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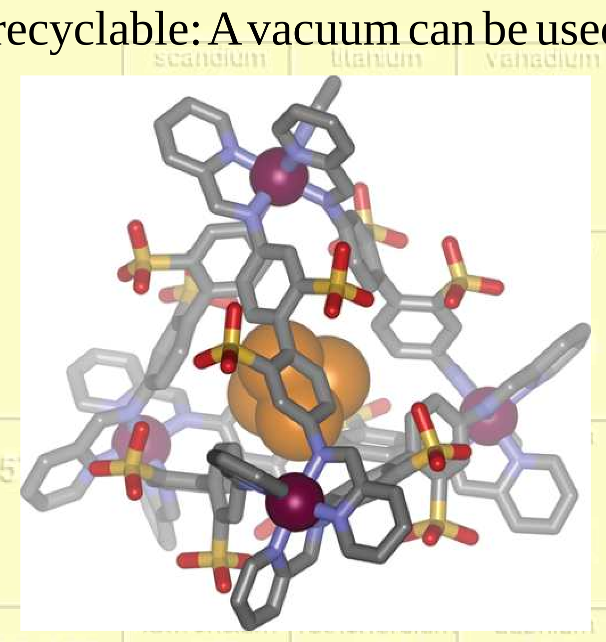
El fòsfor ja no crema

An iron-based cage compound can take up white phosphorus (P_4), keeping the highly flammable substance from reacting with oxygen and burning uncontrollably, researchers report (J.R. Nitschke *et al*. *Science* **2009,** *324*, 1697). The cage complex prevents combustion and also makes it possible to release P_4 at will.

The approach could be useful for storing P_4 safely, controlling its release for chemical reactions, or remediating spills of the toxic substance. P_4 has been kept safe by storing it under water or enclosing it in a metal casing or glass ampule, but never before by chemical complexation. Similar host-guest chemistry might also prove useful for sequestering other dangerous substances.

The tetrahedral metal-organic cage self-assembles in water from commercially available organic compounds and iron(II). The caged P_4 doesn't decompose, even after contact with the atmosphere for over four months. The guest is stable because the reaction of O_2 with P_4 would create an intermediate product too big to fit into the host molecule's cavity.

P_4 can be removed from the host by adding a competing guest such as benzene, which displaces P_4. And the cage is recyclable: A vacuum can be used to empty it of some guests.

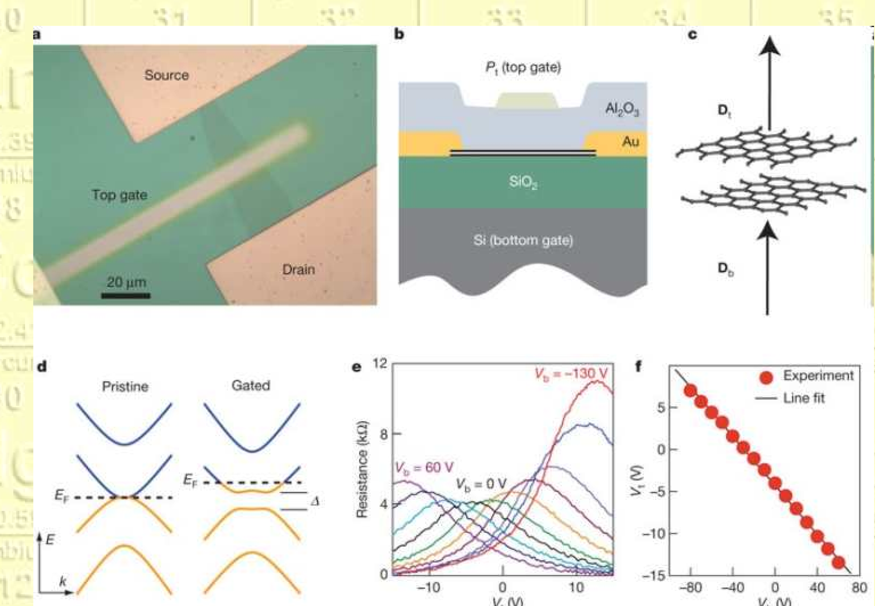


Semiconductivitat a mida

The electronic properties of graphene—a single layer of carbon atoms configured like chicken wire—are compelling enough. But now, by connecting two layers of graphene, researchers have achieved what could be an extraordinary breakthrough in electronics: a device with a tunable bandgap.

The defining property of any semiconductor or insulating material is the size of its bandgap—the amount of energy between the material's valence band and conduction band. This intrinsic, fixed characteristic determines the material's ability to transport electrons or absorb photons and thus what role it can play in devices such as transistors and photodiodes. University of California, Berkeley professor Feng Wang and colleagues report that by placing two sheets of graphene on top of each other and putting the layers between two electrical gates, they are able to adjust the bandgap by changing the applied voltage (*Nature* **2009,** *459*, 820).

