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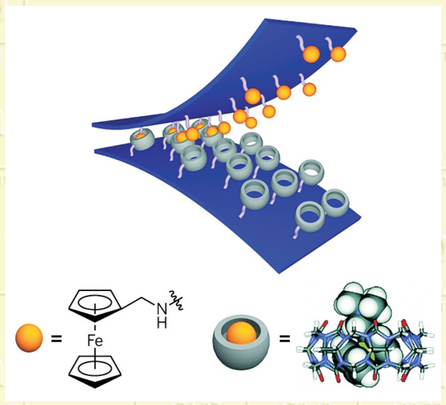
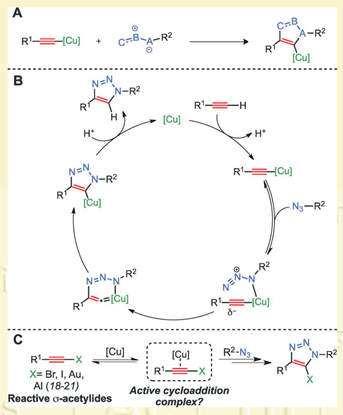
Un *velcro* amb ferrocè

Aquatic creatures such as mussels are experts at sticking to wet surfaces, providing inspiration for researchers to design glues based on the animals' secretions. But these synthetic adhesives typically require curing agents and are then irreversibly sticky. To overcome these limitations, a research group has created a new adhesive that works under water. It has molecular hooks and loops akin to the fabric structures that hold together Velcro (K. Kimm et al., *Angew. Chem. Int. Ed.*, **2013**, *52*, 3140). The team coated one silicon surface with aminomethylferrocene and another surface with cucurbit[7]uril, a large doughnut-shaped molecule. The aminomethylferrocenes (the hooks) fit snugly into the hydrophobic cavities of the cucurbit[7]urils (the loops). The sticky system is strong enough to support a 2-kg weight, even under water. The added bonus, the team says, is that the adhesive can be chemically switched off: When immersed in a solution of sodium hypochlorite, which oxidizes aminomethylferrocene, the silicon surfaces come apart with only the pull of a 0.5-kg weight. The researchers have filed a patent for their molecular Velcro, and they will work next on attaching the hook and loop compounds to polymer surfaces.



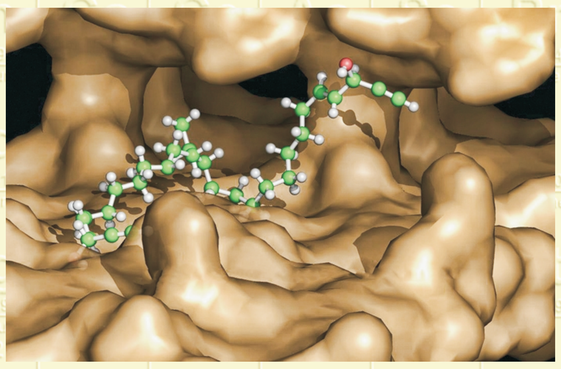
El coure fa clic

The copper-catalyzed addition of azides and alkynes to form triazoles has been hailed as the crème de la crème of click chemistry—a way to assemble molecules via rapid, irreversible reactions. It is an efficient way to make biological probes, novel polymers, drug candidates, and smart materials. Now, researchers looking under the hood of this chemical transformation have found a few surprises in its mechanism (V.V. Fokin et al., *Science*, **2013**, *340*, 457). They hope their new knowledge will lead to further improvements in the design of reactions for synthetic chemistry and perhaps to new uses for copper isotope analysis. Most notably in the recent work, chemists have been able to prove that two copper atoms are involved in the Cu(I)-catalyzed azide-alkyne cycloaddition, also known as the CuAAC reaction. "This is the first time someone was able to show there is a two-copper intermediate that is very short-lived. We cannot isolate it. We cannot see it. But we can implicate its existence unambiguously," Fokin adds.



