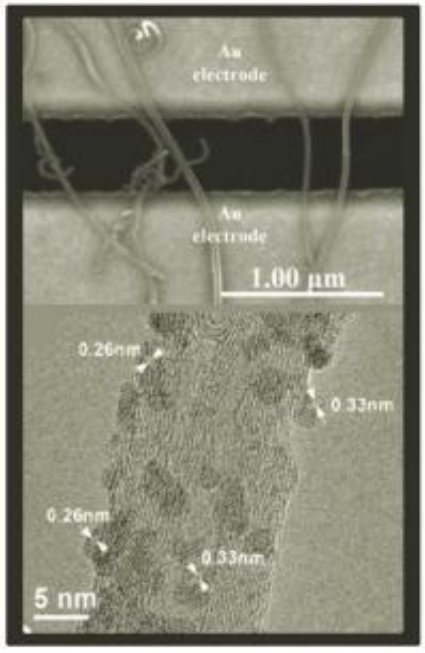
New Gas Sensor Based on Multiwalled Carbon Nanotubes

May 27 2009



Hybrid sensor fabrication process: (top) SEM image of a few MWCNTs spanning across two neighboring Au fingers of the interdigitated electrode; (bottom) HRTEM image of a MWCNT uniformly coated with SnO nanocrystals.

Argonne Center for Nanoscale Materials staff in the Nanofabrication & Devices Group together with collaborative users from the University of Wisconsin-Milwaukee have fabricated a miniaturized gas sensor using hybrid nanostructures consisting of SnO_2 nanocrystals supported on multiwalled carbon nanotubes (MWCNTs).

In contrast to the high-temperature operation required for SnO_2 nanocrystals alone, and to the insensitivity towards H_2 and CO for CNTs alone, the hybrid sensor exhibits room-temperature sensing capability when exposed to low-concentration gases such as NO_2, H_2, and CO. The performance of the hybrid nanostructure sensor is attributed to the effective electron transfer between SnO_2 nanocrystals and MWCNTs and to the increase in the specific surface area.

The hybrid platform as a sensing element provides an opportunity to engineer sensing devices with quantum-mechanical attributes due to the electron transfer. The nanomaterials employed are affordable, and the nanofabrication technique is simple and compatible with existing microfabrication capabilities; the latter, in turn, facilitates a scale-up process. This new sensing scheme will be instrumental for the development of new sensors based on hybrid nanostructures.

More information: "Room-Temperature Gas Sensing Based on Electron Transfer between Discrete Tin Oxide Nanocrystals and Multiwalled Carbon Nanotubes," G. Lu, L.E. Ocola, and J. Chen, *Adv. Mater.*, 21, 1-5, 2009.

Provided by Argonne National Laboratory (news : web)