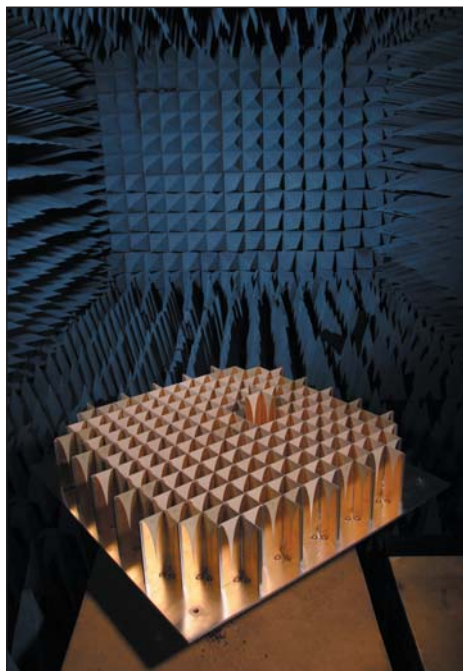


# EMERGING TECHNOLOGY

## Radio camera features hundreds of antenna elements

Scientists at the National Research Council Canada are working on a radio telescope “radio camera” that is based on an array of hundreds of antenna elements, with each element capturing a separate pixel. Because this device contains so many more pixels than radio telescopes did before, it will gather images faster and allow for a much wider field of view. This photo from National Research Council Canada shows the Canadian prototype of the radio camera array undergoing testing in a special anechoic chamber.

For more information: National Research Council Canada, 1200 Montreal Road, Ottawa, Ontario, Canada K1A 0R6; [www.nrc-cnrc.gc.ca](http://www.nrc-cnrc.gc.ca)



## Three-dimensional metamaterials designed for optical wavelengths

A stacked split-ring metamaterial for the optical wavelength range has reportedly been manufactured by researchers at the University of Stuttgart, Germany. This layer-by-layer stacking, which can be repeated indefinitely, is capable of producing well aligned three-dimensional metamaterial structures.

The present 3D structures consist of horseshoe-shaped gold nanowires that are arranged in a

### Zero thermal expansion semiconductors work in high heat

A semiconducting material with zero thermal expansion (ZTE) that is a hybrid inorganic-organic semiconductor has reportedly been shown to possess superior electronic and optical properties by scientists at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) and Argonne National Laboratory, Argonne, Ill. The material is a multifunctional semiconductor that forms a fully coherent, three-dimensionally ordered crystal. The materials under study form alternating organic and inorganic layers that work together to produce these effects. One contracts while the other expands, and the net effect is zero.

While chemical and thermal stability are two major problems for most hybrids, the hybrid nanostructures investigated in this work are found to be exceptionally stable in the air, even under the illumination of an ultraviolet laser.

“Not only do the crystal structures remain unchanged,” says NREL's Yong Zhang, “but also their electronic and optical properties remain after a few years of air exposure or upon heating to more than 200°C, a feature attributed to the strong covalent bonding throughout the structure.”

For more information: Steve McGregor, Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439; tel: 630/252-5580; [www.anl.gov](http://www.anl.gov). Yong Zhang, NREL; tel: 303/384-7673; [yong\\_zhang@nrel.gov](mailto:yong_zhang@nrel.gov); [www.nrel.gov](http://www.nrel.gov).

square pattern and perfectly stacked above each other. Due to the strong vertical coupling, broadband optical features are developed in the structure. Also, the vertical coupling leads to negative optical permeability, which is a prerequisite for a negative refractive index.

The key to this achievement is a planarization method for the rough nanolithography surface, combined with robust alignment marks that survive the dry etching processes during nanofabrication. This results in perfect lateral alignment as well as perfectly flat layers. The method can produce arbitrary shapes in each layer as well. Thus, more complex structures such as twisted or chiral structures are possible.

Possible applications in the future include perfect lenses that

## BRIEFS

### Durham University

researchers are launching a four-year project to make thin-film light-absorbing cells for solar panels from sustainable and affordable materials. [www.durham.ac.uk](http://www.durham.ac.uk)

A new report from **NanoMarkets**, an industry analyst firm, says that the market for organic electronics materials will be worth \$4.9 billion in 2012, surging to \$15.8 billion in 2015. [www.nanomarkets.net](http://www.nanomarkets.net)

### The Institute of Materials Science of Barcelona and Nexans Co.

have won a \$740,000 prize from Endesa, Spain, a consortium of electric power companies. The prize will be invested in developing a 30-meter superconductor cable made of BSCCO, which is planned to be completed before 2010. [www.uab.es](http://www.uab.es); [www.icmab.es](http://www.icmab.es)

Engineers at the **Massachusetts Institute of Technology** have designed oil-repellent materials composed of specially prepared microfibers that cushion droplets of liquid, allowing them to sit intact just above the material's surface. <http://web.mit.edu/newsoffice/2007/surfaces-1206.html>

**NCoat** and **North Carolina Agricultural and Technical State University** have established a technical collaboration agreement for characterization and development of nanotechnology materials and industrial coatings. [www.ncoat.com](http://www.ncoat.com)

**Nucor Corp.** has donated \$1 million to create the "Nucor Endowed Professorship for Metallurgical and Steelmaking Technologies" in the Materials and Metallurgical Engineering Department at the **South Dakota School of Mines and Technology**. [www.nucor.com](http://www.nucor.com)

**Carl Zeiss Inc.**, England, has developed ZEN, an integrated suite of digital imaging software that reduces the complexity of the interface to the minimum without diminishing the range and scope of the functions available. [www.zeiss.co.uk](http://www.zeiss.co.uk)

beat the diffraction limit, and optical cloaking devices that provide some invisibility for macroscopic objects.

For more information: Prof. Harald Giessen, University of Stuttgart, Germany; tel: 49-711/685-65110; [giessen@physik.uni-stuttgart.de](mailto:giessen@physik.uni-stuttgart.de); [www.pi4.uni-stuttgart.de](http://www.pi4.uni-stuttgart.de).

### Carbon honeycomb could replace silicon in electronics

Graphene, a single layer of carbon atoms arranged in a honeycomb lattice, could allow electronics to process information and produce radio transmissions ten times better than silicon-based devices, say researchers at Princeton University, Princeton, N.J. Prof. Stephen Chou and his team developed a novel method to make high-performance working graphene transistors.

In their new method, the researchers make a special stamp consisting of an array of tiny flat-topped pillars, each one-tenth of a millimeter wide. They press the pillars against a block of graphite, cutting thin carbon sheets that stick to the pillars. The stamp is then removed, peeling away a few atomic layers of graphene.

Finally, the stamp is aligned with and pressed against a larger wafer, leaving the patches of graphene precisely where transistors will be built. By repeating the process with stamps of various shapes, all the active areas for transistors are covered with single crystals of graphene.

One innovation that made the technique possible was to coat the stamp with a special material that sticks to carbon when it is cold and releases when it is warm, allowing the same stamp to pick up and release many graphene layers.

For more information: Stephen Chou, Princeton University, Princeton, NJ 08542; [chou@princeton.edu](mailto:chou@princeton.edu); [www.princeton.edu](http://www.princeton.edu).

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