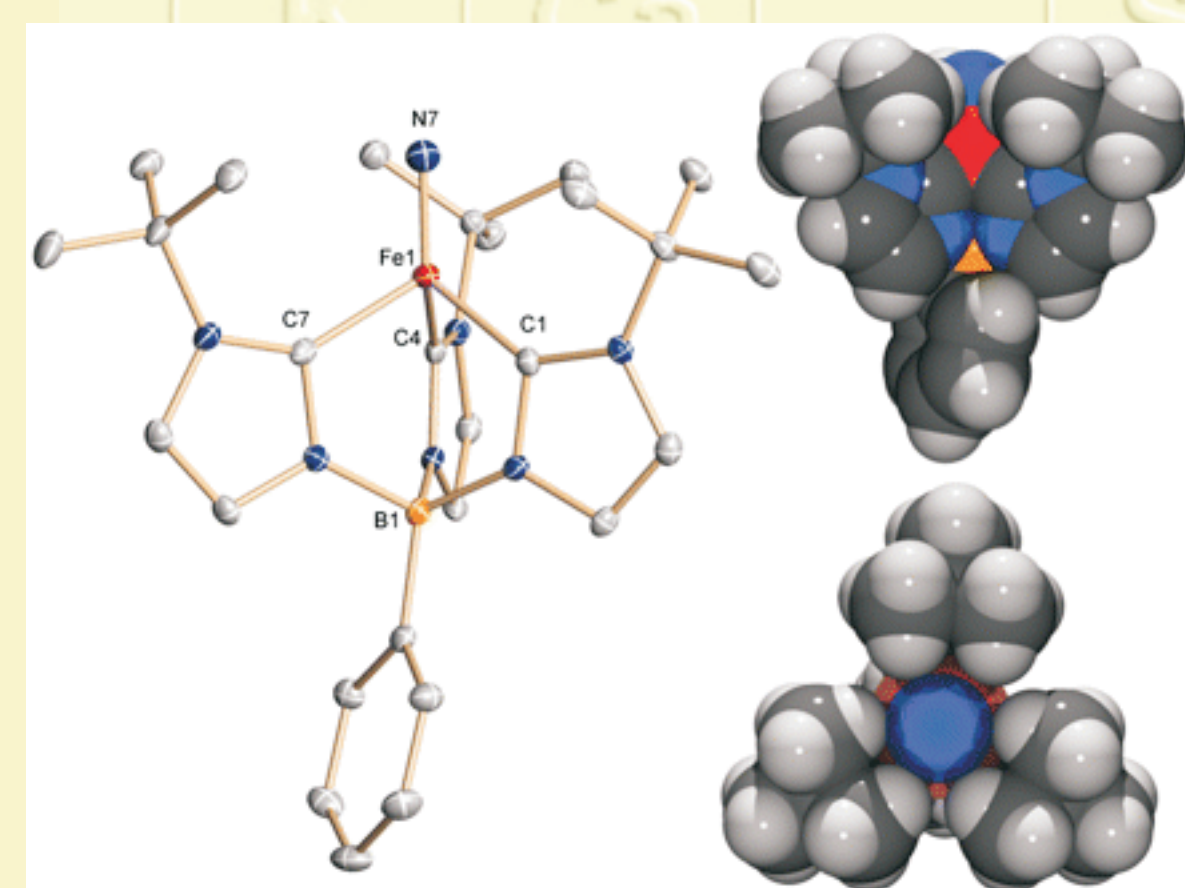


## El Fe(V) fa amoníac del nitrogen

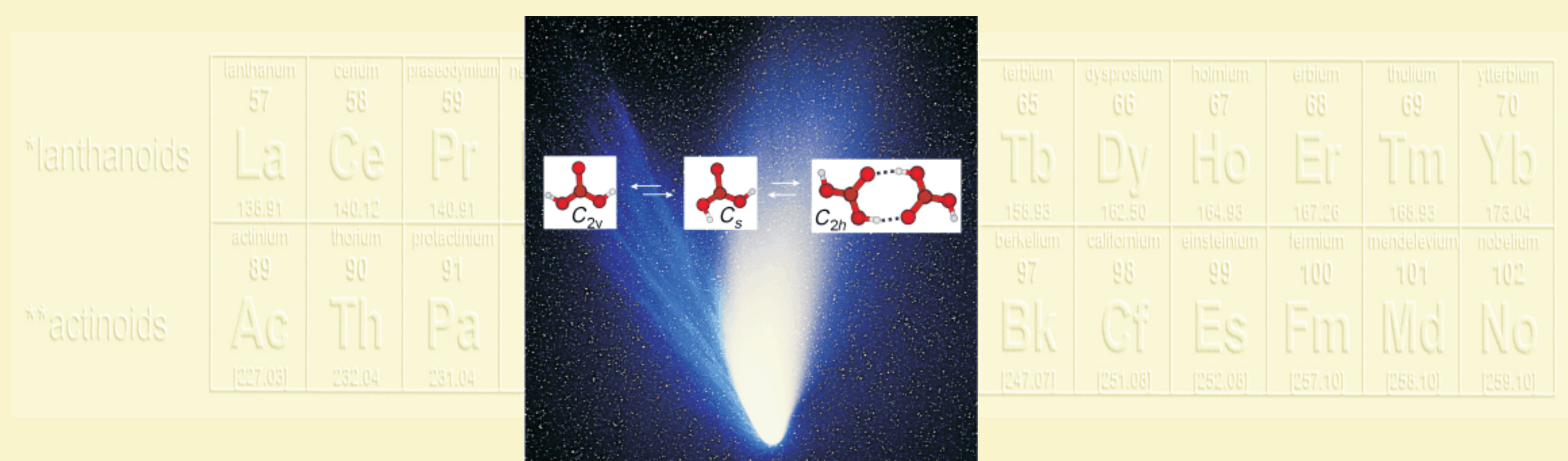
An international research team has isolated an iron(V) nitride ( $\text{Fe}=\text{N}$ ) complex that readily produces ammonia, mimicking one of the steps nitrogenase enzymes may use to reduce  $\text{N}_2$  to  $\text{NH}_3$  (K. Meyer et al, *Science*, **2011**, 331, 1049). Chemists are on the lookout for high-oxidation-state iron complexes with metal-ligand multiple bonds as models to study nitrogenase and other enzyme catalytic cycles with the goal of developing efficient industrial catalysts. In these cycles, iron shifts into different oxidation states to bind nitrogen intermediates on the pathway between  $\text{N}_2$  and  $\text{NH}_3$ . Iron(V) complexes proposed to participate in this process have been exceedingly hard to isolate and study, however. The researchers of New Mexico State University and of Friedrich Alexander University, in Erlangen, made their complex by synthesizing an iron(IV) complex containing a tripodal N-heterocyclic carbene ligand and then oxidizing it to iron(V). When the researchers added water and an electron source to the complex, the  $\text{Fe}=\text{N}$  group protected by the ligand—like the active site of an enzyme—produced ammonia within seconds and formed an iron(II) complex. This reactivity is similar to nitrogenase chemistry in which water supplies hydrogen for ammonia synthesis, the researchers note.



