



Department of Chemical Engineering Special Guest Speaker



Gang Wu

Scientist, Los Alamos
National Laboratory

Host: Elizabeth Podlaha-
Murphy
e.podlaha-murphy@neu.edu

**“Graphene
Nanocomposite
Catalysts for
Sustainable
Electrochemical
Energy Storage and
Conversion”**

Tuesday, March 11
108 West Village H
11:45a – 1:00p

Refreshments will be
served

ABSTRACT The oxygen reduction reaction (ORR) is one of the most technologically important reactions for a variety of electrochemical energy storage and conversion technologies. It is important to design and develop advanced precious-metal-free materials capable of catalyzing this sluggish reaction at sufficient rates for practical applications. In our recent efforts at Los Alamos, cost-effective nitrogen-doped graphene nanocomposites have been prepared *via* the graphitization of heteroatom polymers, combined with transition metals as catalysts, and nanostructured supports such as carbon nanotubes and metal-organic frames as templates. The unique physical and chemical properties of graphene, such as high surface areas, high chemical stability, excellent electron conductivity, and graphitic basal plane structure, are beneficial for enhancement of catalytic activity. Nitrogen doping into graphene can deliberately tune the electronic and geometric properties, thereby facilitating the ORR. As a result, the graphene-rich composite catalysts exhibit substantially improved activity for the ORR in nonaqueous electrolytes as compared to those of currently used carbon blacks and Pt/carbon catalysts, evidenced by both rotating disk electrode evaluation and Li-O₂ battery experiments. The synthesis-structure-activity correlations for the

graphene nanocomposites were further established by tuning their synthetic chemistry. This allows us to investigate how the resulting morphology and nitrogen-doping functionalities influence the catalyst activity. This unique *in situ* formation of nitrogen-doped graphene directly from heteroatom polymers provides a new route for preparation of functional graphene nanocomposites for sustainable electrochemical energy storage and conversion applications.

BIOGRAPHY: Gang Wu is a scientist at Los Alamos National Laboratory (LANL). He completed his Ph.D. in 2004 at the Harbin Institute of Technology, concentrating on electrodeposition and electrocatalysis. After postdoctoral trainings at Tsinghua University (2004-2006), the University of South Carolina (2006-2008), and LANL (2008-2010), he became a permanent staff scientist at LANL in 2010. His research focuses on the development of nanostructured catalysts and electrode materials for energy storage and conversion technologies. To date, he has authored and coauthored 90 scientific publications and 4 book chapters with around 3000 citations. Now he is leading or participating a few projects supported by DOE ARPA-E and EERE program offices.

For more information visit: <http://www.che.neu.edu/>

Northeastern University
College of Engineering