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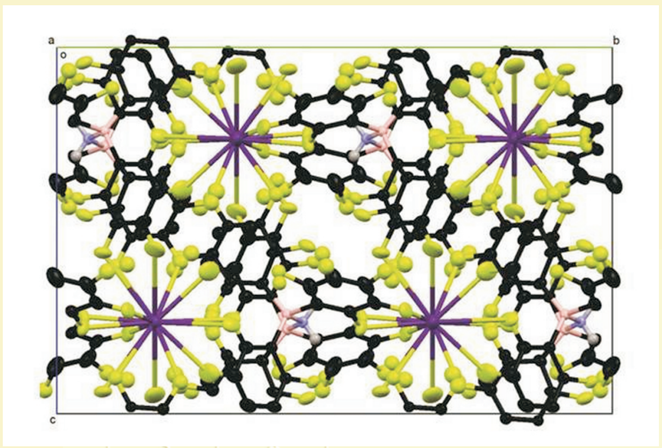
Editors: Gabriel Aullón, Ramón Bosque i Joaquim Sales. Correspondència: noticies@qi.ub.edu

El Cs s'apunta al 16 ...

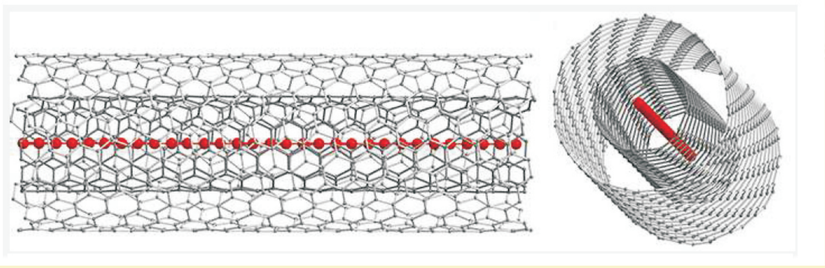
Among the elements, cesium, located in the lower left corner of the periodic table, and fluorine, in the upper right corner, are among the largest electropositive and smallest electronegative elements, respectively. When chemists look at possible ways to get the two elements together, something interesting is bound to happen. And it has. Klaus-Richard Pörschke, et al. of the Max Planck Institute have prepared a molecule in which a central cesium atom is coordinated by 16 fluorine atoms—achieving a perfect score for the maximum number of bonds possible and establishing a new precedent for bonding in the process. (*Abstracts of Papers, 251st ACS National Meeting*, San Diego, March 13-17, **2016**). The team prepared $Cs[H_2NB_2(C_6F_5)_6]$ by using ultrasound to agitate a solution of $[Na(OCH_2CH_3)_4][H_2NB_2(C_6F_5)_6]$ and CsF in dichloromethane. The researchers concentrated the solution and isolated crystals to study by X-ray crystallography.



This crystal structure shows central cesium cations (purple) coordinated by 16 fluorine atoms (yellow).

... i el C al 6000

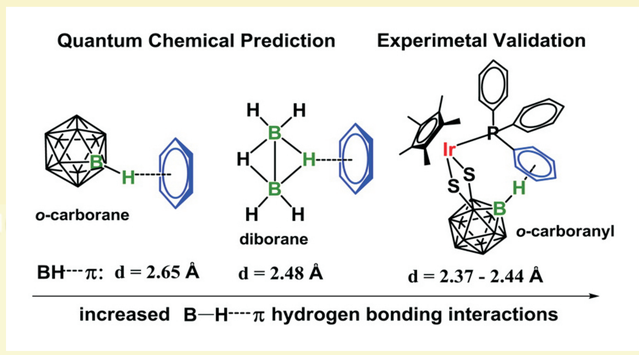
An international research team has created the longest linear carbon chain to date by linking more than 6000 carbon atoms into a single-file strand that stretches for nearly a micrometer (T. Pilcher et al., *Nat. Mater.*, **2016**; DOI: 10.1038/nmat4617). The previous record stood at around 100 carbon atoms, making the new result the closest approximation scientists have to carbyne, one of the world's more contentious materials. Theoretically, carbyne is an infinite line of carbon atoms, strung together with alternating single and triple bonds, with higher strength and stiffness than carbon's multidimensional allotropes: graphene, nanotubes and diamond. But real linear carbon chains are prone to cross-link explosively. The instability and litany of substances misidentified as carbyne have led to hot disputes when new claims of carbyne arise. The team deliberately dubbed their creations "long, linear carbon chains" and addressed the instability problem by growing their chains inside protective carbon nanotubes. The researchers annealed empty double-walled tubes with specific inner diameters — about 0.7 nm— under high vacuum to bolster formation of linear carbon chains. The team thus created much longer chains and many more of them compared with previous efforts.



A long, linear carbon chain (red) resides within two carbon nanotubes (gray), as shown from two perspectives. The inner tube has a diameter of about 0.7 nm.

