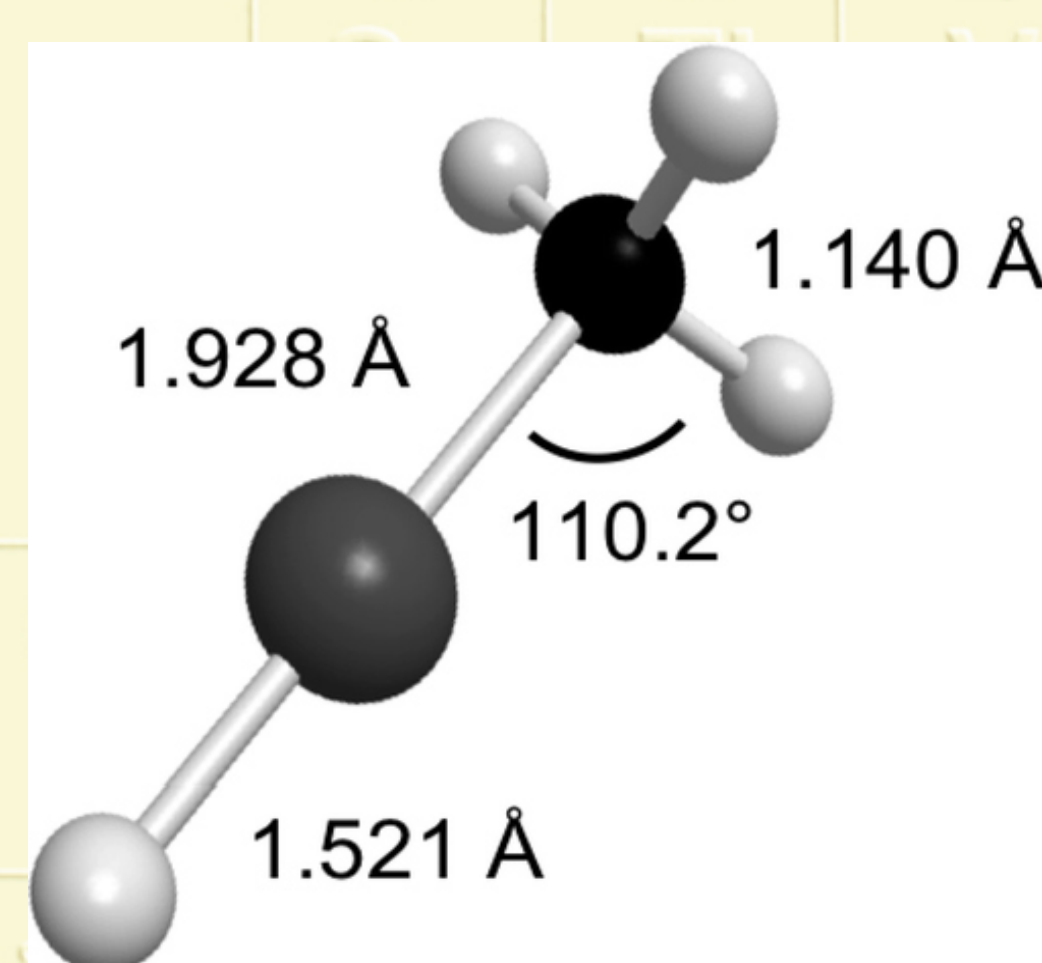


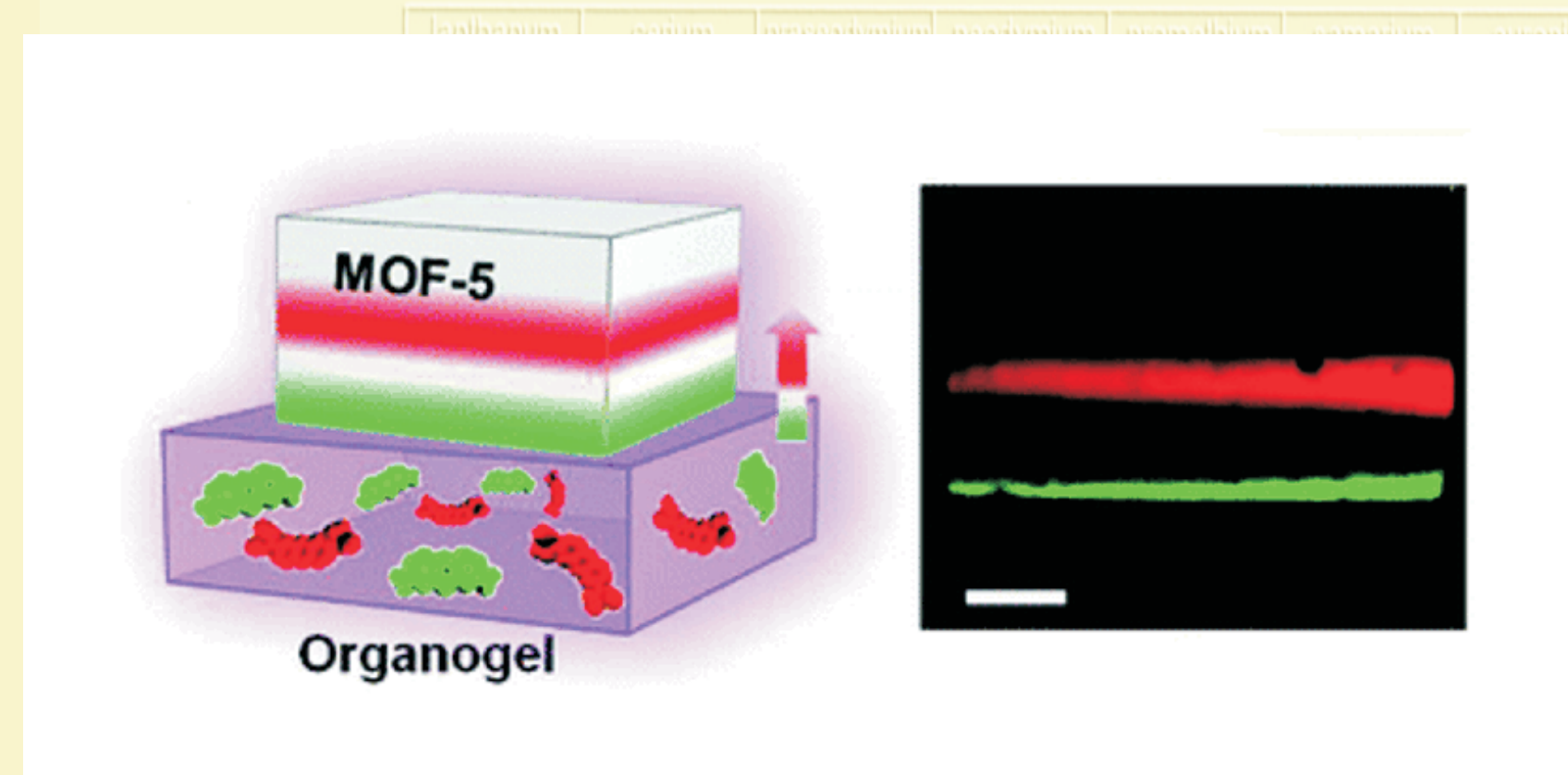
Per fi la reacció directa metall + metà

Researchers at the University of Arizona have captured the first detailed structure of a molecule formed by insertion of a transition metal into a C–H bond of methane (L. M. Ziurys, et al, *J. Am. Chem. Soc.*, **2010**, 132, 17186). The achievement gives new insight into the mechanisms of catalytic C–C and C–H bond activations that are important in organic synthesis. Scientists have previously tried multiple approaches for obtaining a structural snapshot of metal-methane insertion complexes. Those efforts have been limited until now to photochemical reactions in low-temperature inert-gas matrices or gas-phase molecular beam experiments, which can help researchers tell that metal insertion has taken place but can't provide exact structural details about the insertion products. Ziurys and coworkers produced HZnCH_3 in the gas phase by reacting $\text{Zn}(\text{CH}_3)_2$ with H_2 and CH_4 in an electric discharge or by reacting zinc vapor with CH_4 in an electric discharge. The researchers determined HZnCH_3 's precise structure by examining zinc, carbon, and hydrogen isotopic variations in high-resolution rotational spectra recorded using a combination of microwave spectroscopy techniques. They found that HZnCH_3 is relatively stable, has covalent H–Zn and Zn–C bonds, and likely forms by direct Zn insertion into a C–H bond rather than first forming ZnH or ZnCH_3 species.



