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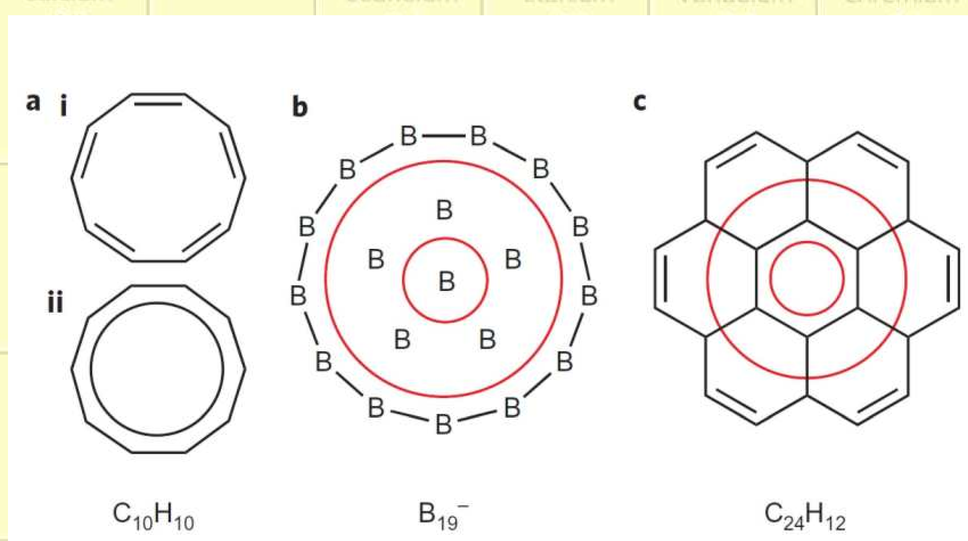
B_{19}^-: una rodella de bor

Clusters of nineteen boron atoms gather together in a ring structure unlike any other seen, with two planar π-bonded aromatic systems nestled inside one another (W. Huang *et al.*, *Nature Chem.* **2010**, *2*, 202).

The lowest energy form of B_{19}^- boasts a pentagonal six-atom group sharing two π-electrons, surrounded by thirteen boron atoms sharing ten electrons. Although concentric π-systems have been seen in organic molecules, none have exactly this electronic configuration.

Wang's group had actually generated the B_{19}^- cluster years before, using a laser to vaporise a ^{10}B-enriched disc target. They then measured the cluster's photoelectron spectrum to produce an 'electronic fingerprint'. From then on, the puzzle was which structure generated the correct spectrum. The breakthrough came when Huang used a so-called Basin-Hoping algorithm to search for the most stable atomic arrangement of the 19-atom cluster. Then Boldyrev's group performed more accurate calculations to generate a theoretical spectrum confirming the proposed concentric ring structure, and analysed its chemical bonding to discover the double π-system.

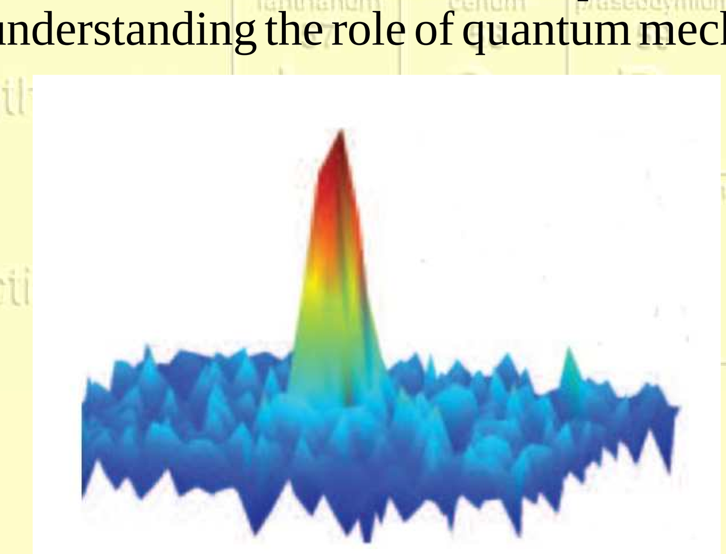


Química *supergèlida*

The first indication that chemical reactions can occur at nano-Kelvin temperatures has raised the tantalizing possibility of a new realm of quantum-controlled, ultracold chemistry (S. Ospelkaus *et al.*, *Science* **2010**, *327*, 853).

