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Notícies Inorgàniques

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La calor no ho dilata tot

In a serendipitous discovery, an electrically conductive compound of ytterbium, gallium, and germanium has been shown to maintain its room-temperature volume when heated between 100 and 400 K.

The compound, YbGaGe, was prepared by Mercouri G. Kanatzidis and coworkers at Michigan State University [*Nature*, **425**, 702 (2003)].

Zero-thermal-expansion (ZTE) materials prevent or reduce the strain or internal stresses that can occur in systems subjected to large temperature fluctuations, such as in space applications and thermomechanical actuators.

Most solids expand on heating (positive thermal expansion). The few materials that expand on cooling are known as negative-thermal-expansion (NTE) materials. They include a number of oxides.

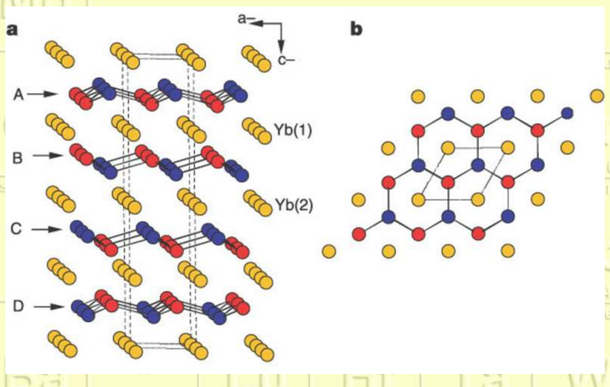
To date, the rare examples of ZTE materials are all composites rather than pure materials, and they are all insulators. They are prepared by combining NTE materials with positive-thermal-expansion materials. The composites exhibit ZTE over narrow temperature ranges of 5 to 10 °C. The range for YbGaGe is an impressive 300 °C.

Superfícies quirals, potencials catalitzadors

A new way to create solid chiral surfaces having catalytic properties may make it easier to synthesize or sense chiral molecules.

A team led by chemistry professor Jay A. Switzer of the University of Missouri, has discovered how to electrochemically deposit onto an achiral gold surface a copper oxide (CuO) film that has either a right-handed or left-handed arrangement of atoms. The key is adding a chiral molecule—in this case, tartrate ion—to the electrolyte. The researchers report that "the chirality of the ion determines the chirality of the deposited film" [*Nature*, **425,** 490 (2003)]

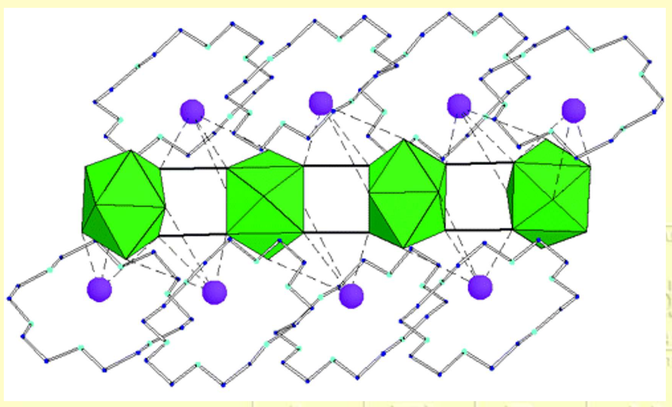
The electrochemical experiments were performed in a highly alkaline copper tartrate solution. The use of (*R*,*R*)-tartrate leads to a CuO film with the opposite handedness than when (*S*,*S*)-tartrate is used. The handedness of the film is influenced by the adsorption of either free tartrate ions or copper tartrate complexes on the gold surface.



Un nanobastó de germani

A linear tetramer of nine-atom polyhedral germanium clusters (shown) has been synthesized, and at about 2 nm long and 0.4 nm in diameter, it's appropriate to call it a nanorod [A. Ugrinov, S.C. Sevov, *Inorg. Chem.*, **42,** 5789 (2003)]. The tetramer extends by one unit the family of Ge_9^{2-} dimer and trimer clusters.

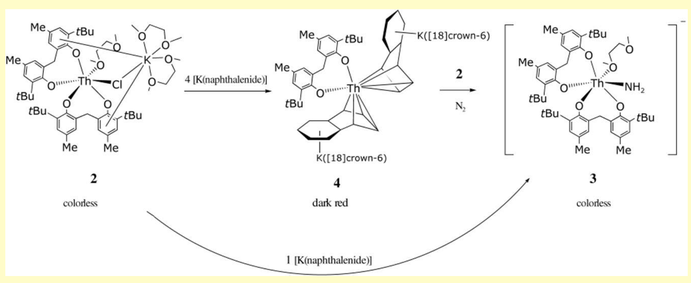
The crystal structure reveals that the Ge_9^{2-} clusters are connected by pairs of parallel bonds, and the delocalized 8^- overall charge of the nanorod is countered by eight rubidium cations, each of which is held in an 18-crown-6 molecule.