Molecular structure of  $[\text{PhB}(\text{tBulm})_3\text{FeV}=\text{N}]^+$   
 Fe = red, N = blue, C = gray, B = orange

## L'àcid carbònic enxampat

Carbonic acid, an elusive but important compound in geochemical, physiological, and atmospheric processes, has been trapped and analyzed spectroscopically in the gas phase by a team of researchers headed by chemists in Austria (*Angew. Chem. Int. Ed.*, **2011**, 50, 1939).  $\text{H}_2\text{CO}_3$  plays key roles in regulating blood pH, acidifying oceans, and dissolving minerals. The compound has been studied previously as a solid, but the gaseous species had escaped direct detection because it rapidly decomposes to water and carbon dioxide. That conventional wisdom needs to be updated, according to Thomas Loerting of the University of Innsbruck, Hinrich Grothe of Vienna University of Technology, and coworkers. The team reports that it has trapped gas-phase carbonic acid molecules in a noble-gas matrix at cryogenic temperatures and that the molecule is stable above 200 K. In addition, on the basis of infrared spectroscopy studies, the group proposes that  $\text{H}_2\text{CO}_3$  exists as a mixture with a 1:10:1 ratio of two monomeric conformers (*cis-trans* and *cis-cis*) and a cyclic dimer, respectively. These results could aid the search for gas-phase carbonic acid in astrophysical environments, the researchers say.



## Any Internacional de la Química 2011



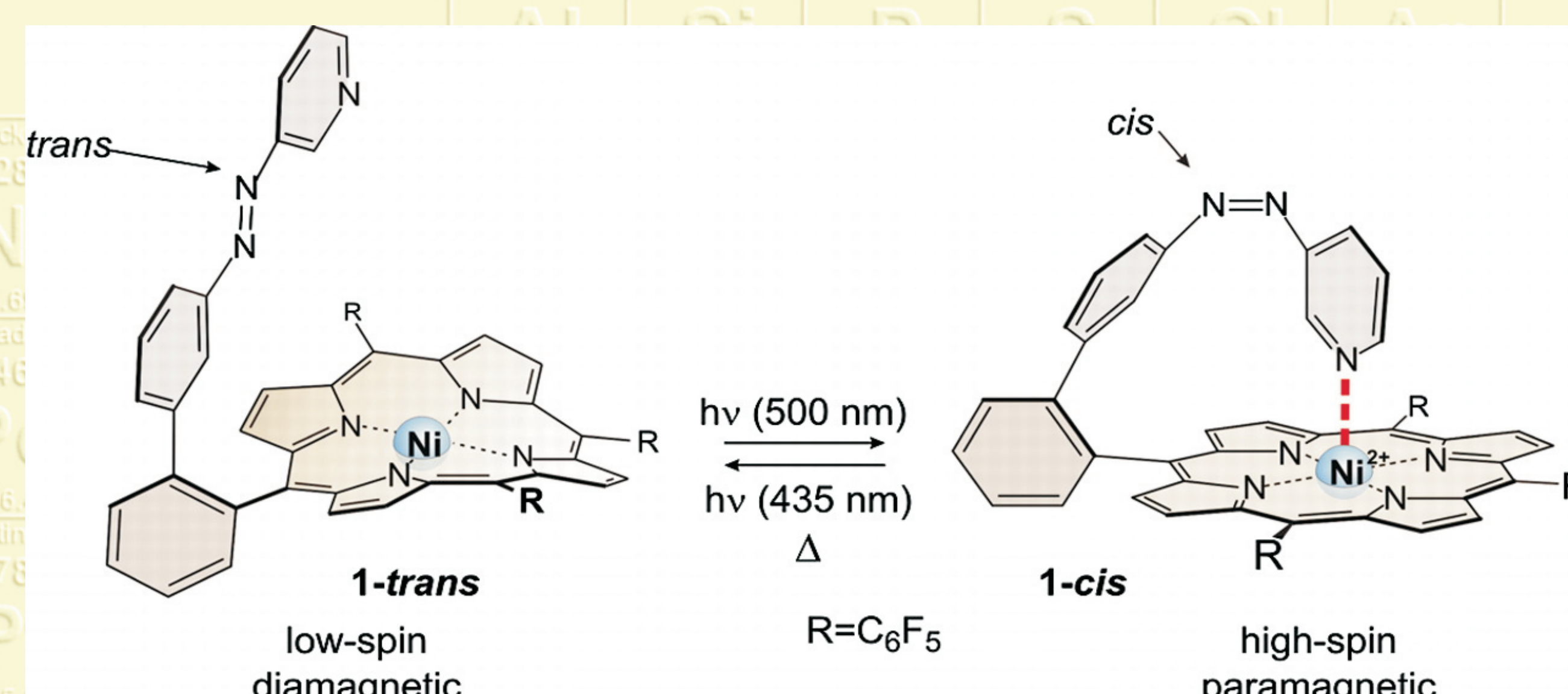
- A la pàgina web «365: Chemistry for live», cada dia de l'any es destaca un fet químic important.
- Recordeu que a les següents adreces es pot trobar la relació completa dels actes programats  
<http://bloqs.iec.cat/aiq2011>  
<http://www.quimicaysociedad.org>  
<http://www.euchems.org/IYC11/index.php>  
<http://www.chemistry2011.org>