La columna cromatogràfica més petita del món

Single metal-organic framework (MOF) crystals can be used to separate mixtures of dyes just like a miniature chromatography column. MOFs are highly porous structures made of metal oxide hubs joined by organic struts, and can adsorb high volumes of molecules onto the surface of the cavities within their structures. Ordinarily, using MOFs instead of silica to separate liquids in a chromatography column would require columns up to tens of metres long. Now a single millimetre-sized MOF crystal made from terephthalic acid struts and octahedral carboxylate $\text{Zn}_4\text{O}(\text{CO}_2)_6$ hubs to separate dyes on a much smaller scale. The team placed the MOF crystal on an organogel that had been soaked in dimethylformamide containing a mixture of two fluorescent dyes. Over a distance of just a few hundred micrometres, the mixture separated as it flowed up through the MOF. The team monitored the separations and measured the concentrations of each dye using fluorescence confocal microscopy - an optical imaging technique - and found that each of the dyes were clearly separated by the MOF. (S. Han et al, *J. Am. Chem. Soc.*, **2010**, 132, 16358)

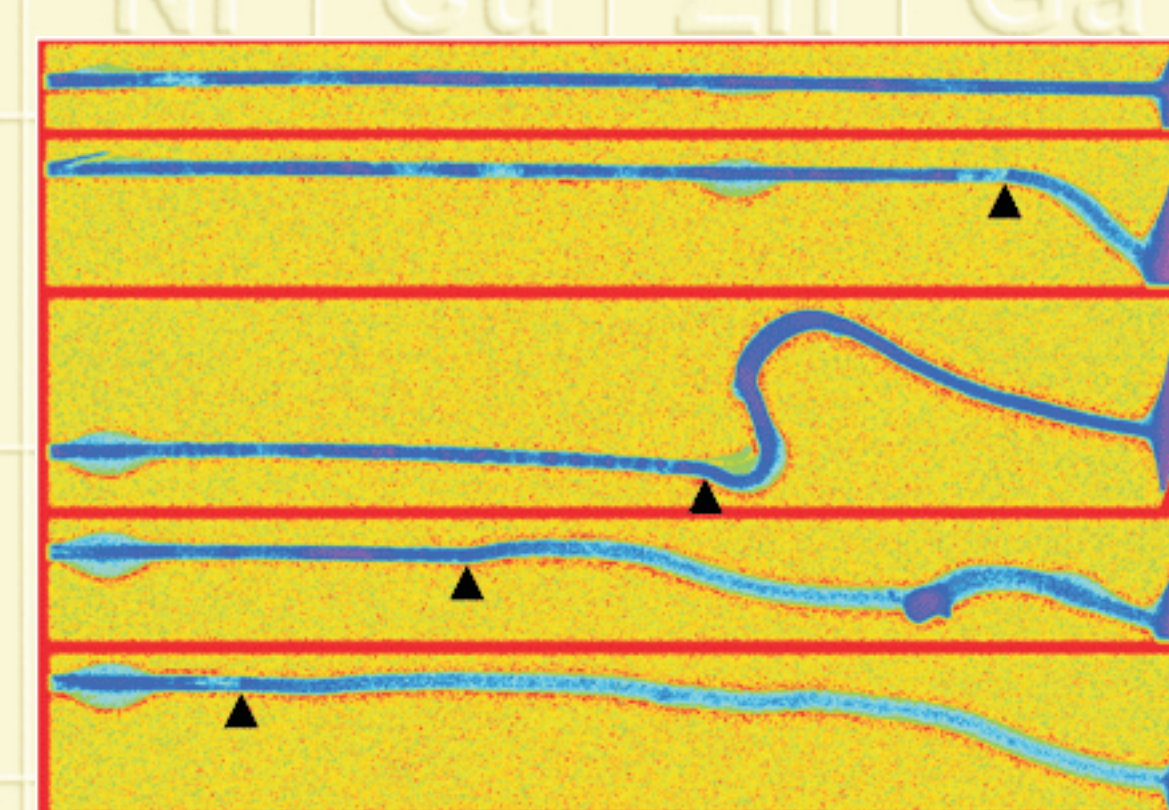


The MOF column separates dyes over a distance of a few hundred micrometres

Les intimitats de les bateries

A tiny lithium-ion rechargeable battery built inside a transmission electron microscope shows for the first time how a SnO_2 nanowire electrode swells and distorts as it is charged, (J. Y. Huang et al, *Science*, **2010**, 330, 1515). A crystalline SnO_2 nanowire made up the battery anode in the study, with bulk LiCoO_2 serving as the cathode. An microscope is used to watch what happens to the nanowire as it is first reduced. In the reduction step, four Li^+ ions and four electrons react with a molecule of SnO_2 to produce two Li_2O molecules and metallic Sn. A reaction front migrates along the wire from the electrolyte, converting the wire from crystalline SnO_2 to amorphous Li_2O with metallic Sn and Li_2Sn dispersed throughout as nanocrystals. The reaction front contains a high density of crystallographic defects, or dislocations. The researchers propose that the dislocation points may be lithium transport sites. After the first charge, the Li_2O becomes a permanent part of the electrode. In addition to providing a better understanding of the transformation of the nanowire's composition, phase, and plasticity under strain, visualizing the effects could have consequences for battery assembly. The bending, coiling, and twisting of electrode wires will have to be accommodated in battery design to prevent loss of electrical contact and shorting across different electrode wires.

