UNIVERSITAT DE BARCELONA

Química Inorgànica

Notícies Inorgàniques

Any 4, Núm. 20, Febrer de 2005

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

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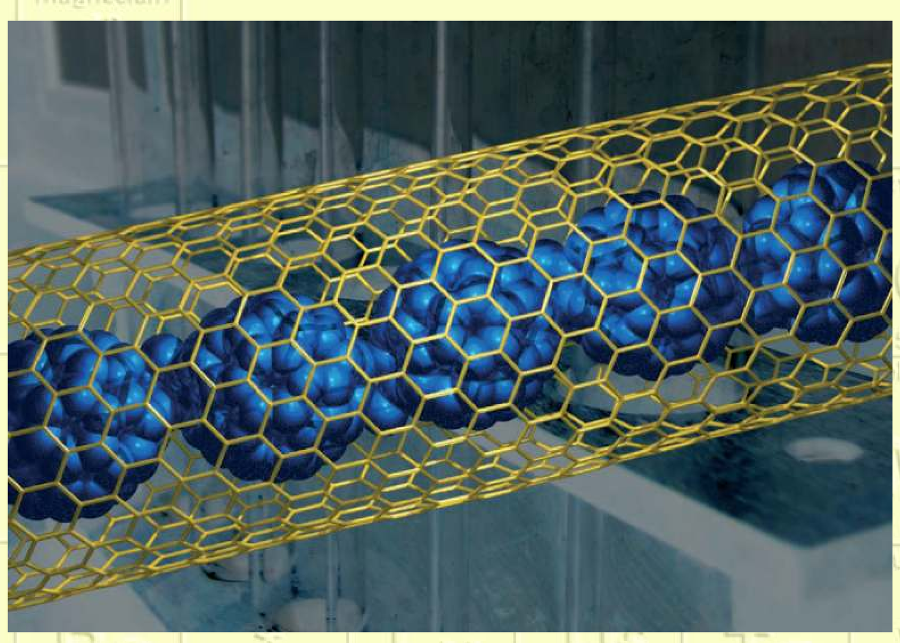
Un nanotub d'assaig

Using a single-walled carbon nanotube as a highly confining reaction vessel, researchers have polymerized a fullerene derivative to form a linear, unbranched polymer that has never before been observed. The technique may allow other unprecedented linear polymers to be synthesized.

With supercritical carbon dioxide as the solvent, the researchers inserted molecules of the known fullerene epoxide $C_{60}O$ into nanotubes. The CO_2 was then allowed to escape from the nanotubes. The resulting peapod structure consists of epoxide molecules lined up in a single row inside the nanotube, which is only wide enough (about 1.4 nm) to accommodate one row of fullerenes.

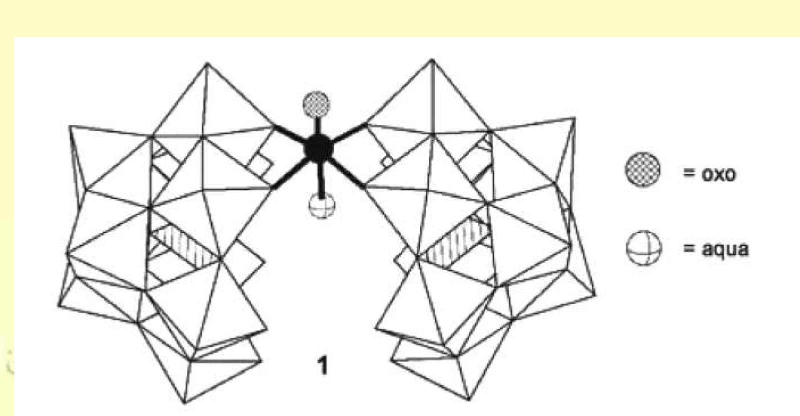
The nanotubes were then heated to 260 °C in a vacuum, causing the strained epoxide rings to open. Each epoxide oxygen atom attacks one of the C=C bonds of its neighbor, forming a C–O–C bridge. The two carbon atoms--one on each buckyball--that have been left with unsatisfied valences then join "hands," completing the formation of a rigid furan-type ring between the two cages. The result of this head-to-tail polymerization is a linear chain, $(C_{60}O)_n$, that, in principle, can be as long as the length of the nanotubes [D.A. Britz *et al.*, *Chem. Commun.*, 37 (2005)].



