



HOME | SCIENCE NEWS | COMPENDIUM | RESOURCES

Topics — [Physics](#) | [Chemistry](#) | [Geology & palaeontology](#) | [Biology](#) | [Environment](#) | [Astronomy](#) | [Health](#)

Hubble finds that blue blobs in space are orphaned clusters of stars

Researchers bend light through waveguides in colloidal crystals



Science Centric

— 8 January 2008 | 17:05 GMT

Colloidal Silver Details

Real Colloidal Silver Information Without Misleading Fuzzy Science
www.Bio-Alternatives.net

Fiber optical network

Watch demo on how optical switches enable optical networks worldwide.
Glimmerglass.com/Switch_Demo

Ads by Google

Researchers at the University of Illinois are the first to achieve optical waveguiding of near-infrared light through features embedded in self-assembled, three-dimensional photonic crystals. Applications for the optically active crystals include low-loss waveguides, low-threshold lasers and on-chip optical circuitry.

Key to the fabrication technique — which uses multi-photon polymerisation and a laser scanning confocal microscope — is a self-assembled, colloidal material that exhibits a photonic band gap, said Paul Braun, a University Scholar and professor of materials science and engineering.

In previous work, reported in 2002, Braun's research group was the first to show that through multi-photon polymerisation they could embed a polymer feature inside a silicon dioxide, self-assembled colloidal crystal. Now, in a paper

accepted for publication in *Nature Photonics*, and posted on the journal's Web site, Braun and his team demonstrate actual optical activity in waveguides and cavities created in their colloidal crystals.

'Taking our earlier work as a starting point, we built upon recent advances in theory and computation, improvements in materials growth techniques, and better colloidal crystallisation capabilities to produce this new photonic material,' said Braun, who also is affiliated with the university's Beckman Institute, Frederick Seitz Materials Research Laboratory, and Micro and Nanotechnology Laboratory.

To make their optically active devices, the researchers begin by assembling a colloidal crystal of uniform silica spheres that are 900 nanometres in diameter. After removing the solvent, the researchers fill the spaces between the spheres with a photoactive monomer. Then they shine laser light through a microscope and into the crystal, polymerising the monomer at the desired locations.

Next, they remove the unpolymerised liquid, and then fill the structure with silicon. Finally, they etch away the silica spheres, leaving the desired optical features embedded in a three-dimensional photonic crystal.

'Using spheres 900 nanometres in diameter creates a band gap at 1.5 microns, which is the wavelength used by the telecommunications industry for transmissions through fibre-optical cables,' Braun said. 'Creating these waveguides by coupling colloidal assembly and multi-photon polymerisation is simpler and less expensive than conventional fabrication techniques, especially for large-area photonic crystals.'

With Braun, co-authors of the paper are Stephanie A. Rinne, a postdoctoral fellow at the Beckman Institute, and Florencio Garcia-Santamaria, a postdoctoral research associate in the department of materials science and engineering.

The work was funded by the U.S. Army Research Office, National Science Foundation and the U.S. Department of Energy.

Source: University of Illinois at Urbana-Champaign

LATEST

MOST POPULAR

ARCHIVE

New X-ray source in nearby galaxy
Centaurus A spawns mystery
Details of Hubble servicing mission
Genetic variant predicts antipsychotic response for schizophrenia patients by ethnicity
New technology watches older people
Leading astronomers and geophysicists honoured with RAS medals and prizes
New treatment mechanisms for schizophrenia
Pushing the limits of chip miniaturisation
XMM-Newton gives new insight into neutron stars
Mars rover investigates signs of steamy Martian past
Adapting to pregnancy played key role in human evolution
Enormous new dinosaur
Voyager 2 proves solar system is squashed
Flurry of Geminid meteors lights up December sky
The Milky Way has a double halo
Simple recipe turns human skin cells into embryonic stem cell-like cells
Supercomputer simulation of universe may help in search for missing matter

2007

— [I](#) [II](#) [III](#) [IV](#) [V](#) [VI](#) [VII](#) [VIII](#) [IX](#) [X](#) [XI](#) [XII](#)

2008

— [I](#)