The experiments involved using laser techniques to create an ultracold, dense gas of KRb molecules in their ground state. Under such circumstances, one might think that chemistry would turn off. In fact, chemistry still happens, although understanding it requires a decidedly different view of reactivity. Gone is the classical picture of a collision between two billiard balls, with the ensuing interaction of electrons. Instead, quantum mechanics takes over, and the molecules must be thought of as waves. Whether and how those waves interact determines chemical reactivity. Consequently, molecules can react even if they're barely moving and are at a distance from each other.

The ability to create ultracold gases is currently limited primarily to alkali and alkaline earth metals, which have a limited chemistry. Researchers are developing new methods to cool a wider range of molecules, which would further open the possibilities of precisely controlled chemistry and understanding the role of quantum mechanics in reactivity.

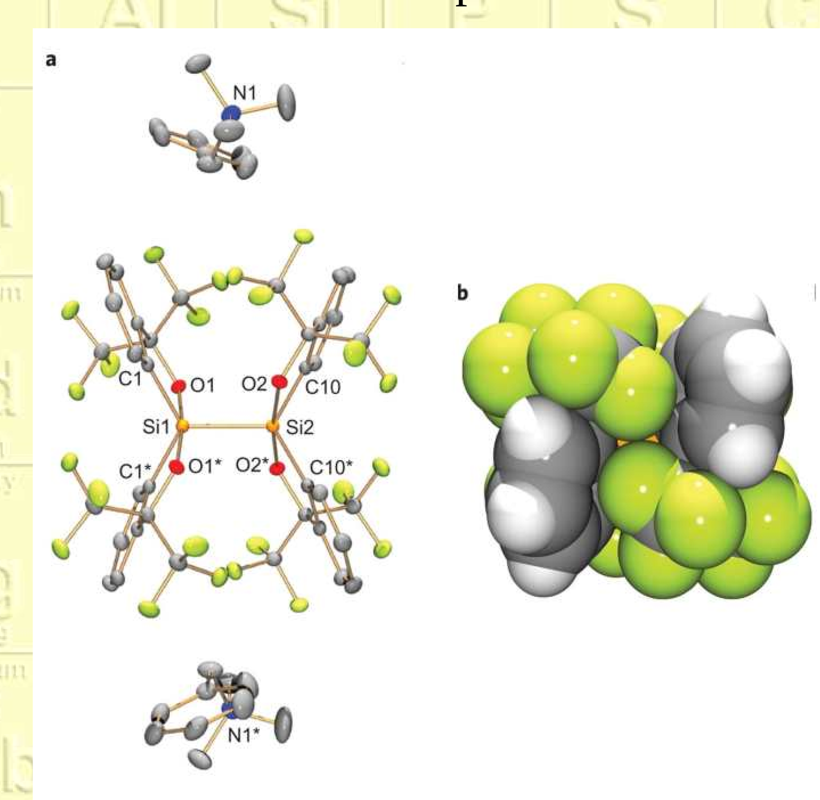


Un disilicat peculiar

A compound containing a stable silicon-silicon bond between two negatively charged pentacoordinated silicon atoms - silicates - has been synthesized and isolated for the first time by Japanese researchers. The new disilicate species offers unexpected insight into silicon chemistry and could be useful for making new conductive and optical materials (*Nature Chem.* **2010**, *2*, 112)

Silicon normally combines with four other atoms to form a tetracoordinated structure, which can form a bond with another tetracoordinated silicon atom. Such structures form the basis of the crystalline silicon used for semi-conductors and organosilicon compounds. Previously, the highest coordination number in silicon atoms to allow for a stable silicon-silicon bond was widely thought to be four.

