Northeastern University
College of Engineering

Please join us for a
Special Chemical Engineering Seminar

Friday, January 31, 2014
320 Shillman Hall
11:45 am – 1:00 pm

"Synthesis and Assembly of High Performance Nanomaterials to Create Next-Generation Energy Conversion Devices"

Distinguished Seminar Speaker
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ABSTRACT

One of the key challenges facing the widespread use and commercialization of promising energy devices (i.e. fuel cells, batteries, organic solar cells etc.) is the high cost of the electrocatalytic and electrolyte materials and inefficiencies in their assembly and utilization. In this talk, I will present three examples of how we are designing nanomaterials such as graphene-based carbons and bulk metallic glass (BMG) alloys that can be incorporated into multifunctional composites for high performance nanostructured-enabled energy devices. 1) *Electrocatalysts.* We will describe a new class of materials, $Pt_{58}Cu_{15}Ni_5P_{22}$ bulk metallic glass that can circumvent Pt-based anode poisoning and agglomeration/dissolution typically associated with supported catalysts during long-term operation in fuel cells. These amorphous metal alloys can serve as an interesting platform for next-generation catalysts and devices such as the first all bulk metallic glass micro fuel cell.2) *Spin Spray Layer-by-Layer (SSLBL) Assembly*. We have developed a fully automated SSLBL system with deposition at sub-second cycle times allowing nano-level control over film growth and efficient formation of a conducting network not available with other solution based deposition methods for lithium ion battery electrodes. 3) *Network Electrodes* Here we describe a technique for developing freestanding multifunctional SWNT composite thin films that provides a fundamental engineering basis to bridge the gap between their nano and macroscale properties for solar cell transparent conductive electrodes. We will also describe recent efforts in using these films as active layers in hybrid SWNT/Si solar cell device as well as the use of Förster resonance energy transfer for high efficiency polymer solar cells.

BIOGRAPHY: Prof. André D. Taylor is an Associate Professor and leads the Transformative Materials and Devices Group in the Chemical and Environmental Engineering Department at Yale University. He received all three degrees in chemical engineering with a BS from the Missouri University of Science and Technology, an MS from Georgia Institute of Technology, and a PhD from the University of Michigan. While in graduate school Taylor was a Sloan Fellow, NSF-Rackham Merit Fellow, Eastman Kodak Fellow, and GEM (MS and PhD) Fellow. Taylor has developed CMOS compatible micro fuel cells (with integrated heaters and temperature sensors) and a method of patterning ITO substrates for both flat and non-planar surfaces for optoelectronic devices (Artificial Eye Project). He is an NSF CAREER award recipient and a Presidential Early Career Award in Science and Engineering (PECASE) recipient. See website above for publication links and recent press releases from his lab.

Refreshments will be served.