the cell to green light blue-shifted the LH reflection back to where it overlapped the RH reflection.

The researchers said, "Inducing hyper-reflectivity was the first step; now we are working toward making the polymer scaffold dynamic to enable fully tunable hyper-reflectivity."

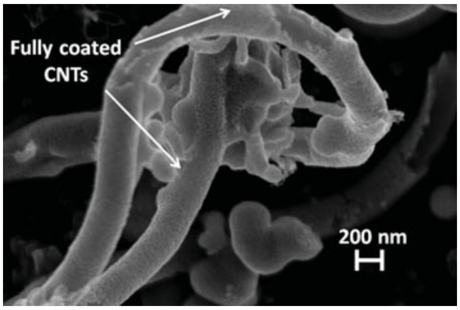
**Steven Trohalaki**

Nano Focus

## High-yield, low-cost approach developed to functionalize MWCNT surface

Multiwalled carbon nanotubes (MWCNTs) are finding increasing use in a variety of applications such as scanning probe microscope tips, hydrogen storage devices, catalyst support, and energy storage devices. Carbon nanotubes (CNTs) are often modified to prepare templates for advanced sensing technologies. A number of studies have reported attempts to functionalize the surface of CNTs for improved templating. A recent study by researchers from Virginia Tech has yielded CNTs functionalized with a uniform layer of metal oxide on the nanotube surface that afford high yield with low costs.

Previous studies have mostly resulted in CNTs functionalized with metal nanoparticles. There has been limited success with coating CNTs with oxides. In the November 2010 issue of the *Journal of the American Ceramic Society* (DOI: 10.1111/j.1551-2916.2010.04154.x; p. 3618), V. Bedekar, S. Priya, and their colleagues from Virginia Tech introduce a technique to prepare MWCNTs uniformly coated with $BaTiO_3$.




Scanning electron micrograph of multiwalled carbon nanotubes coated with $BaTiO_3$.

In this two-step process, CNTs were first immersed in nitric acid to incorporate surface –OH functional groups that act as sites for $BaTiO_3$ attachment. The acid-functionalized CNTs were immersed in a solution of barium titanium ethylhexanoisopropoxide and isopropanol. Transmission electron micrographs revealed that the MWCNTs were uniformly coated by $BaTiO_3$ with thickness in the range of 5–20 nm. Changes in chemical composition resulting from surface functionalization were characterized using a combination of infrared and x-ray energy-dispersive spectroscopy.

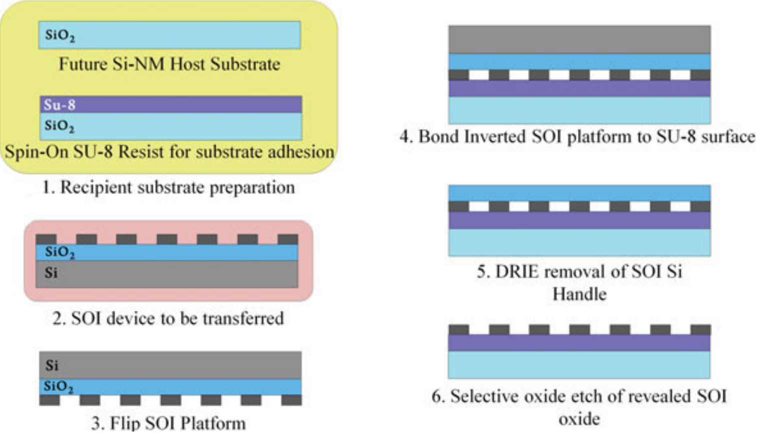
The research team said that these surface-functionalized CNTs will find use in diodes, sensors, and smart textiles.

**Kaushik Chatterjee**

Nano Focus

## High-fidelity transfer of intricate photonic devices via nanomembranes demonstrated

Silicon nanomembranes (Si-NM) are typically fabricated by harvesting the top Si layer of the silicon-on-insulator (SOI) wafers. Selective etching of the middle buried oxide layer releases the top Si device layer from the bulk as a nanomembrane. The fragile nanomembrane is susceptible to cracks and wrinkles during transfer to other substrates often resulting in a partial transfer. Furthermore, the scalability of the transfer process is limited. Now M.J. Zablocki and D.W. Prather from the University of Delaware and A. Sharkawy and O. Ebil from EM Photonics, Newark have overcome these challenges by developing a high-fidelity direct transfer process that can be used to transfer electronic and photonic devices without compromising structural integrity and functionality.




A process flow for the fabrication and transferring of a patterned Si-NM from a silicon-on-insulator (SOI) substrate to a $SiO_2$ substrate. Reproduced with permission from *Optics Letters* **36** (1) (2011) DOI:10.1364/OL.36.000058; p. 58. © 2011 Optical Society of America.

The researchers describe their fabrication protocols in the January 1st issue of *Optics Letters* (DOI:10.1364/