## Breus

- Segons un nombrós grup d'astrònoms (*Nature*, **2011** 471, 608), analitzant la manera com oscil·len els estels es pot distingir entre els que cremen hidrogen i els que cremen heli.
- El Dr. Arnald Grabulosa, professor lector del Departament de Química Inorgànica, ha publicat el llibre *P-Stereogenic ligands in enantioselective catalysis*, a la col·lecció RSC Catalysis Series.

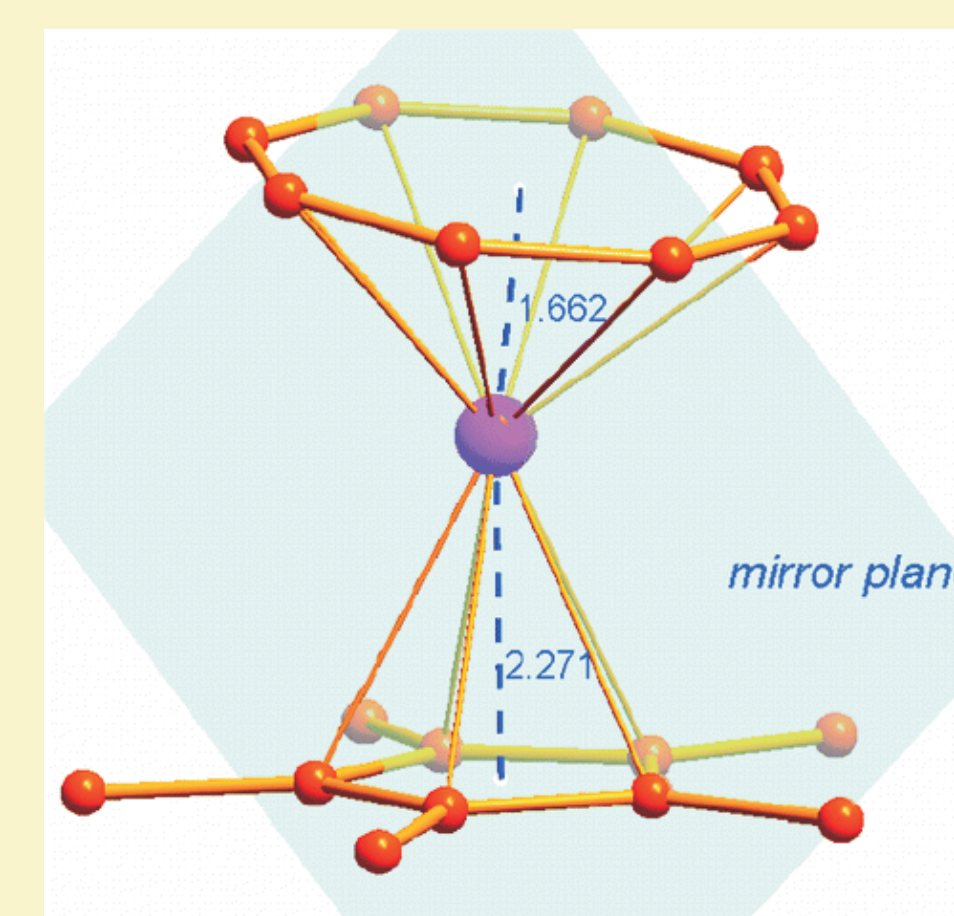
## Un interruptor magnètic ...