L'enllaç Pt-O, estabilitzat per polioxotungstats

Single oxygen atoms are good ligands for early transition metals because oxygen is a strong -electron donor and its donated electron pair can delocalize into vacant d orbitals on the metal. But oxo complexes of metals farther across the periodic table are rare or don't exist because electron-electron repulsion between the increased number of d electrons and oxygen's donated electrons creates instability.

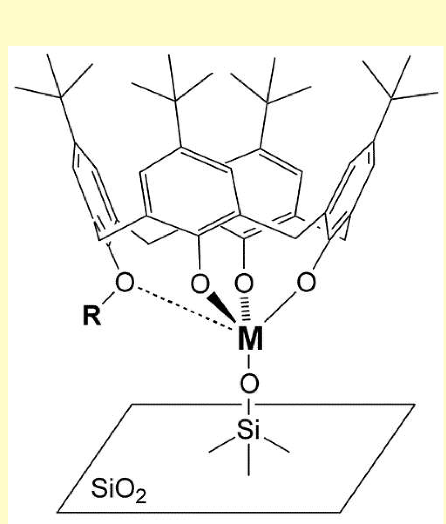
Craig L. Hill of Emory University, Atlanta, and coworkers have shown how this electron push back can be mitigated by synthesizing a platinum oxo complex containing polyoxometalate ligands that have delocalized molecular orbitals to accommodate some of the additional electron density [*Science*, **306**, 2074 (2004)]. The complex, $K_7Na_9[Pt(O)(H_2O)(PW_9O_{34})_2]$ 21.5H_2O, has a platinum(IV) center with six d electrons and is surrounded by six oxygen atoms, including the Pt=O oxo ligand.



Titani immobilitzat, catalitzador actiu i selectiu

Grafting titanium-calixarene complexes onto silica produces effective epoxidation catalysts, according to a study from the University of California, Berkeley. Alexander Katz and coworkers have shown that the immobilized form of the catalyst (shown) is more than 20 times more active and far more selective than the solution-phase compound in olefin epoxidation reactions using organic hydroperoxides as oxidizing agents [*J. Am. Chem. Soc.*, **126,** 16478 (2004)].

The researchers propose that the multidentate and bulky structure of the calixarene ligand keeps the metal centers isolated from one another during reaction with alkenes. Separating the titanium centers prevents oligomerization, which would lead to formation of unreactive and unselective Ti–O–Ti structures. The team notes that the catalysts are robust and reusable and exhibit long-term stability under ambient storage conditions.



1, M = Si, R = H
2, M = Si, R = CH_3
3, M = Ti, R = CH_3

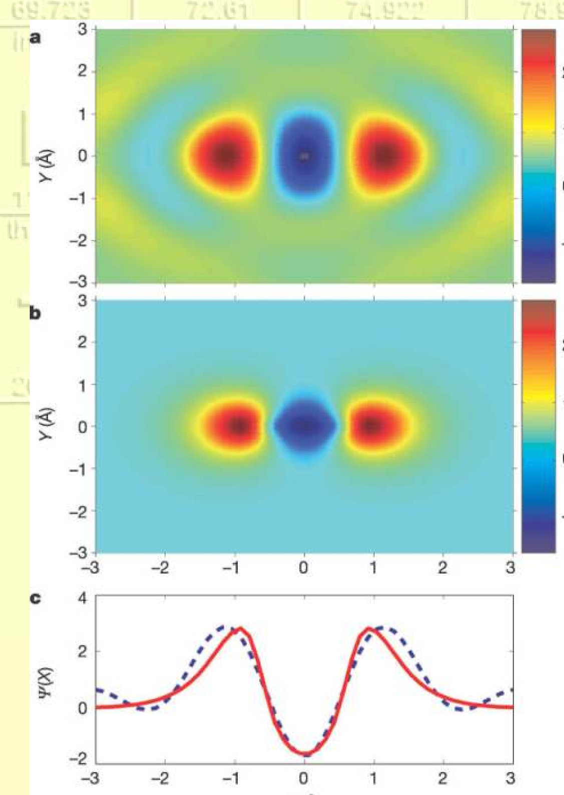
Els orbitals moleculars del N_2, retratats

Scientists at the Canadian National Research Council (CNRC) in Ottawa have demonstrated a procedure in which femtosecond (10^{-15} second) laser pulses are used to construct a 3-D image of a single molecular orbital. The technique, which bears similarities to medical tomography, was used to image the highest occupied molecular orbital (HOMO) of a simple test system: dinitrogen [*Nature*, **432**, 867 (2004)].

