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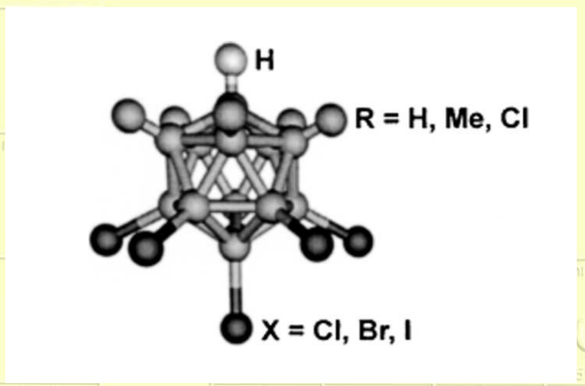
Un àcid superfort

The world's strongest acid, at least a million times more potent than concentrated sulphuric acid, has been made in a lab in California [M. Juhasz et al., *Angewandte Chemie Int. Ed*., **43**, 5352 (2004)]. Perhaps confusingly, it is also one of the least corrosive. The compound, a carborane acid that has the formula $H(CHB_{11}Cl_{11})$, is the first 'superacid' that can be stored in a bottle. The previous record holder, fluorosulphuric acid, is so corrosive that it would eat straight to the glass.

The new acid's gentleness is down to its remarkable chemical stability. Like all acids, it react with other compounds, donating a charged hydrogen atom to them. But what is left behind, although negatively charged, is so stable that it refuses to react further.

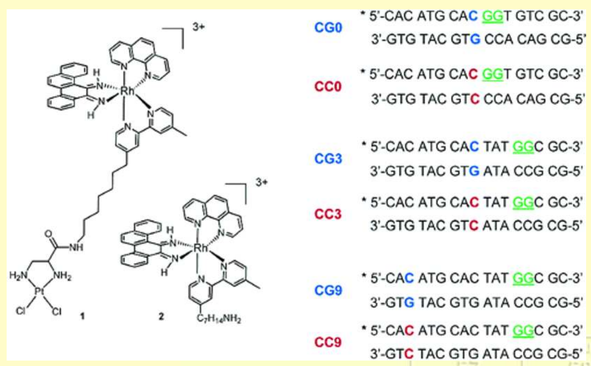
Is this secondary reaction that is essential for corrosion. For example, hydrofluoric acid corrodes glass, which is composed largely of silicon dioxide, because the fluoride ion attacks the silicon as the hydrogen reacts with oxygen.



El rodi millora el *cis*-platí

The cancer drug cisplatin binds DNA at preferred sites such as double guanines, and the resulting DNA complex kills growing cancer cells. Unfortunately, cisplatin binds all DNA and also kills normal cells.

In an initial step toward fine-tuning the binding of molecules similar to cisplatin, Jacqueline K. Barton and Anne Petitjean at Caltech created a two-headed molecule [J. *Am. Chem. Soc*., **126**, 14728 (2004)]. At one end is the cis-platinum moiety. At the other is a rhodium-based intercalator that inserts itself into mismatched DNA. When the two ends are tethered together, the binding preference of the metallointercalator dominates. This specific two-headed species may not be a good drug, however, a similar strategic combination could be useful in helping to direct cis-platinum therapy toward mutated DNA more likely to lead to cancer.



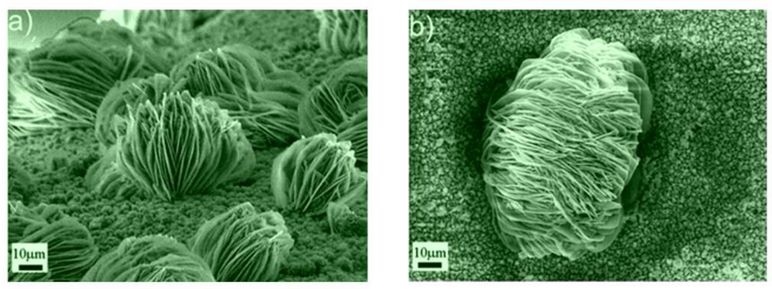
Schematic structures of conjugate 1 and its precursor 2 (left) as well as the three families of DNA duplexes (right).

Un pam, distància de reacció ideal

Forsterite (Mg_2SiO_4) is a form of the mineral olivine used as an insulator in high-frequency electronics and other applications. When doped with chromium, it is used in laser optics. Forsterite typically is made from MgO and SiO_2 by solid-state synthesis above 1,100 °C.

Now, a research team led by Raymond Whitby of the University of Sussex, in England, has devised a lower temperature method to make forsterite that produces leaflike microstructures with a geometric ordering that hasn't been seen before [*Chem. Commun*., **2004**, 2396]. The team loaded a reaction tube with two separate reactants--a Mg/I_2 mixture and amorphous SiO_2--spaced 20 cm apart. Under a helium atmosphere, the Mg/I_2 powder was heated to 800 °C and the SiO_2 was heated to 600 °C, creating a temperature gradient. Cabbagelike Mg_2SiO_4 crystals formed, as well as catenated crystals that resemble segmented earthworms.

The researchers believe MgI_2 is formed as an intermediate species that ferries Mg to SiO_2 nucleation sites, where the forsterite crystals grow. They have shown that the synthesis is reproducible and plan to continue to investigate the nanoscale growth mechanism and to prepare chromium-doped forsterite.



