CENTER FOR ADVANCED ENGINEERING FIBERS AND FILMS

A National Science Foundation Engineering Research Center

Seminar

Co-sponsored by the School of Materials Science and Engineering

Wednesday, September 12, 2007
4:00 p.m.
302 Rhodes Engineering Research Center
Refreshments will be served prior to the seminar.

Carbon Nanotube Yarns and Transparent Sheets: Dry Processing and Applications

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Abstract:
We have recently developed a method to make mechanically strong carbon nanotube yarns and fibers by a dry drawing self-assembly from CVD grown nanotube forests. Similar process is developed for processing forests into optically transparent multiwall carbon nanotube (T-CNT) sheets [1], which are chemically stable, mechanically strong and have a combination of other interesting properties. First I will describe this unique process of dry self-assembly on a simple model, which takes into account the interbundle connectivity and its reorientation during a draw process. Then I show how CNT yarns can be used for electron emission for bright lamps. I will also describe how transparent CNT sheets can be used as interfacial electrode for charge collection in two types of solar cells (SC): organic photovoltaic cells (OPV) and dye sensitized cells (DSC). This T-CNT films have been used as charge injectors, instead of conventional ITO coatings in two types of organic LEDs: both in polymeric PLEDS and low molecular OLEDs. It is demonstrated, that T-CNT films can be laminated on any flexible substrates, starting from free standing aerogel T-CNT sheets, obtained by dry drawing self-assembly from a CNT-forest [1], and densified to thicknesses of 50-100 nm. Such a film, with initial sheet resistance of 500 ohm/sq, should be first coated by optimal layers of PEDOT-PSS for its planarization and further used as charge collecting/injecting porous three-dimensional network. The newest data on CNT sheets as hole injectors in OLEDs with polymers (MEH-PPV) and low molecular light emitting layers, combined with quantum dots (QD) will be also presented and discussed.

[1] M. Zhang, S. Fang, A. Zakhidov, S. B. Lee, A. Aliev, R.H. Baughman, *Science,* 309,(2005) 1215

Biography:
Dr. Anvar Zakhidov is one of the co-founders and Associate Director of Nanotech Institute at University of Texas at Dallas, and Professor of Physics and Adjunct Professor of Chemistry. His “Nanophysics for Devices” research group is actively involved in broad investigations of physical properties of advanced nanomaterials: carbon nanotubes, photonic crystals, organic and hybrid multilayers. They study electrical, thermal, optical, magnetic, photonic, MW, structural, etc. properties in wide temperature range from 2 K to 500 K aiming to design and create novel types of electronic and photonic devices.

Dr. Anvar Zakhidov graduated "cum laude" (with distinction) from Tashkent Technical University (Uzbekistan, USSR) in 1975, obtained his M.S. in 1977 and Ph.D. in Physics (Optics) from Institute of Spectroscopy of USSR Academy of Sciences in Moscow in 1981. He spent five years in Japan (Okazaki, Kyoto and Osaka) as Visiting Professor (1990-1995), and a year in Italy (Bologna) at the Institute of Molecular Spectroscopy. Before joining UT Dallas, from 1996 to 2000, he was a Senior Principal Scientist working with advanced materials at Honeywell Inc. (formerly AlliedSignal).

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