Since its discovery in 2004, graphene has grabbed much attention. The material's single, incredibly strong sheets appear to conduct electrons almost effortlessly, and researchers are expending considerable effort to learn how to synthesize it more easily. On the horizon are graphene-based transistors, frequency multipliers, and light-emitting diodes.

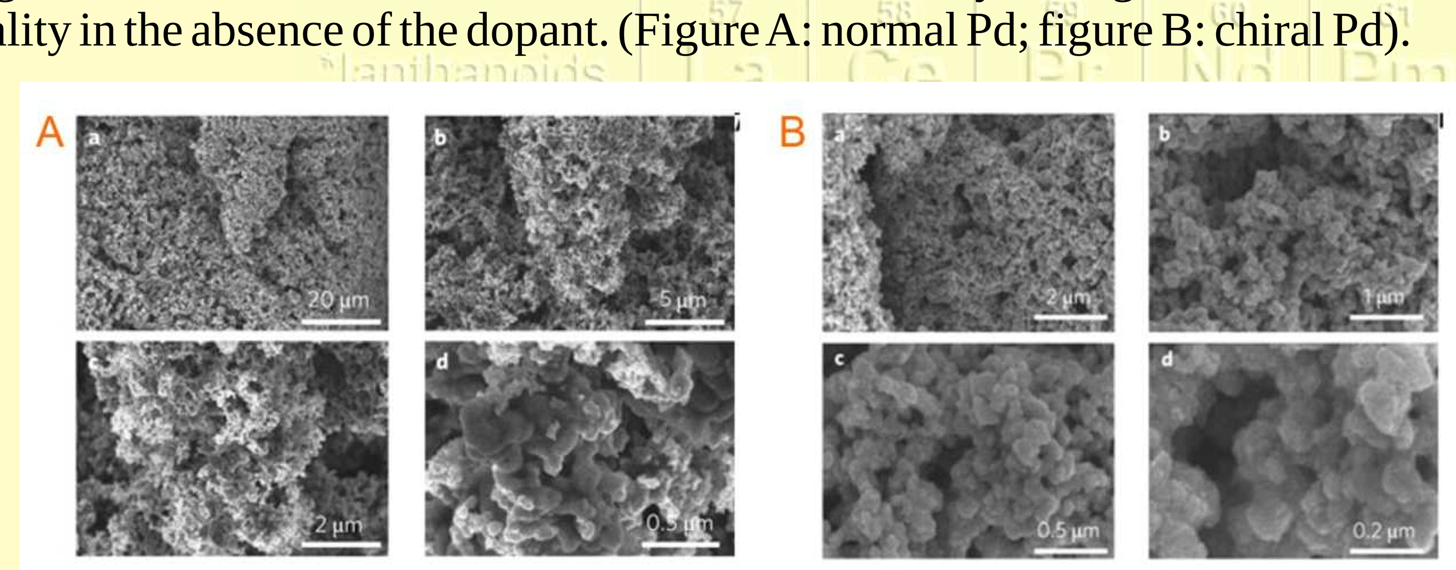


Metalls quirals

Chirality can be induced in metals, a class of inherently achiral materials, by crystallizing a metal compound with chiral organic dopants, according to researchers in the Netherlands and Israel (*Nat. Chem.* **2009,** *1*, 160). In addition to uncovering new enantioselective catalysts, the study outlines a general method for making various types of chiral metals and novel chiral metallo-organic composites.

By reducing a palladium salt in the presence of cinchonidine or closely related chiral alkaloids, L. Durán and G. Rothenberg of the University of Amsterdam synthesized porous composites consisting of nanometer-sized aggregates of metal crystallites and pockets of dopant molecules. On the basis of spectroscopy measurements, the team demonstrated that the composites have imprinted chirality and that extracting the organic fraction with solvents forms porous metal products that are also chiral.

