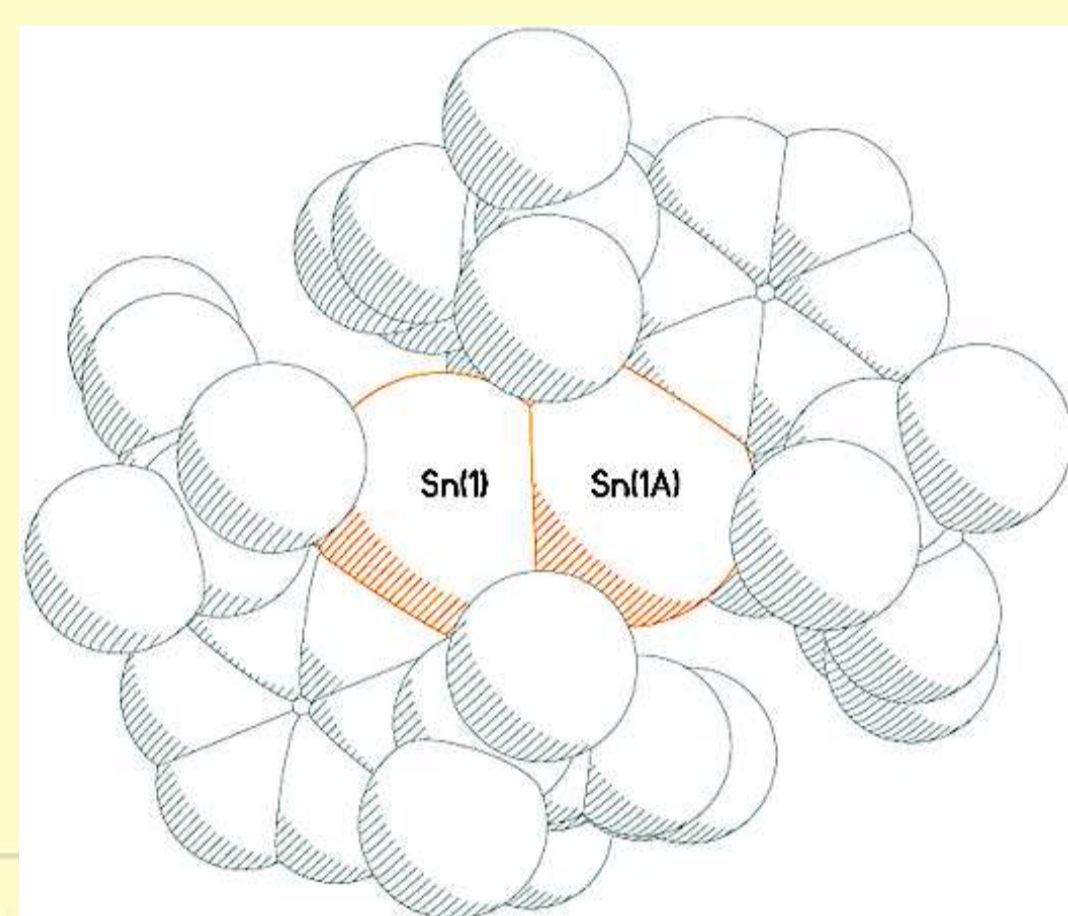


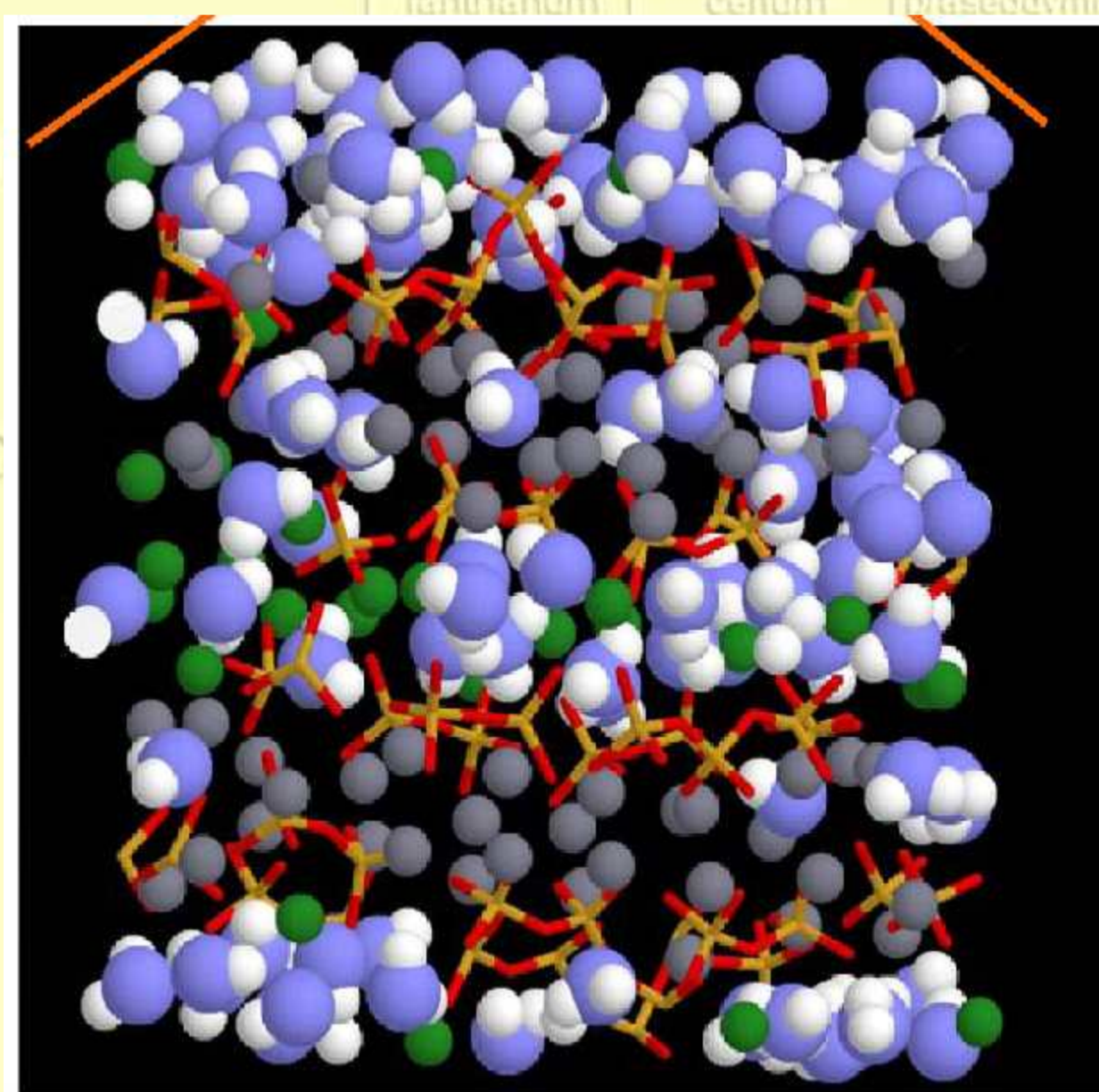
Els triples enllaços arriben a l'estany

A tin analog of acetylene, a rare compound with a Sn=Sn bond, is proving to have unusual reactivity: It reversibly adds two ethylene molecules across the triple bond under ambient conditions, a reaction normally forbidden to its carbon analog, report Philip P. Power and coworkers of the University of California, Davis (*Science* **2009**, 325, 1668). Cycloaddition reactions involving alkenes or alkynes are classic transformations in organic synthesis, leading to stable products. These reactions are normally "symmetry forbidden," meaning that under standard conditions the molecular orbital overlap is insufficient for bonding to occur. This barrier can be overcome by boosting the energy of the system with heat or light. In contrast, alkene and alkyne analogs of silicon, germanium, tin, and lead can undergo cycloadditions under mild conditions. But until now, even those reactions were irreversible. The UC Davis team showed that once ethylene adds to the triple bond of the distannylene $R\text{Sn}=\text{Sn}R$, where R is a bulky phenyl group, the ethylene molecules of the isolable adduct that forms can pop off with a gentle change in temperature or pressure.