With a turntable-like design, chemists have developed the first single molecule that can stably switch magnetic properties at room temperature in a homogeneous solution (R. Herges et al, *Science*, **2011**, 331, 445). This kind of spin-switching behavior had previously been limited to bulk materials or to very low temperatures, which limits potential applications in areas such as single-molecule magnetic storage. The switchable molecule, is a nickel(II) porphyrin complex with a dangling phenylazopyridine group attached to its side. When exposed to green light, the nitrogen-nitrogen double bond in the phenylazopyridine isomerizes from *trans* to *cis*, which leaves the pyridine nitrogen hanging above the nickel like a record player needle. As the nitrogen coordinates to nickel, the complex's geometry transitions from square planar to square pyramidal and its magnetic properties switch from diamagnetic to paramagnetic. The shift can be reversed by blue light. The team notes that the complex may be useful as a contrast agent that can be turned on and off at will for dynamic magnetic resonance imaging.



## ... i un imant organometàl·lic

An unusually unsymmetrical organometallic complex made up of an erbium atom sandwiched between two different aromatic hydrocarbon rings exhibits unique magnetic behavior. This complex could become a prototype for further development of single-molecule magnets (SMMs), which are being sought for applications such as high-density information storage and quantum computing. Conventional magnets rely on the collective behavior of the unpaired electron spins of millions of individual metal atoms in a bulk material. SMMs, on the other hand, individually exhibit magnetlike behavior. A magnetic device made with these complexes, each storing a bit of data, could hold thousands of times more information than current storage devices. A research team has synthesized and studied the magnetic properties of a new type: an erbium cyclooctatriene pentamethylcyclopentadiene complex (S. Gao et al, *J. Am. Chem. Soc.*, **2011**, 133, 4730). The erbium complex is notable for being the first example of an organometallic single metal-ion magnet; previous versions contain oxygen- or nitrogen based ligands. In the complex, the  $\text{C}_8$  ring is closer to the erbium atom than the  $\text{C}_5$  ring, and the rings are not perfectly parallel to each other as they are in most other sandwich compounds.



## L'element

Color blau que agafa el Xe, incolor, sota una descàrrega elèctrica



Espectre d'emissió

L'element número **54**, **xenó**, va ser descobert per William Ramsay i Morris Travers el 1898 en els residus obtinguts en evaporar aire líquid, després d'haver separat, pel mateix procediment, neó, argó i criptó. El nom prové del grec ξενον, que vol dir estrany.

Fou el primer gas noble del que s'aconseguí obtenir un compost; el 1962 Neil Barlett, que prèviament havia preparat el  $\text{O}_2^+ [\text{PtF}_6]^-$  —en fer reaccionar  $\text{PtF}_6$  i  $\text{O}_2$ —, obtingué una mescla que contenia el compost anàleg,  $\text{Xe}^+ [\text{PtF}_6]^-$ , aprofitant que l'oxigen i el xenó tenen pràcticament el mateix potencial d'ionització.

Encara que és un element poc abundant, l'atmosfera en conté 0.087 ppm, i car d'obtenir, té diverses aplicacions. S'empra en dispositius que emeten llum com les làmpades flash usades en fotografia, llums estroboscòpics, llums bactericides; s'usa, també, en diversos làsers. Cada cop és més present en l'àmbit mèdic, com a anestèsic, neuroprotector i com agent de contrast en proves de RMN i en tomografies d'emissió de fotons.