Constructing an image of N_2's HOMO is a multistep process. First, the Ottawa group aligns the nitrogen molecules in a particular orientation by exposing them to a brief pulse of linearly polarized laser light. An instant later, the researchers deliver an intense femtosecond laser pulse to the gas molecules. Within the 10^{-15}-second period of the intense pulse, an electron in N_2's HOMO is forced away from the molecule and then driven to recollide with the molecule energetically. The collision angle between the electron and the molecule is fixed by controlling the angle between the two laser pulses.

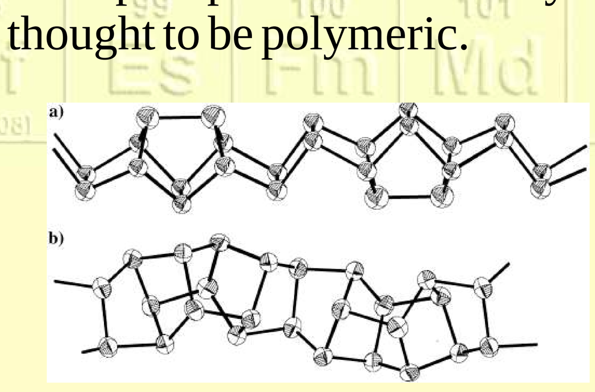
The team members explain that the laser-molecule interactions produce a series of high-order harmonics--radiation with overtone frequencies that are multiples of the initial laser pulse. They note that the spectrum of overtones carries 2-D information about the electron orbital structure. So by varying the collision angle (via the alignment laser) and recording numerous overtone spectra, the group is able to use tomographic methods to construct a 3-D image of the HOMO.

Now that the group has shown that, in a simple molecule, the HOMO--the orbital directly involved in bonding--can be imaged with femtosecond resolution, more complex chemical systems may soon be within reach.



Un nou al·lòtrop del fòsfor

New structural forms of elemental phosphorus have been revealed in studies carried out by German researchers [*Angew. Chem. Int. Ed.*, **43**, 4228 (2004)]. Phosphorus occurs in nature in various phosphate-bearing rocks, and for some 350 years it has been known that pure phosphorus can be prepared by reducing these materials. Several phosphorus allotropes consisting of P_4 and other units have been identified, with the white, red, violet, and black color modifications being the main forms. Arno Pfitzner of the University of Regensburg and Hellmut Eckert of the University of Münster and coworkers have now isolated two red-brown forms, one each from solutions of $(CuI)_8P_{12}$ and $(CuI)_3P_{12}$. They prepared the compounds by reacting CuI with red phosphorus. The German team used electron microscopy and NMR to identify the red-brown forms as rod-shaped P_{12} units (shown), noting that red-brown phosphorus is distinctly different from the amorphous red phosphorus, which is also thought to be polymeric.



Breus

- Ha mort Herbert C. Brown (Londres 1912), premi Nobel de Química l'any 1979 per la reacció d'hidroboració.
- Un nou compost de tecneci, base d'una prometedora prova no invasiva de detecció del càncer de mama [E. Wickstrom *et al.*, *J. Nucl Med.*, **45**, 2070 (2004)].
- Malgrat els reports que asseguraven el contrari [N.E. Leadbeater *et al.*, *Angew. Chem. Int. Ed.*, **42**, 1407 (2003)], el pal·ladi continua sent imprescindible en la reacció de Suzuki [R.K. Arvela *et al.*, *J. Org. Chem.*, **70**, 161 (2005)].
- L'American Chemical Society porta Google als tribunals per l'ús de la marca registrada "Scholar"

L'element número **20**, **calci**, va ser descobert el 1808 per Sir Humphrey Davy. El seu nom prové del mot llatí *calx* que significa *calç*.