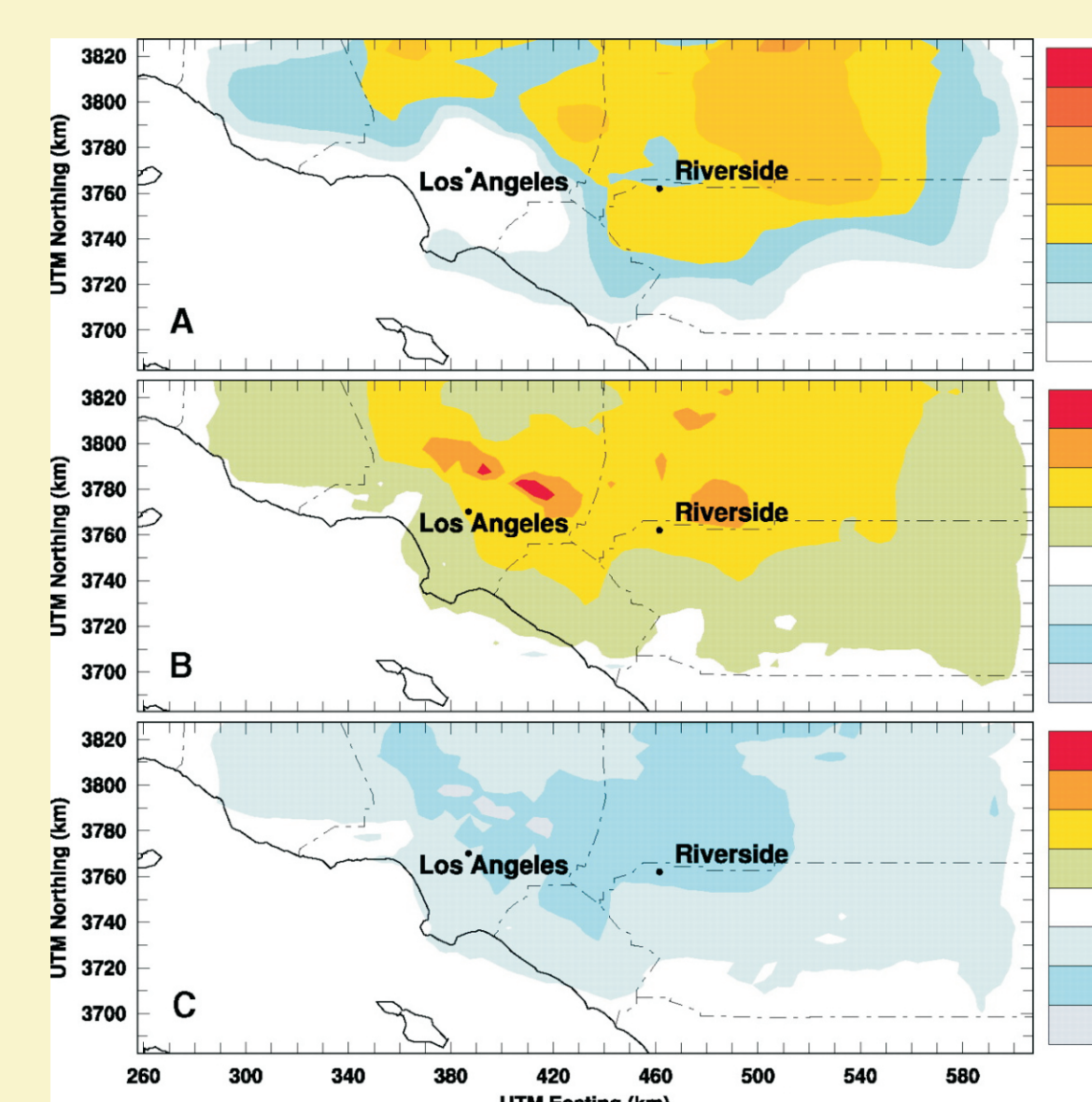
A <http://mt.seas.upenn.edu/Stuff/sn/Movie> poden veure's un conjunt de videos.



