

The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



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Lecture Title: Piezoelectric Nanofibers and Nanotubes and Their Applications in Energy Scavenging

Friday, September 25, 2009, 2:00 PM, Room 173 Light Engineering

Abstract

One dimensional nano structures such as nano-tubes, nano-wires and nano-fibers have great potential as either building blocks for micro/nano devices or as functional materials for micro-scale sensing and actuation applications. They provide more design flexibility and high performance which may not be achievable before. Functional nanostructures such as PZT nanofibers and nanotubes are two very good examples. In this talk, the fabrication, characterization and applications of piezoelectric (PZT) nanofibers and nanotubes will be discussed. We demonstrated the piezoelectric properties of polycrystal PZT nanofibers and nanotubes through electro-mechanical coupling tests such as dynamic loading and mechanical vibration. PZT nanofibers were fabricated by electrospinning process, while the nanotubes were fabricated using template-assisted methods. SEM image of PZT nanofibers has shown that the diameters of these fibers were controlled to be from 40 to 160 nm. The wall thickness of the nanotubes was from 5 to 25 nm. The piezoelectric constants of the PZT nanofibers increase with the decrease of their diameters. Energy scavenging from PZT nanofibers and nanotubes was demonstrated through dynamic loading and impact tests. The largest output voltage from the dynamic test is 170mV under 0.5% strain.

Biography

Dr. Yong Shi is an assistant professor in the Mechanical Engineering Department at Stevens Institute of Technology, Hoboken, New Jersey. Dr. Shi obtained his M.S and Ph.D. from Massachusetts Institute of Technology in 2001 and 2004 respectively. His research interests include functional nanostructures such as piezoelectric and thermoelectric nanofibers, nanotubes and their nanocomposites, micro/nano actuators and sensors, Bio, medical MEMS/NEMS systems design, modeling and fabrication.

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