El ciment, més ben conegut

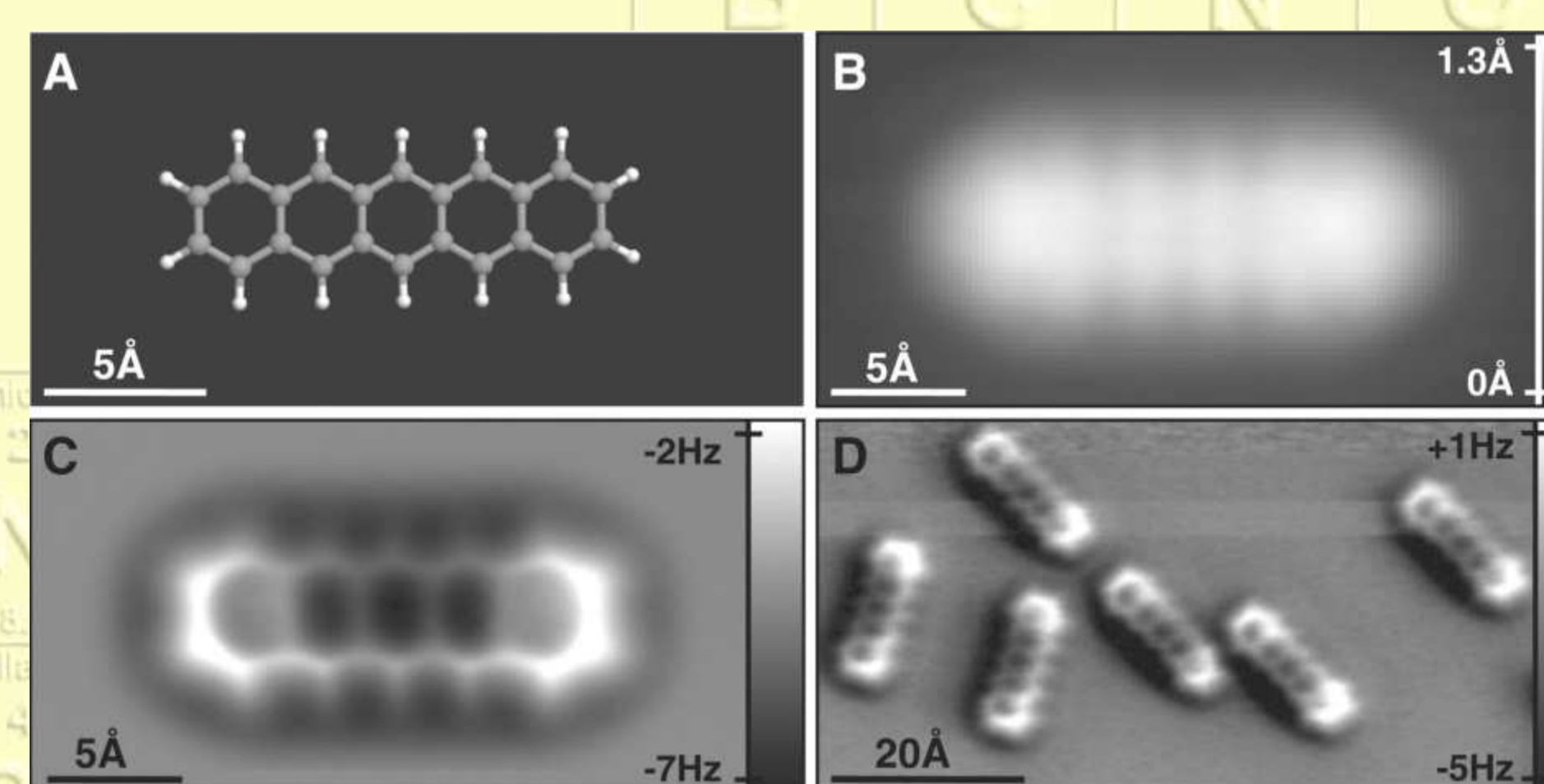
Cement used to make mortar and concrete is one of the most common building materials in the world. Despite its longtime use and scrutiny, there is still more to learn. An MIT research team led by Franz-Josef Ulm is reporting a new molecular model for evaluating cement hydrate—the calcium-silicate-water mineral phase in cement—that they say is the most realistic view of the material to date (*Proc. Natl. Acad. Sci. USA*, **2009**, 106, 16102). Previous models based on natural mineral analogs indicated that cement nanoparticles consist of long SiO_2 chains interspersed with neat layers of CaO and H_2O . Building on neutron scattering data reported in the literature that pinpointed cement hydrate's Ca/Si ratio and density, the researchers created a model showing that the nanoparticles are more accurately a hybrid of crystalline and amorphous $\text{CaO-SiO}_2\text{-H}_2\text{O}$. The hybrid model contains shorter SiO_2 chains with flaws that reach into the CaO layers, creating void spaces where H_2O molecules gather. This minor disorder provides some atomic-level give to cement, allowing it to stretch or compress under stress, rather than snapping. "Now that we have a validated molecular model, we can better manipulate cement's chemical structure to design concrete for desired strength, durability, and environmental qualities, such as low CO_2 emissions," Ulm says.