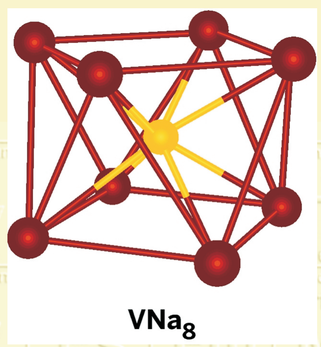
Cristal·lografia sense cristalls

Crystals are the preferred material chemists use to determine molecular structure via X-ray crystallography. But when scientists can't crystallize a substance, or not enough exists to get good crystals, they face a roadblock. Now, researchers have found a way to solve this problem using nanoscale scaffolds to capture the molecules they want to visualize. In X-ray crystallography, X-rays are shot through a single crystal of a compound. How they bounce, or diffract in crystallographic lingo, reveals the structure of the molecule that makes up the crystal. The technique has helped scientists visualize innumerable molecules, including antibiotics, industrial catalysts, and even artificial sweeteners. Researchers report it can use porous metal frameworks with large cavities as "crystalline sponges" that soak up guest molecules within their voids, putting the molecules in an ordered array that can be studied via X-ray crystallography (M. Fujita et al., *Nature*, **2013**, *495*, 461). The technique works on as little as 80 ng of material. In one example, the researchers used a zinc-based crystalline sponge to soak up just 5 μg of miyakosyne A, a scarce marine natural product that had defied stereochemical assignment. Using their crystal-free crystallographic technique, the team was able to identify the compound's stereochemistry. At the moment, the crystalline sponges are not commercially available, and the small molecules that can be studied with this technique are limited to those that fit within the sponges' pores. Inokuma believes that these limitations will be solved in time.



Superàtoms magnètics

Small metal clusters called superatoms that mimic the properties of individual atoms are of interest as potential building blocks for nanostructured materials. Magnetic superatoms in particular could be used in so-called spintronic devices, which store information using electron spins rather than charges. Although a variety of superatoms have been made, a team reports the first synthesis of magnetic superatoms (S.N. Khanna et al., *J. Am. Chem. Soc.*, **2013**, *135*, 4856). The researchers prepared vanadium-sodium clusters using a pulsed arc cluster ionization source to vaporize metal electrodes. They studied the resulting clusters by photoelectron spectroscopy and computational methods. The results show that VNa_8 and VNa_7^- are magnetic superatoms with valence electron configurations resembling those of manganese atoms, whereas VNa_8^- and VNa_9 resemble chromium. Further research is needed to improve the synthesis and to stabilize the clusters, but the strong spin magnetic moments of the clusters suggest they could be used in spintronics.



Breus

• És ben sabut que el metilmercuri, CH_3Hg^+, és l'espècie tòxica produïda per microorganismes, mitjançant la qual el mercuri s'acumula a través de la cadena alimentària. S'acaba d'identificar els gens i les proteïnes responsables del procés de metilació (J. Parks et al., *Science*, **2013**, *339*, 1332).

• La revista *Angewandte Chemie* de la Societat Alemanya de Química ha complert 125 anys; destinada inicialment als químics industrials actualment és una de les revistes més prestigioses de la química. Manté l'edició en alemany i una altra, idèntica, en anglès, *Angewandte Chemie International Edition.*

• El meteorit que el passat 15 de febrer caigué a Rússia era condrita material típic dels meteorits rocosos, compostos principalment per olivines i piroxens.

Avui recomanem

El número 8 de la col·lecció Clàssics de la Química, editada per la Societat Catalana de Química, «*Enric Moles, Determinació de pesos moleculars de gasos pel mètode de les densitats límit*» traducció, introducció i comentaris de Joaquim Sales (UB) i Agustí Nieto-Galan (UAB). Amb aquesta publicació s'inicien una sèrie d'actes en homenatge a Enric Moles i Ormella (1883-1953), possiblement el químic català de més renom internacional de la primera meitat del segle XX.

L'element

L'element número 63, l'**europi**, fou aïllat per primer cop, bastant impur, per Paul Lecoq de Bosibaudran l'any 1890, no obstant el descobriment s'atribueix a Eugène-Antole Demarçay l'any 1901, que el separà d'un material que contenia samari de manera majoritària, i li donà el nom en clar homenatge al continent europeu. Tot amb tot, William Crookes l'havia detectat abans, l'any 1885, en espectres de fosforescència de terres rares.

En relació a altres elements té poques aplicacions comercials i quasi sempre relacionades amb les propietats fosforescents dels compostos de Eu(II) i Eu(III), en vidres, làsers, pantalles de TV i altres aparells electrònics. Alguns derivats com $Eu(fod)_3$ i $Eu(hfc)_3$ encara s'usen com a agents de desplaçament en RMN i en la determinació d'excessos enantiomèrics. No hi ha dades definitives sobre la toxicitat, però tot indica que ho és menys que altres metalls pesants.

Les roques de la lluna tenen una concentració d'europi superior a les de la terra, fet que suggereix que la terra i la lluna no provenen d'un mateix material còsmic; de fet encara no hi ha una teoria que expliqui de manera convincent la formació de la lluna.