

Silicon behaves like metal when formed into nanotubes

When silicon is shaped into tubes less than 1 nm in diameter, it may behave like a metal, reports University of Nebraska-Lincoln. Prof. Xiao Cheng Zeng and his team modeled nanotubes in hexagonal, pentagonal, and square configurations on the university's powerful supercomputer (PrairieFire). They found the thinnest known nanotube has a square configuration with a diameter of less than 0.5 nm.

The researchers then used a quantum mechanical method to analyze the tubes and found that they are very likely to be conductors. In other words, they appear not to have the semiconducting properties that have made three-dimensional silicon one of the foundation materials for the modern electronics industry.

"To find that these tubes are very likely to be metals instead of semiconductors is very surprising," says Dr. Zeng. "Scientists have studied silicon for more than 50 years and it's the cornerstone material for the modern semiconductor industry."

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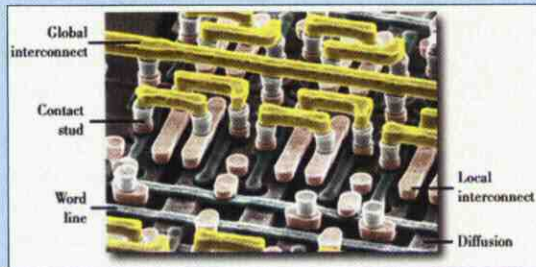
Light-activated molecules create complex microstructures

A three-dimensional microfabrication technique in which light-activated molecules selectively initiate chemical reactions within polymers and other materials has been reported by researchers at the Georgia Institute of Technology, Atlanta. The technology could provide an efficient way to produce complex structures with sub-micron features. Known as "two-photon 3D lithography," the technique could compete with existing processes for fabricating microfluidic devices, optical storage devices, and micromachines.

Prof. Seth Marder says that the technique is based on a family of organic dye molecules known as bis-donor phenylene vinylenes. These molecules have a special ability to absorb two photons of light simultaneously. Energized molecules transfer an electron to form a simple acid or a radical group that can initiate a chemical re-

Highways on a chip

This low-angle scanning electron micrograph shows a portion of a partially completed array of SRAM (static random access memory) containing six-device memory cells. The insulating oxide films have been removed, revealing the lower levels of the interconnect structure. The word lines are colored green and are made of salicided polysilicon. The yellow lines are global interconnects, and are made of Ti/AlCu/Ti/TiN. The pink interconnects and the gray plugs are made of tungsten, which is applied as tungsten metal, tungsten silicide, tungsten nitride, and tungsten-titanium alloy thin films. This image is from www-3.ibm.com/chips/technology. For more information: International Tungsten Industry Association, 2 Baron's Gate, 33 Rothschild Road, London, England W4 5HT; tel: 44 20 8742-2274; fax: 44 20 8742-7345; Web site: www.itia.info.



action, such as polymer cross-linking or ion reduction.

The reaction begins by adding small concentrations (0.1%) of the molecules to a resin slab containing cross-linkable acrylate monomer. A focused near-infrared laser beam draws patterns and initiates cross-linking reactions only in material exposed to the narrow laser beam.

Those areas are then insoluble, allowing the remainder to be washed away to leave a complex three-dimensional structure.

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