L'hidrogen ja no s'amaga

By functionalizing an atomic force microscope tip, researchers have greatly enhanced the resolution of atomic force microscopy (AFM), making it possible to view the entire structure of a single molecule. Physicist Leo Gross of IBM Research, in Rüschlikon, Switzerland, and coworkers accomplished the feat on the aromatic compound pentacene (*Science* **2009**, 325, 1110).

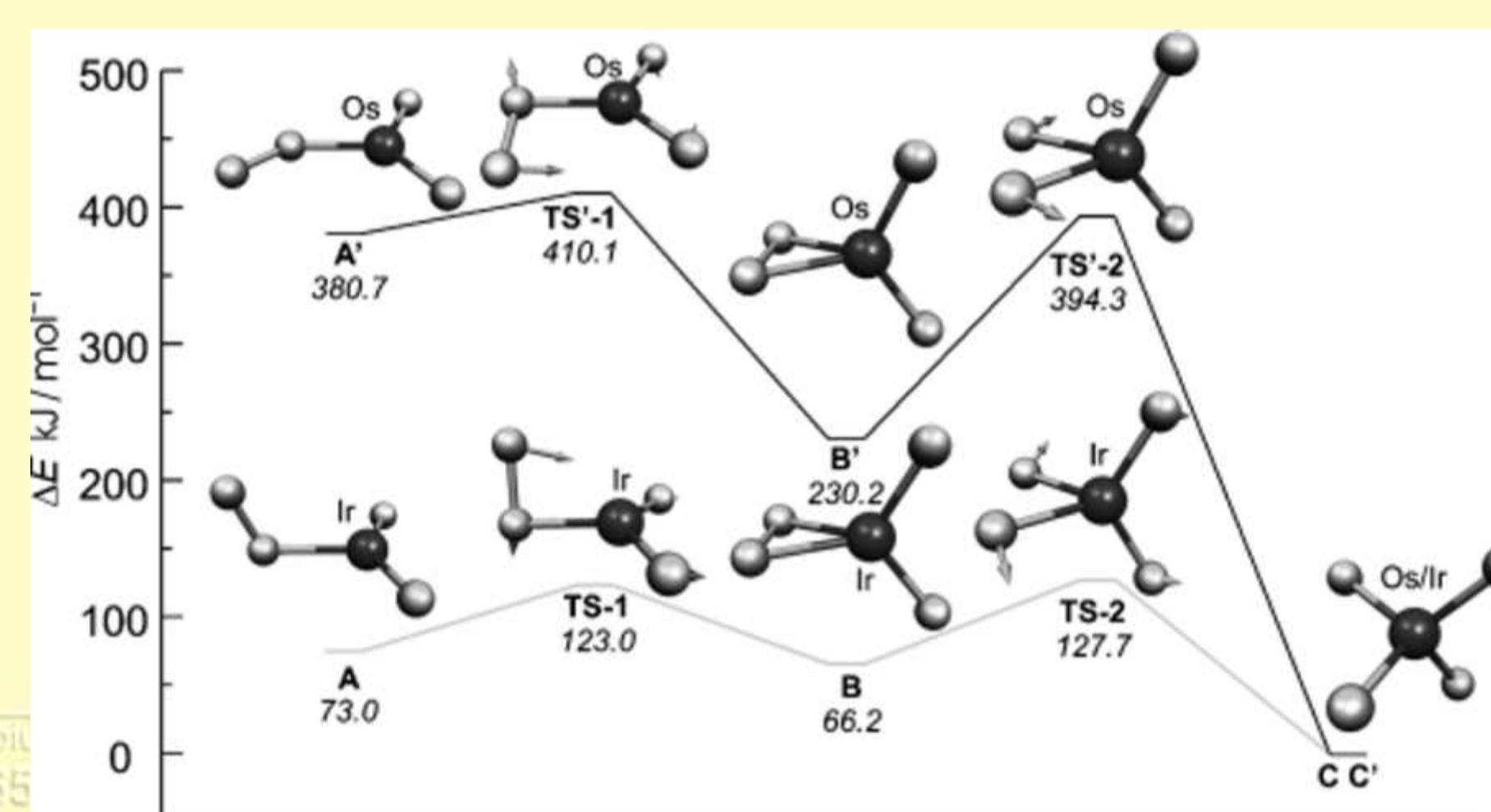
Although atomic resolution has been attained previously for AFM imaging of individual atoms in nanotubes and in unit cells of crystals on surfaces, this is the first time all the atom positions and bonds of a single molecule, including its hydrogens, have been visualized with atomic-scale precision. The IBM team overcame the atomic resolution barrier by trying a range of atoms and molecules as AFM tip terminations. They achieved their best imaging results by putting carbon monoxide onto the AFM tip.