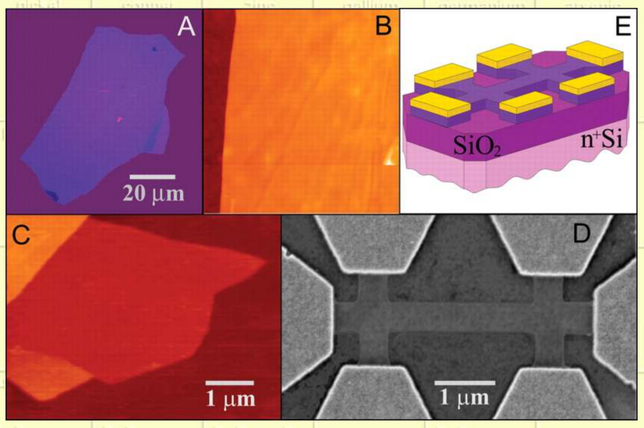
Monocapes de grafit, nous components electrònics

Graphite films just a few atoms thick--and in some cases, as thin as a single atom--have been prepared as single, stable layers for the first time and incorporated into experimental devices [*Science*, **306**, 666 (2004)].

A team led by physics professor Andre K. Geim at the University of Manchester, in England, managed to obtain the planar graphene sheets by repeatedly peeling layers off highly oriented pyrolytic graphite. They report that the process can yield superslim graphitic layers about 10 μm across, as well as larger ones that are about 3 nm thick and 100 μm in diameter.

Graphene films have been reported previously; these examples were either only a few nanometers in size or were chemically bound to a metal substrate, rather than in the free state. Until now, scientists had presumed that single graphene sheets would be too unstable to work with and that they would curve into more stable structures like soot or, under special conditions, nanotubes and fullerenes.

To study the films' physical properties, Geim and Novoselov's team used their thinnest films as field-effect transistors. They found that, even at room temperature, the materials were able to transport electrons at ultrafast speeds. No other film of similar thickness is known to behave in a comparable manner at ambient conditions.

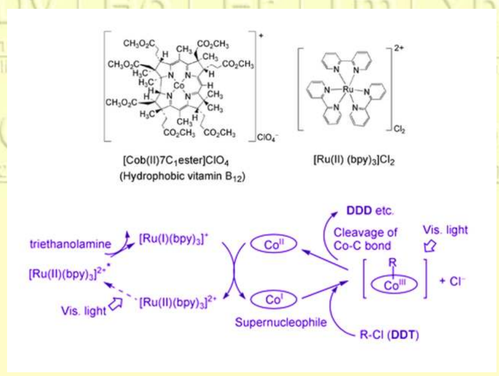


(**A**) Photograph of a relatively large multilayer graphene flake with thickness 3 nm on top of an oxidized Si wafer. (**B**) Atomic force microscope (AFM) image of 2 μm by 2 μm area of this flake near its edge. Colors: dark brown, SiO_2 surface; orange, 3 nm height above the SiO_2 surface. (**C**) AFM image of single-layer graphene. Colors: dark brown, SiO_2 surface; brown-red (central area), 0.8 nm height; yellow-brown (bottom left), 1.2 nm; orange (top left), 2.5 nm. (**D**) Scanning electron microscope image of one of our experimental devices prepared from FLG. (**E**) Schematic view of the device in (D).

La vitamina B_{12} a més descontamina

A new catalytic system for dechlorinating chlorinated organic pollutants employs a vitamin B-12 derivative and a ruthenium photosensitizer. Yoshio Hisaeda and coworkers at Kyushu University, Fukuoka, Japan, used the system to catalyze the dechlorination of DDT [1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane] under visible light irradiation [*Chem. Commun.*, **2004**, 1806].

The catalyst, hydrophobic vitamin B-12, has ester groups in place of the peripheral amide moieties of naturally occurring vitamin B-12. The system exhibits high catalytic efficiency and stability during the dechlorination. The authors postulate that the hydrophobic vitamin B-12, which contains cobalt(II), is reduced to a supernucleophilic Co(I) species by the ruthenium photosensitizer. The Co-C bond of the alkylated complex generated by the reaction of the supernucleophile with DDT is cleaved by photolysis to form a substrate radical and a Co(II) species. The radical reacts with H_2 to form, as the main product, a DDT derivative having a $CHCl_2$ group instead of CCl_3. The system is simpler and more facile than conventional electrochemical dehalogenation systems.



Breus

- Ha sortit la versió catalana, a cura del Dr. Josep M. Costa, del *Llibre Verd* de la IUPAC, *Magnituds, unitats i símbols en Química Física* (IEC, Barcelona, 2004).
- La nova tècnica DESI (Desorption ElectroSpray Ionisation) permet fer espectres de masses sense preparació prèvia de la mostra [R. G. Crooks et al., *Science*, **306**, 471 (2004)]
- Estudis fets sobre treballadors de fàbriques xineses mostren que el benzè és més tòxic del que es pensava [Q. Lan et al., *Science*, **306**, 1774 (2004)].
- Aquest número recomanem la pàgina web de la molècula de la setmana: http://www.chemistry.org/portal/a/c/s/1/home.html

L'element número **19**, **potassi**, va ser descobert el 1894 per Sir Humphrey Davy. El seu nom prové de l'expressió anglesa *pot ashes* que significa *cendres de pot*.