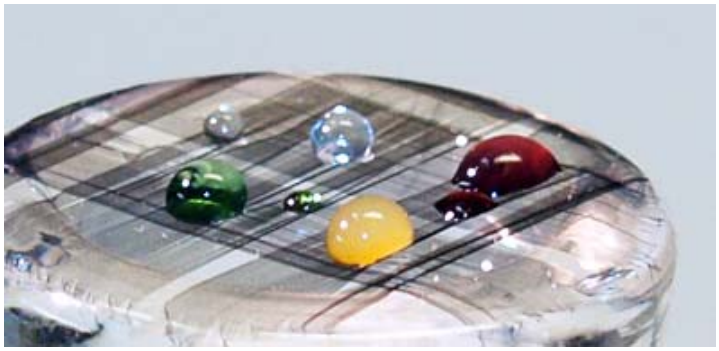
NanoTech Institute

THE UNIVERSITY OF TEXAS AT DALLAS



U. T. Dallas Scientists Win Two Awards For Nanotechnology Breakthroughs

Honors Recognize Importance of Carbon Nanotube Yarns, Sheets

RICHARDSON, Texas (June 30, 2006) — Scientists at The University of Texas at Dallas (UTD) NanoTech Institute, together with an Australian collaborator, learned this week that they have won two awards – one in Australia and the other in the United States – for their breakthroughs in fabricating carbon nanotube yarns and transparent nanotube sheets, which promise important industrial applications.

The UTD team, lead by Dr. Ray H. Baughman, and an Australian colleague, Dr. Ken Atkinson from Commonwealth Scientific and Industrial Research Organisation Textile and Fibre Technology, were awarded the prestigious NanoVic Prize by Nanotechnology Victoria Ltd., a venture involving three universities and the government of the Australian state of Victoria. While interest in exploiting various aspects of the researchers' discoveries is worldwide, the NanoVic Prize, which includes a $10,000 award to team members, specifically recognizes innovation in nanotechnology research of importance to companies in Australia.

The scientists also garnered a Nano 50 Award, presented by *NanoTech Briefs,* a digital monthly magazine that highlights engineering breakthroughs in nanotechnology and micro-electro-mechanical systems. The annual awards recognize the top 50 technologies, products and innovators that have significantly impacted, or are expected to impact, the state of art in nanotechnology.

The researchers successfully assembled trillions of carbon nanotubes into strong, tough, electronically and thermally conducting nanotube yarns and transparent nanotube sheets and demonstrated their utility for such diverse applications as electronic textiles, protective clothing, artificial muscles, supercapacitors, fuel cells, organic light-emitting displays, solar cells and high-intensity sources of field-emitted electrons for lamps and miniature x-ray tubes. These and other related team advances are covered in a 430-page international patent application, important aspects of which are available for licensing nationally and internationally.

The breakthroughs were first reported in the Nov. 19, 2004 and August 19, 2005 issues of the prestigious journal *Science*, and subsequently described in television, radio, newspaper and magazine reports around the world. *Discover* magazine listed the advances as 8th of the 100 most important science news stories of 2005. Team members were also honored last year at an international conference in Frankfurt, Germany, involving 20,000 technologists and industrialists, where they received the New Materials Innovation Prize of the Avantex International Forum for Innovative Textiles.

Individual nanotubes have spectacular properties, including strengths ten times higher than commercial fibers or yarns, a thermal conductivity higher than diamond and a thousand-fold higher current-carrying capability than copper. The challenge has been in developing methods for correctly assembling billion-mile lengths of oriented individual nanotubes for every pound of fabricated yarn and sheet, and doing so at industrially useable rates. The award-winning processes, first demonstrated in UTD NanoTech Institute laboratories, initially used relatively inexpensive multiwalled nanotubes. These multiwalled nanotubes, comprising seamless cylinders of carbon arrayed like rings in a tree trunk, are a thousand times thinner than a human hair and much longer than nanotubes that can be processed in other ways.

Starting from chemically grown, self-assembled structures in which nanotubes are aligned like trees in a forest, the sheets and yarns are produced at up to 10 meters per minute by the coordinated rotation of a trillion nanotubes per minute for every centimeter of sheet width. By comparison, the production rate for commercial wool spinning is 20 meters per minute. Unlike previous fabrication methods using dispersions of nanotubes in liquids, the dry-state process developed by the UTD-Australian team can use the ultra-long nanotubes needed for optimization of properties.

"Industrial interest has been enormous and is accelerating – new inquiries are arriving daily from companies wanting to apply our nanotube yarns and sheets in products," said Baughman, Robert A. Welch Professor of Chemistry and director of the NanoTech Institute. "While process and property improvements are still being made, present properties are so remarkable that suggested product names come from the realm of fantasy, including "Mithral," the fictional material from the *Lord of the Rings* trilogy, and "transparent aluminum" from the science fiction television show *Star Trek*.

"While transparent and so light that four ounces would cover an acre, the nanotube sheets are stronger than the same weight of steel plate," Baughman added. "The carbon nanotube yarns are much tougher than graphite yarn and, unlike other yarns and fibers, do not degrade in strength and toughness when knotted or knitted."

The awardees come from around the world: NanoTech Institute research scientists Dr. Mei Zhang and Dr. Shaoli Fang from China; associate director of the institute Dr. Anvar Zakhidov and institute research scientist Dr. Sergey Lee from Uzbekistan; institute research scientist Dr. Ali Aliev from the Ukraine; Atkinson from Australia; and UTD Physics Department graduate student Christopher Williams and Baughman from the U.S.

The research leading to the awards was funded by the U.S. Defense Advanced Research Projects Agency, the National Aeronautics and Space Administration, the U.S. Air Force Office of Scientific Research, the Texas Advanced Technology Program, the Robert A. Welch Foundation, the Strategic Partnership for Research in Nanotechnology and the Commonwealth Scientific and Industrial Research Organisation.

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