STM and AFM imaging of pentacene on $\text{Cu}(111)$. (A) Ball-and-stick model of the pentacene molecule. (B) Constant-current STM and (C and D) constant-height AFM images of pentacene acquired with a CO -modified tip.

L'iridi arriba al vuit

Despite theoretical predictions that iridium is limited to a maximum oxidation state of $7+$, a group led by Mingfei Zhou of Fudan University, in Shanghai, and Sebastian Riedel of Albert Ludwigs University, in Freiburg, Germany, has experimentally observed IrO_4 featuring an $8+$ iridium center (*Angew. Chem. Int. Ed.*, **2009**, 48, 7879). The researchers formed the compound by codepositing iridium with O_2 and a noble gas onto a CsI surface at 4 to 6 K. After annealing the sample to 30 K, they used infrared spectroscopy to detect $(?^1\text{-O}_2)\text{IrO}_2$, where $(?^1\text{-O}_2)$ represents the end-on arrangement O-O-IrO_2 . Irradiating the sample with infrared light produced $(?^2\text{-O}_2)\text{IrO}_2$, where $?^2\text{-O}_2$ indicates a side-on bound O_2 (forming a three-membered IrO_2 ring). Further irradiation with visible light produced the complex identified as IrO_4 , which has four terminal $\text{Ir}=\text{O}$ bonds.



Fibres òptiques, Nobel 2009 de física

This year's Nobel Prize in Physics is awarded for two scientific achievements that have helped to shape the foundations of today's networked societies. In 1966, Charles K. Kao made a discovery that led to a breakthrough in fiber optics. He carefully calculated how to transmit light over long distances via optical glass fibers. With a fiber of purest glass it would be possible to transmit light signals over 100 kilometers, compared to only 20 meters for the fibers available in the 1960s.

Also, in 1969 Willard S. Boyle and George E. Smith invented the first successful imaging technology using a digital sensor, a CCD (Charge-Coupled Device), which has revolutionized photography.

Breus

- La base de dades CAS Registry de substàncies químiques ja té cinquanta milions d'entrades.
- Estudis isotòpics han revelat nous detalls sobre l'augment de la quantitat d'oxigen a l'atmosfera al llarg del temps (R. Frei *et al.*, *Nature* **2009**, 461, 250)
- L'orina podria ser més eficaç que l'aigua pura per produir hidrogen mitjançant mètodes electroquímics (B. K. Hoggs *et al.*, *Chem. Commun.* 2009, 4859)

Avui recomanem

Al centre Arts Santa Mònica, La Rambla 7 de Barcelona, pot veure's l'exposició "FREQUÈNCIES" d'Eugènia Balcells, que conté una Taula Periòdica amb els espectres d'emissió dels elements.

<http://frecuencias-eugeniabalcells.blogspot.com/2009/08/descripcio-del-proyecto.html>

L'element



L'element número **47**, **plata**, és conegut des de l'antiguitat i ja se'n parla al Gènesi. El nom prové del llatí *plattus* que significa *làmina metàl·lica*, i el símbol, Ag , ho fa del terme, també llatí, *argentum*, que vol dir *blanc, lluent*.

Element escàs a la terra, s'hi troba, majoritàriament, lliure o en forma de sulfurs. És un metall d'encunyar, dúctil, mal·leable i té una conductivitat elèctrica superior al coure. S'utilitza en joieria i, antigament, en la fabricació de monedes. Altres aplicacions importants són en contactes de generadors elèctrics, bateries d'alta capacitat, en electrònica i en la confecció de miralls. És un bon catalitzador en reaccions d'oxidació. Les sals tenen una activitat antimicrobiana important que les fa apropiades per a la preparació de medicaments, majoritàriament d'ús tòpic. Es manté viva la llegenda de la seva utilitat per eliminar criatures sobrenaturals, com els vampirs i els homes llop.