



# DEPARTMENT OF MECHANICAL ENGINEERING Purdue School of Engineering and Technology

## FALL 2003 SEMINAR SERIES

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**Date: Friday, October 17, 2003**

**Time: 1:00 pm - 2:00 pm**

**Room: SL 165**

**Reception at 12:45 pm (cookies and refreshments served)**

**Everyone is invited**

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### **Challenges & Opportunities in Fuel Cells Development: from Materials to Devices**

**Dr. Jian Xie**

***Electronic and Electrochemical Materials and Devices Group, Materials Science  
and Technology Division, Los Alamos National Laboratory***

**Abstract.** The development of high performance Polymer Electrolyte Fuel Cells (PEFCs) involves the research and development of both materials (i.e. catalysts, carbon supports, membrane electrolytes) and devices (i.e. gas diffusion layer (GDL), gas flow field, bipolar plates). In general, fuel cell research includes materials research and development, and materials processing (membrane electrode assembly (MEA) making), the study of mass transport phenomena (i.e. gas and liquid), heat transfer, and basic hardware design. This talk will focus on the characterization and understanding of the MEA structure, and the development of new MEAs based on the knowledge of its structure and the formulation of the catalyst ink. The comparison of different catalysts for PEFC and the durability of PEFC will also be discussed. The PEFC durability study will be presented by correlating the structure changes of MEA with its performance. The potential research opportunities for fuel cells will be introduced in terms of materials development, flow dynamics, simulation/modeling, and hardware design. The potential for interdisciplinary collaboration among mechanical engineering, electric engineering, materials science and engineering, chemical engineering, and chemistry will be proposed.

**About the Speaker.** Dr. Jian Xie received his B.S in chemical engineering (with emphasis on electrochemical engineering) from Tianjin University, China in 1982. He spent 8 years in Tianjin Institute of Power sources (China), (a National Comprehensive Research Institute on Advanced Batteries, Fuel Cells, Solar Cells and Thermal Semiconductors with 2,700 people) working on the research and development of advanced batteries such as Ni/Cd, LiAl/FeS, Li-ion, and high power Li/SOCl<sub>2</sub> batteries for under water vehicle propulsion systems. In 1994, he went to the University of South Dakota for his M.S and studied oxygen reduction on the surface of heterogeneous catalysts using chemiluminescence's coupled with cyclic voltammetry, scanning electrochemical microelectrode microscopy, and atomic force microscopy (AFM). Dr. Xie went to University of Miami in 1996 for his Ph.D. While at Miami, he worked on ionic liquids, and xerogel and aerogel metal oxide thin films. After he received his PhD in 1999, he went to the General Motors Advanced Technology Vehicle Division, Indianapolis Technical Center and served as a system engineer in charge of battery pack development for electric vehicle and hybrid electric vehicle programs. He joined Los Alamos National Laboratory in 2001 and has been working on the research and development of fuel cells.