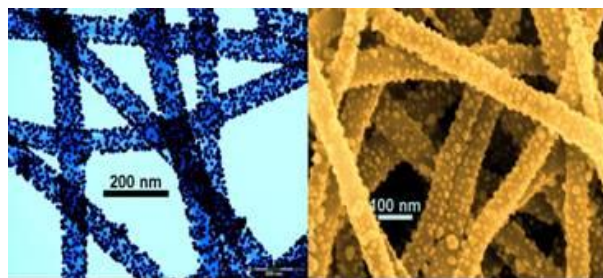
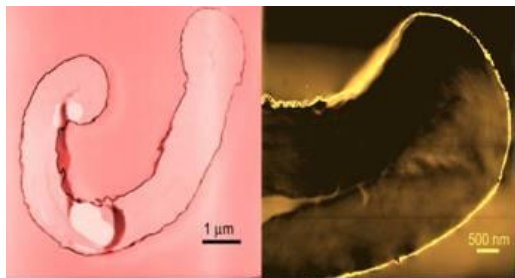


The Department of Mechanical Engineering/College of Engineering and Applied Sciences  
Stony Brook University

## Mechanical Engineering Seminar



**Juan P. Hinestroza, Ph.D.**

**Assistant Professor of Fiber Science  
Cornell University, Ithaca, NY 14853**

TEXTILES NANOTECHNOLOGY LABORATORY AT CORNELL UNIVERSITY

<http://nanotextiles.human.cornell.edu>

### **Lecture Title: Multifunctional Fibers via Manipulation of Nanoscale Phenomena**

Thursday, April 29, 2010, 2:00 PM, Room 173 Light Engineering

#### **Abstract**

In this seminar we will discuss our research work on understanding complex phenomena at the nanoscale that are of fundamental relevance to fiber and polymer science. Initially we will present our use of self-assembly phenomena to tailor the barrier properties of conventional textile materials. We have successfully used electrostatic self-assembly techniques to deposit, for the first time, fully conformal nanolayers over irregular and heterogeneous natural fiber surfaces achieving a significant increase in chemical selectivity due to the carefully controlled molecular architecture of the nanolayers. We use self-assembly to develop novel selectively permeable materials for protective clothing applications as well as active filtration. Our group has also used atomic layer deposition (ALD) techniques to covalently attach inorganic and metallic moieties to natural fibers opening a new avenue for the development of flexible electronic and smart textiles. A second thrust of our research efforts is concentrated on using external fields, transient plasticizers and associative polymers to induce self-assembly at the nanoscale during the electrospinning process. The manipulation of the viscoelasticity of the precursor solutions allows for precise position control of embedded nanoparticles or active compounds inside and outside of polymeric fibers. Magnetic, photocatalytic and inorganic nanoparticles have been successfully encapsulated so far as well. Finally we will present our developments on using scanning probe microscopy based techniques to probe nanoscale phenomena in fibrous systems. We will present our use of electric force microscopy as a probing tool to quantitatively determine the electrical charge degradation on electret fibers media. We will also present the use of lateral force microscopy to probe lubrication phenomena in complex interfaces as well as acoustic force atomic microscopy to measure the mechanical properties of nanofibers.

**Biosketch** Juan Hinestroza is an Assistant Professor of Fiber Science in the Department of Fiber Science and Apparel Design at Cornell University. Prior to his appointment at Cornell, Juan was an Assistant Professor in the Department of Textile Engineering, Chemistry and Science at North Carolina State University. Before graduate school, he worked as a Process Control Engineer for Dow Chemical. Prof. Hinestroza received his PhD in Chemical Engineering from Tulane University in 2002 and his BS in Chemical Engineering from the Industrial University of Santander, Colombia in 1994. His research focuses on nanoscale phenomena associated with fiber science and is interested in self-assembly, functionalization of fibers for smart textiles and flexible electronics, manipulation of physical properties of polymer fibers during forming, and scanning probe microscopy. He has received numerous honors for his work including the NYSTAR James D. Watson Young Investigator Award, the National Textile Center Humanitarian Award, the National Science Foundation CAREER Award, and Educator of the Year Award from SHPE.

**Directions:** Please call Augusta Kuhn at 631-632-8310 for more information.