Sequential TEM images of a 16-µm-long nanowire electrode show the wire expanding and coiling as it charges in a lithium-ion battery. The electrolyte is to the right, and the black triangle

Més contaminats del que ens pensàvem

The reaction of hydroxyl radicals with nitrogen dioxide to form gaseous nitric acid is critical in atmospheric chemistry because it sequesters the reagents and slows the catalytic cycle that produces air pollutants such as ozone. Researchers have struggled, however, to pin down the reaction's rate constant, which is a key component of atmospheric modeling. They have now used pulsed-laser photolysis to remeasure the overall rate constant and quantify the yields of both nitric acid and a competing product, peroxyxynitrous acid (A. K. Molner et al, *Science*, **2010**, 330, 646). It has been found that the rate constant for nitric acid formation is $9.2 \times 10^{-12} \text{ cm}^3 \text{ molecule}^{-1} \text{ second}^{-1}$ at 1 atm and 25°C, as much as 20% lower than values currently recommended by data evaluation panels for atmospheric modeling. Incorporating the new constant into a model of summer ozone formation in the Los Angeles Basin, the researchers observed a 10% increase in computed peak ozone concentration, an amount that could change the assessed impact on human health.



Spatial distribution of predicted midday summertime ozone concentrations in parts per billion in southern California using emission inventory estimates for 2010. (A) defines k_{1a} as recommended by NASA/JPL 2006. (B and C) show ozone changes relative to the base case for (B) lower k_{1a} measured in this work and (C) higher k_{1a} recommended by IUPAC.

Any Internacional de la Química 2011



Com a acte inaugural, la Facultat ha organitzat la conferència que dictarà el Prof. Harold Kroto, de la Florida State University, amb el títol «Carbon in Nano and Outer Space». L'acte tindrà lloc el proper 11 de març, a les 12.30 h. a l'Aula Enric Casassas. El Prof. Kroto obtingué el Premi Nobel de Química l'any 1996, conjuntament amb Robert F. Curl i Richard E. Smalley pel descobriment dels full·lerens.

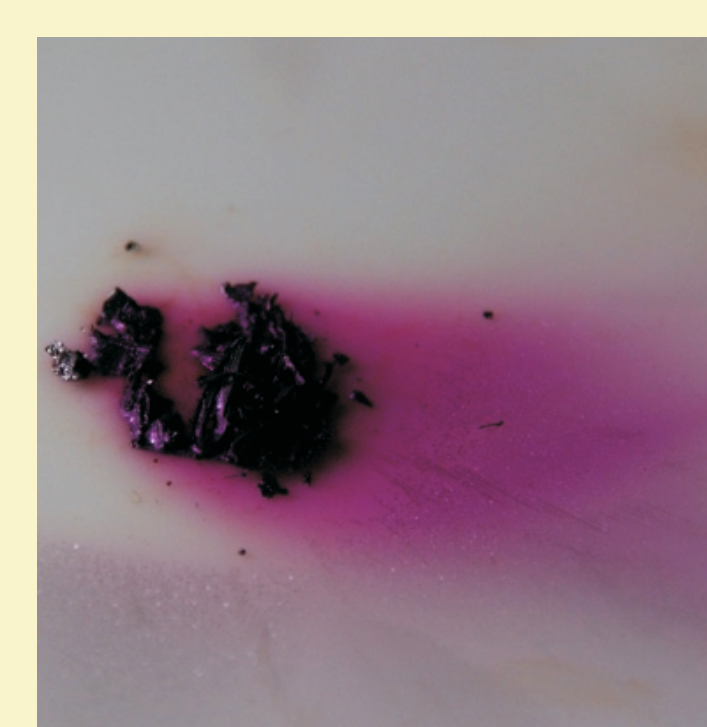
A <http://blocs.iec.cat/aiq2011>, podeu trobar tots els actes programats als Països Catalans

Breus

Amb motiu del 350è aniversari la Royal Society, la institució científica més antiga del món, ha publicat una sèrie d'articles sobre els principals reptes que la ciència té plantejats avui dia.

<http://royalsociety.org/further>

L'element



L'element número **53, iode**, fou descobert per Bernard Courtois el 1811, en tractar algues marines amb àcid sulfúric, quan intentava obtenir sals de sodi i potassi, relacionades amb la fabricació de pólvora, molt necessària en aquells temps de les guerres napoleòniques. El seu nom prové del terme grec *ιοειδης* que vol dir violat, en referència al color dels seus vapors i de la forma cristal·lina.

És un element no gaire abundant a la terra (0.45 ppm), però de coneixement popular atès l'ús tradicional com a desinfectant de les seves solucions alcohòliques. És essencial per a la vida, si bé la única funció coneguda en el cos humà és com a constituent de la tiroxina, hormona que es genera en el tiroides, i la seva deficiència produeix la malaltia del goll; en aquest sentit s'afegeix a la sal comercialitzada com a sal iodada.