium channels in physiological processes and also provide insights into counterion transport of pathological relevance.

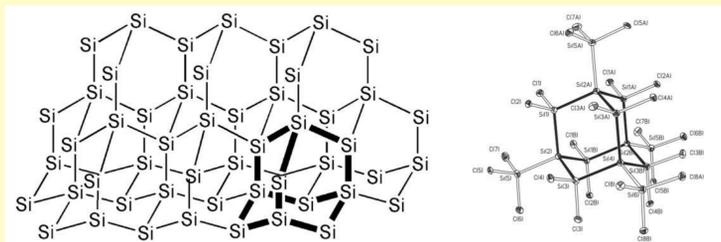


Construint el silici

The smallest discretely defined repeat unit that can be plucked from the silicon crystal lattice has been synthesized as an independent molecule by a team of Austrian chemists (C. Marschner *et al.*, *Science* **2005**, *310*, 825).

"Sila-adamantane," as the new compound is called, is a tricyclic Si₁₀ cluster with pendant methyl and trimethylsilyl groups. The molecule is anticipated to help scientists better understand how the properties of silicon transition from the molecular level to the bulk solid. The compound has the same structure as adamantane, the carbon compound that serves as the repeat unit in diamond, one of carbon's structural allotropes.

Sila-adamantane's structure should impart properties that could make it suitable for use in molecular electronics, such as constructing molecular wires and miniaturized semiconductor devices.



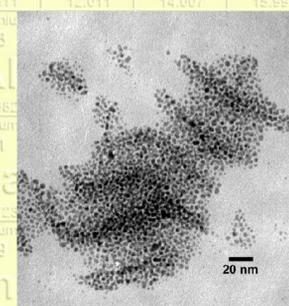
L'or, catalitzador verd

Industrial oxidation processes that convert hydrocarbons to epoxides, ketones, aldehydes, and other oxygen-containing organic compounds could become greener with the discovery of nanocrystalline gold catalysts that work under mild conditions.

A team led by Graham J. Hutchings, professor of physical chemistry at Cardiff University, in Wales, has shown that gold nanoparticles supported on carbon activate molecular oxygen in air to convert alkenes to partial oxidation products such as epoxides at atmospheric pressure and temperatures of 60–80 °C (*Nature* **2005**, *437*, 1132).

The catalyst can be fine-tuned with exceptionally high selectivity for the desired products by changing the solvent. The partial oxidations can also be carried out under solvent-free conditions, so they fit with green chemistry.

Oxidation catalysts are second in usage only to polymerization catalysts. Most industrial oxidation processes tend to use chlorine or organic peroxides. The chlorine processes produce large amounts of chloride salts and significant amounts of chlorinated organic by-products. The disadvantage of organic peroxides is their expense.

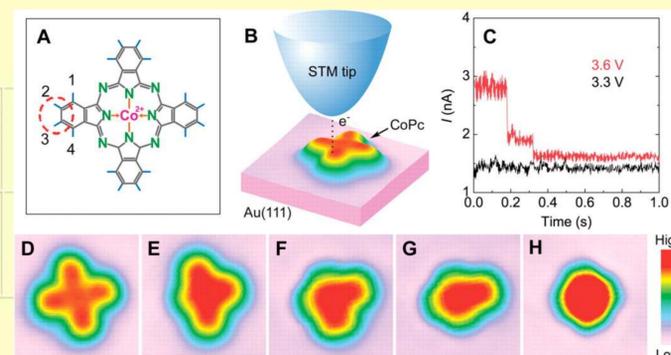


Cirurgia molecular

Remarkable advances in science and technology have allowed people to control objects ranging in size from huge space shuttles to tiny nanorobots. Manipulating the physical properties of a single molecule by cleaving its chemical bonds sounds like science fiction, but this goal has been attained by a group of researchers led by J. Yang and J. G. Hou at the University of Science and Technology of China in Hefei (*Science* **2005**, *309*, 1542).

The researchers performed this "molecular surgery" on the molecule cobalt phthalocyanine (CoPc, 1). When the planar molecule was adsorbed on a gold (111) surface, it was imaged as a four-lobed structure.

The molecular surgery was effected by a local high-voltage pulse from a scanning tunneling microscope (STM) tip. Cutting away the eight peripheral hydrogen atoms formed a new species, d-CoPc, as evidenced by its lobe-free topographic image. The naked end-carbon atoms are in close contact with the gold substrate (1.9 Å), whereas the central cobalt atom bends upward to a distance of 3.8 Å from the substrate. This structural variation alters the magnetism in the molecule.



Breus

- La pàgina web *Linus Pauling and the Nature of the Chemical Bond*, (<http://osulibrary.orst.edu/specialcollections/coll/pauling/bond/index.html>), recull tota la informació relacionada amb el llibre *The Nature of the Chemical Bond* de Linus Pauling, que és el document més citat de la història de la Química.

- S'ha trobat un segon polimorf de l'aspirina, que es buscava des dels anys 60 [S. M. Block *et al.*, *Phys. Rev. Lett.*, **2005**, *95*, 208102].

- S'ha comprovat que l'arsènic, el cadmi i el plom del fum de les cigarretes s'escampa per l'aire, afectant així també els no fumadors [M. J. Chany *et al.*, *J. Environ. Monit.*, **2005**, *7*, 1349].

- L'augment de la radioactivitat ambiental produïda per les explosions nuclears permet un nou mètode d'identificació dels cossos humans basat en l'edat de l'esmal dental [K. L. Spanding *et al.*, *Nature*, **2005**, *437*, 333].

L'element número 25, manganès, va ser descobert el 1774 per Johann Gahn. El seu nom prové del mot llatí *magnes*, que vol dir *imant*.