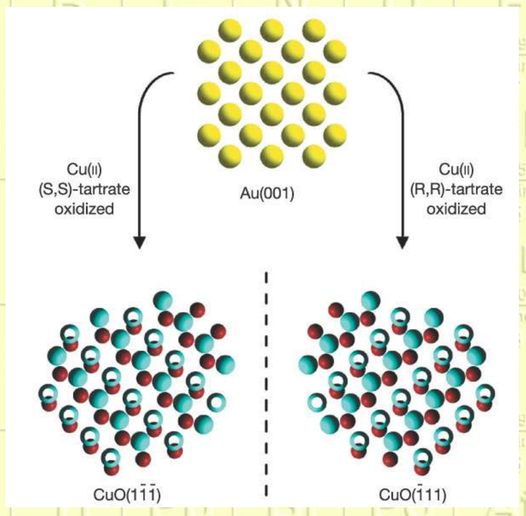


Del N_2 a l'amoníac en un sol pas

Key steps in the conversion of dinitrogen to ammonia can be carried out in a one-pot synthesis procedure, according to researchers at the University of Ottawa. Sandro Gambarotta, Ilia Korobkov, and coworkers report that a transient midvalent thorium complex generated via a reaction between zero- and tetravalent thorium complexes can be used to promote N_2 bond cleavage and hydrogenation in a single-step reaction that transforms the gas into amides [*Angew. Chem. Int. Ed.*, **42**, 4958 (2003)].

Previous work in nitrogen-activation chemistry by other researchers has led to separate synthesis procedures for each of these steps. Although the mechanism has not yet been elucidated, the Ottawa group proposes that the reaction involves the midvalent complex and a zero-valent thorium species, which they have isolated and analyzed with X-ray crystallography. The most likely route for the reaction, they say, is by way of cooperative attack on a single N_2 unit by two or more metal centers, which cleaves the molecule, and hydrogenation of N via radical-based H abstraction from the solvent.

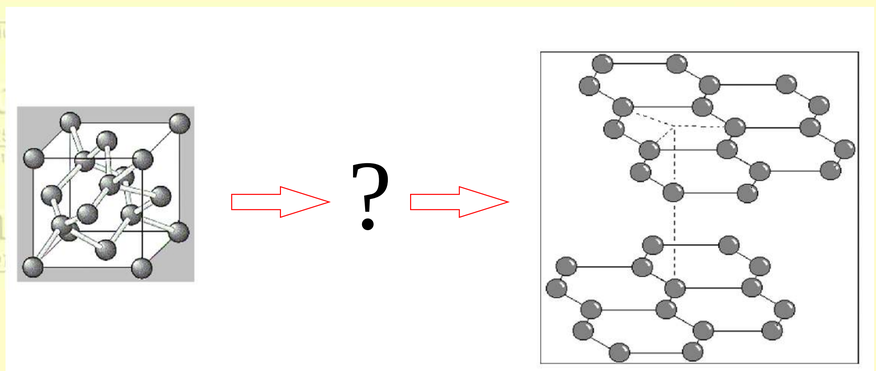




Mig grafit mig diamant

The form that graphite takes when compressed at ambient temperatures has long puzzled researchers. The substance's physical properties suggest something akin to diamond, but unlike various forms of diamond, when the so-called cold-compressed graphite returns to ambient pressure, it reverts to conventional graphite. A team led by Wendy L. Mao (University of Chicago) now has identified the material's elusive structure using inelastic X-ray scattering spectroscopy [*Science*, **302**, 425 (2003)].

The researchers report that at 17 gigapascals of pressure, half of the C=C π bonds in graphite break and form σ bonds with carbon atoms that are directly above or below one another in adjacent layers of graphite. The transient material is superhard and able to scratch diamond, as evidenced by cracks the material left in the diamond anvils of Mao's sample gasket. The researchers speculate that this reversible change in hardness could have intriguing applications as a pressure-dependent structural component.



Breus

- Fa dos-cents anys que John Dalton va presentar la primera llista de pesos atòmics (http://www.nature.com/nsu/031020/031020-3.html)
- El pH dels oceans està disminuint, degut probablement a l'absorció de CO_2 [K. Caldeira, M.E. Wickett, *Nature*, **425**, 365 (2003)].
- Les dades enviades per la sonda Mars Global Surveyor indiquen una gran abundància del mineral olivina [$(Mg, Fe)_2SiO_4$] a la superfície de Mart.
- A la pàgina web *Elementymology & Elements Multidict* es poden trobar els noms dels elements en més de cent idiomes **(http://www.vanderkrogt.net/elements/)**

L'element número **13**, **alumini**, va ser preparat l'any 1825 per H.C. Ørsted. El seu nom prové de la paraula llatina *alumen*, que vol dir *sal amarga*.