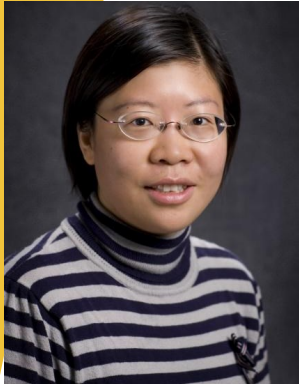




DEPARTMENT OF
MECHANICAL ENGINEERING

The Sidney E. Fuchs Seminar Series

4:20-5:10pm, Friday, September 6, 2013
Frank H. Walk Design Presentation Room



Novel Nanostructured Materials for Advanced Energy Conversion and Storage

by **Ying Wang***

Assistant Professor, Mechanical and Industrial Engineering, LSU

This research is focused on the developments of novel nanomaterials and subnanometer-scale materials for applications in superior lithium-ion rechargeable batteries, advanced solar cells, and efficient photocatalysis. The major work is divided into two categories. First, ultrathin and highly-conformal oxide coatings are deposited via atomic layer deposition (ALD) method for surface modification and enhanced electrochemical performance of high-capacity lithium-excess layered cathode material $\text{Li}[\text{Li},\text{Ni},\text{Mn},\text{Co}]\text{O}_2$. The high-quality surface coating can effectively isolate electrode from electrolyte, reduce HF attack and alleviate metal dissolution, to improve cycleability of electrode. In addition, thickness of ALD coating can be accurately tuned at atomic scale by varying ALD growth cycles for optimization of battery performance. Six oxide ALD layers (as thin as ~ 1 nm) are demonstrated to have optimal thickness for maximized performance of new-generation lithium ion batteries. The second part of the work concentrates on fast electrochemical synthesis of bamboo-type TiO_2 nanotube arrays with enhanced surface area due to bamboo ridges, for applications in advanced dye-sensitized solar cells (DSSCs) and efficient photocatalysis. Ridge spacing and length of bamboo-type nanotubes can be facily tuned by adjusting time of high-voltage step and electrolyte composition, for maximized performances of DSSCs. The titania nanotubes are also modified with silver nanoparticles for plasmon effect and reduced graphene oxide sheets for increased electronic conductivity, to achieve further improved performance in photovoltaics and photocatalysis.

* Dr. Ying (Jane) Wang is an Assistant Professor in the Department of Mechanical and Industrial Engineering at Louisiana State University since August 2008, and she currently holds Roy Paul Daniels Distinguished Professorship for career development. Before joining LSU, Dr. Wang was a postdoc fellow in Materials Science at Northwestern University from 2006 to 2008. She received her Ph.D. degree in Materials Science and Engineering at the University of Washington and a B.S. degree in Chemical Physics from University of Science and Technology of China. Dr. Wang's research focuses on nanomaterials synthesis for energy related applications such as lithium-ion batteries, solar cells, and photocatalysis. She has published 39 journal articles which have received more than 1000 independent citations. Dr. Wang's recent awards include a 2012 LSU Rainmaker award, LSU Dean's Scholarship in 2011, and Ralph E. Powe Junior Faculty Enhancement Award in 2010.