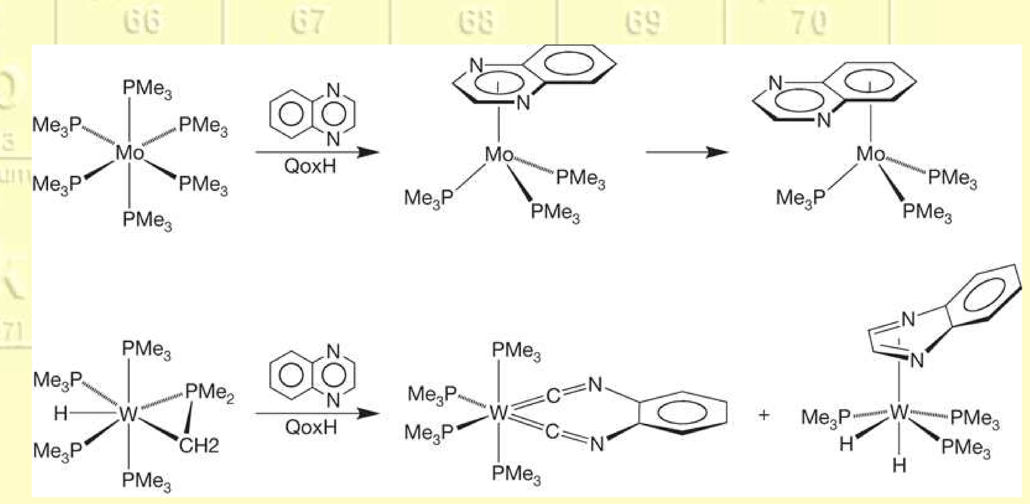
Now, Naokazu Kano and colleagues at the University of Tokyo and the Institute for Molecular Science in Japan have created a direct Si-Si bond between pentacoordinated silicon atoms of silicates. The result is surprising because such a bond would be expected to cleave due to strong steric and electrostatic repulsion between the silicon atoms.



El tungstè trenca l'aromaticitat

A strong aromatic carbon-carbon bond can be cleaved with ease by a tungsten complex that inserts the metal between the two carbon atoms, report chemists at Columbia University (*Nature* **2010**, *463*, 523). The mechanism of this unusual bond breaking, which was observed in quinoxaline under mild conditions, could be extended to other systems, say the report's authors, opening new avenues for functionalizing aromatic molecules.

Aaron Sattler and Gerard Parkin discovered the tungsten complex's bond-breaking ability while searching for a compound that would cleave C–N aromatic bonds. They had been working with molybdenum complexes but decided to switch to tungsten, which is a more aggressive metal. Sattler and Parkin were surprised to find that in the presence of the N heterocyclic molecule quinoxaline, the tungsten complex breaks the aromatic C–C bond adjacent to the aromatic C–N bond, even though the C–N bond is typically more reactive.



Breus

- Després d'una debat intens, la IUPAC ha aprovat el símbol *Cn* per a l'element *copernici*, en lloc del *Cp* proposat inicialment.
- La *Cambridge Structural Database*, base de dades d'estructures cristal·lines, ha arribat a l'entrada mig milió.
- Un nou tipus de rellotge òptic, basat en un únic àtom d'alumini, ha batut el rècord de precisió: té un error de un segon cada 3700 milions d'anys (C. W. Chou *et al.*, *Phys. Rev. Lett.*, **2010**, *104*, 070802).

Avui recomanem

Chemogenesis és un webbook de química que és especialment destacable per la seva col·lecció de taules periòdiques, des d'una de Diderot de 1768 fins a les més actuals.

http://www.chemogenesis.com/

L'element

L'element número **49**, **indi**, fou descobert l'any 1863 pels químics alemanys Ferdinand Reich i Theodor Richter, quan buscaven tal·li en uns minerals de zinc; en observar a l'espectrògraf unes línies noves de color blau, les van assignar a un element nou i d'aquí en ve el nom.

És un element no gaire abundant a la terra (0.25 ppm), i es troba en molt pocs minerals. Les principals aplicacions són la fabricació d'aliatges de punt de fusió baix –la de composició 24% de In i 76% de Ga, és líquida a temperatura ambient–, de semiconductors, LEDs de color blau, pantalles de cristalls líquids i en altres àmbits de l'electrònica. Darrerament s'estan emprant capes primes que contenen indi en la fabricació de plaques solars.

L'isòtop ^{111}In, radioactiu, s'empra en medicina nuclear en el seguiment del moviment dels leucocits pel cos.