Microelectromechanical Systems (MEMS) and Applications in Mechanical Characterization of One-Dimensional Nanostructures

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Austin, TX

Thursday, May 10 at 4:00 PM
1402 Broughton Hall

Over the past decade, there has been a substantial thrust to reduce the size of electronic and electromechanical systems to the nano-scale by integrating devices from one-dimensional (1-D) nanostructures. For these applications, a thorough understanding of the nanostructure mechanical properties requires the development of quantitative *in-situ* experimental approaches.

In this talk, novel *in situ* tensile testing of 1-D nanostructures performed inside scanning and transmission electron microscopes (SEM/TEM) will be presented. A nanoscale material testing system (n-MTS) based on MEMS technology was developed. The design, microfabrication and operation of the n-MTS will be described. A unique feature of the n-MTS is that the load history is recorded by a high-resolution electronic load sensor, while the specimen deformation and fracture is observed by the microscope imaging simultaneously. A nanomanipulator was used to pick and position the nanowires and nanotubes. Results obtained from *in situ* SEM and TEM tensile testing of polysilicon films, palladium nanowires and carbon nanotubes will be discussed. Particular findings such as effects of high-energy electron or ion beam irradiation on nanotube mechanical properties will be highlighted. I will also describe plans for future work in this area, outlining a research program that centers around development of novel nanoscale instrumentations and applications in nanomechanics and nanobiomechanics.

Short Biography:

Yong Zhu is currently a postdoctoral research fellow at the University of Texas at Austin. He received his B.S. in solid mechanics from the University of Science and Technology of China in 1999; his M.S. in 2001 and Ph.D. in 2005 both in mechanical engineering from Northwestern University.

His broad research interests are aimed to interface micro/nano devices and mechanics of materials. In particular, he is interested in development of micro/nano devices for manipulating and testing nano and bio entities, mechanics of nanostructures, and mechanics of polymers and biological cells.