STEVENS INSTITUTE OF TECHNOLOGY
NANOTECHNOLOGY GRADUATE PROGRAM SEMINAR SERIES

DEPARTMENT OF MECHANICAL ENGINEERING

Wednesday, October 25, 2006
Babbio Bldg, Room 104, Time 11am

Nanofiber Technology

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Nanofiber technology is a branch of nanotechnology that concerns the processing/manufacturing technology, characterization methods, design, modeling and application of fibers in the nanometer dimension.

Nanoscale fibrous materials are the fundamental building blocks of biological systems. From the 1.5-nm double helix strand of DNA molecules to sensory cells such as hair cells and rod cells in the eye, nanoscale fibers form extra-cellular matrices for tissues and organs. These biological structures are invariably hierarchical and multiscale, with fibrils and fiber bundles organized in various orientations to form flexible and rigid composite structures. Based upon these "blueprints" laid out by nature, it is reasonable to infer that the availability of nanoscale fibers made of polymers having adjustable electronic, biological and mechanical properties organized in a hierarchical manner will not only contribute directly to future generations of multifunctional materials and structures but also open new opportunities in science and technology. In this presentation, a non-mechanical, electrostatic-based spinning process is introduced as a pathway to the creation of nanoscale fibers and nanocomposites. The science and technology of electrospinning will be discussed with examples given on electroactive nanofibers for electronic components and energy storage devices, bioactive nanofibers for 3-D scaffolds in tissue engineering, and super structural fibers from carbon nanotube.

Professor Frank K. Ko is Director of the Fibrous Materials Laboratory and Professor of Materials Engineering in the Department of Materials Engineering at Drexel University. He has a Ph.D. degree in Textile Engineering from the Georgia Institute of Technology. A SAMPE Fellow and recipient of the American Society for Composites award; the Fiber Society Award for Distinguished Achievement; he was elected to the Drexel 10^6 club and a recipient of the Drexel Research Award, Professor Ko has co-authored three books and contributed to 25 book chapters. He has presented and published over 400 papers in the engineering design and analysis of fibrous structures for medical, industrial and advanced composite applications. He is serving on the editorial board of several Journals including the area editor of nanofiber technology for the Journal of Engineered Fibers and Fabrics. He served on the Roadmap team for the Aerospace Industry Association and as a member of the advisory committee on soldier protection for the Army Board of Sciences of the National Research Council. He was a group leader in the gradient composite armor program for the Army Research Office sponsored Multidisciplinary University Research Initiative (MURI) wherein his research was expanded to the electrospinning of multifunctional nanoscale fibers, nanofibrous structures and nanocomposites.

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