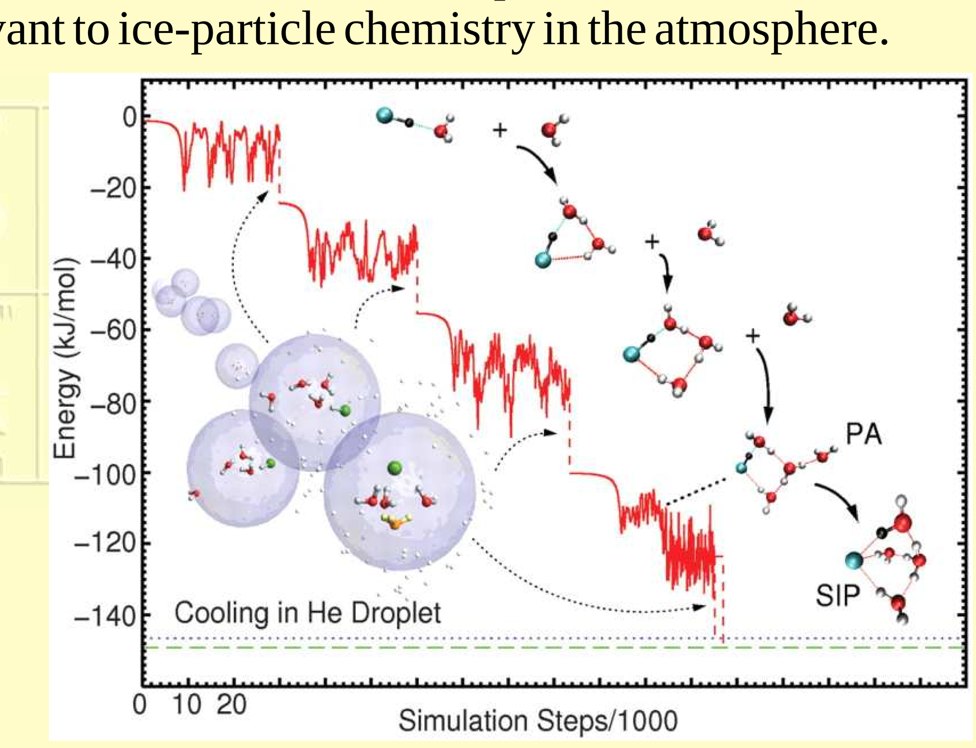
The group showed that the composites can catalyze asymmetric reactions, albeit with modest results. The investigation builds on the team's earlier work in making metal composites that contain organic components. The present study stands out, however, by being the first case in which a metal, rendered chiral by an organic modifier, retains its chirality in the absence of the dopant. (Figure A: normal Pd; figure B: chiral Pd).



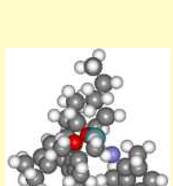
Amb quatre molècules n'hi ha prou

How many water molecules does it take to dissolve one molecule of hydrochloric acid? Just four, say the scientists who created the minimalist collections of atoms at extremely cold temperatures (*Science* **2009,** *324*, 1545). The work lays bare the fundamental process of acid dissociation, unfettered by variables like extra molecules and heat. An international team led by Martina Havenith of Ruhr University, in Bochum, Germany, used protective superfluid helium droplets to encapsulate single HCl molecules with H_2O molecules at temperatures below 1 K.

On the basis of an infrared spectral signature and in conjunction with ab initio calculations of H_3O^+ in the dissociated $H_3O^+(H_2O)Cl^-$ ion pair, they determined that only four water molecules are needed to cause one HCl molecule to spontaneously dissociate. The results could help scientists understand, for example, how HCl dissolves on ice surfaces—a phenomenon relevant to ice-particle chemistry in the atmosphere.



Breus



- La IUPAC ha reconegut la paternitat del descubriment de l'element ^{112}Uub (ununbi). El descobridor, S. Hoffmann (GSI; Darmstadt) podrà proposar el seu nom definitiu, que segurament serà *Copernici* (Cp), en honor a Nicolau Copèrnic (R.C. Barber *et al*., *Pur. Appl. Chem*. **2009**, *81*, 1331).
- Després de 35 anys, el pentaneopentiltàntal ha estat confirmat com el precursor del complex "tàntal-alquilidè" que dóna lloc als catalitzadors de Schrock per la reacció de metàtesi (J. K. C. Abbott *et al*., *J. Am. Chem. Soc.* **2009**, *131*, 8246).
- La companyia farmacèutica Lilly ha posat en marxa una iniciativa en la que els investigadors que preparen nous compostos poden comprovar si són actius en el tractament de diferents malalties (A.M. Trayer, *Chem. Eng. News* **2009**, *87*, 9).

Avui recomanem

Indagando TV és la primera televisió d'Espanya especialitzada en ciència i tecnologia. Difon la seva programació a través d'Internet:
http://www.indagando.tv

L'element

L'element número **46**, **pal·ladi**, fou descobert i aïllat el 1803 pel químic anglès William Hyde Wollaston, en uns minerals de platí d'Amèrica del Sud. Li posà aquest nom en homenatge a l'asteroide *Pal·las*, que s'acabava de descobrir; el terme fa referència a la deessa grega de la saviesa, Pal·las Atena.

A l'igual que altres elements del grup del platí té unes propietats molt singulars que el fan molt útil i apreciat. Forma part dels catalitzadors que porten els cotxes per evitar l'expulsió de gasos contaminants a l'atmosfera i té diverses aplicacions en joieria i en electrònica. El metall pot absorbir, a temperatura ambient i de manera reversible, fins a 900 vegades el seu propi volum d'hidrogen. Alguns dels seus compostos tenen una gran capacitat en la formació d'enllaços C-C, i són bons catalitzadors en reaccions d'acoblament com els processos de Suzuki, Stille i Heck.