Un altre tipus d'enllaç d'hidrogen

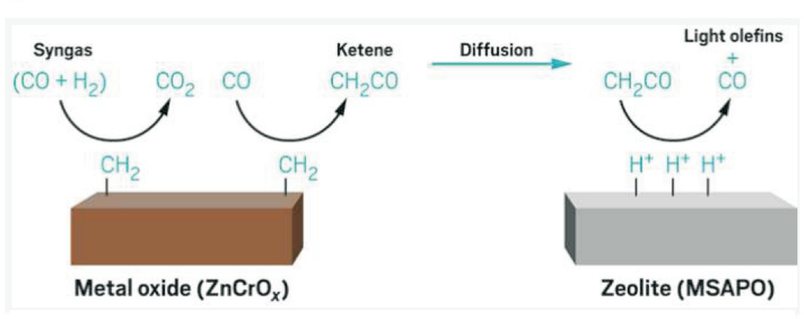
A weak type of hydrogen bond is known to form between C–H, N–H, and O–H groups and the π electron cloud of an aromatic ring. Similar interactions have been predicted for B–H groups on compounds such as diborane (B_2H_6) and o-carborane ($C_2B_{10}H_{12}$), in which the electronic structure produces a slight positive charge on the B–H hydrogens. A complex with a B–H···π interaction has now been created and characterized (Hong Yan et al., *J. Amer. Chem. Soc.*, **2016**; DOI:10.1021/jacs.6b01249). The ability to promote such interactions could have applications in molecular assembly and pharmaceutical binding. The researchers treated an iridium-dithiolene-carborane complex with phosphines to produce a molecule in which a carborane B–H group is in position to form a hydrogen bond with one of the phosphine phenyl rings. The researchers confirmed the hydrogen bond experimentally using NMR and X-ray crystallography studies. Computational analysis of the local stretching force constant of the hydrogen bond reveals that the strength of the B–H···π interaction is similar to that of the hydrogen bond in a water dimer.



An iridium complex positions a carborane to form a B–H interaction with a phenyl group.

Olefines més a l'abast

A catalytic technique has promise as a new way of industrially producing olefins such as ethylene and propylene. Manufacturers use low-molecular-weight olefins to make plastics, solvents, paints, medicines, and other products. The largest-volume organic chemicals produced worldwide, these "light" olefins have traditionally been made, and are still primarily made, by catalytic cracking of crude oil. Because of high oil prices and petroleum conservation efforts in past years, researchers developed two technologies as alternatives to catalytic cracking: the MTO (methanol to olefins) process and the FTO (Fischer-Tropsch to olefins) process. These methods use zeolite and metal catalysts, respectively, to convert syngas, a mixture of hydrogen and carbon monoxide, to olefins. The OX-ZEO (oxide-zeolite) technique, provides a third alternative (Xiulian Pan et al., *Science,* **2016**; DOI: 10.1126/science.aaf1835). The researchers optimized a catalyst system—the partially reduced metal-oxide surface catalyst $ZnCrO_x$ and a zeolite called MSAPO—to convert syngas to ketene (CH_2CO) and then into light olefins. OX-ZEO is highly selective for making light olefins over other products; it favors propene, which has been in short supply; its catalysts last a long time; its one-pot nature makes it streamlined; and it does not generate carbon deposits, which can degrade catalyst activity.



In the OX-ZEO technique, activation of syngas on a metal-oxide surface forms H_2 groups that help create ketene, which then diffuses to a zeolite with hydrogen active site, giving rise to light olefins

Breus

• La comparació de les anàlisis isotòpiques d'oxigen en roques de la lluna i la terra confirma que la lluna es formà, fa uns 4.500 milions d'anys, en el xoc entre un cos planetari anomenant *Theia* i la terra (E. D. Young et al., *Science*, **2015**; DOI:10.1126/science.aad0525).

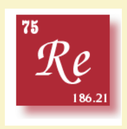
• Un dron d'1.7 Kg de pes i equipat amb un espectròmetre làser, anomenat «quadcopter», és capaç de detectar ppb de metà (Chem. & News, **2016**, *94(15),* 9. 11.04.2016).

•S'ha dissenyat una eina interactiva que permet la selecció d'un solvent segons les seves propietats físiques i químiques, la normativa reguladora, i l'impacte SHE (*safety, health, environmental*). (L.J. Diorazio et al., *Org. Process Res. Dev*., **2016,** *20,* 760; DOI: 10.1021/acsoprd6b00015).

Avui recomanem

El web de la *Chemical Heritage Foundation (CHF)* de Filadèlfia, organització dedicada a la història de la ciència, que manté una biblioteca , un arxiu i un museu especialitzats molt valuosos. Recentment ha adquirit un text d'alquímia, en llatí, d'Isaac Newton sobre la preparació de «mercuri filosòfic», una substància capaç de descompondre els metalls en els seus components. (www.chemheritage.org)

L'element



L'element número 75, **reni**, no fou descobert fins l'any 1925 - de fet fou l'últim element trobat amb isòtops estables - pels químics alemanys Walter Noddack, Ida Tacke i Otto Berg, que el van detectar com a impuresa en la gadolinita, un silicat de diversos lantànids. Forma part de la llista d'elements predits per Mendeléiev. La producció anual és de l'ordre de 5 Tm i les reserves, en la molibdenita, MoS_2, d'unes 3500 Tm, localitzades als EUA, Rússia i Xile. Es coneixen dos isòtops naturals, l'estable, 185-Re, en representa només el 37.5%, el 62.6 % restant, 187-Re, té una vida mitjana de 10^{10} anys; es coneixen alguns altres isòtops molt inestables. S'empra, principalment, com a component en aliatges resistents a temperatures molt altes; com a catalitzador en processos d'hidrogenació d'olefines i en la fabricació de gasolina d'alt octanatge. No se li coneix cap activitat biològica. Els isòtops radioactius 186 i 188 s'usen en el tractament de càncer de fetge i pàncrees. L'any 1994, es va descobrir el primer mineral de Re a la naturalesa, ReS_2, format en la condensació de les fumaroles del volcà Kudriavy a les illes Kuril (Rússia).