

2010-2011 Graduate Seminar Series

The Department of Mechanical Engineering – Engineering Mechanics

Proudly Presents

Dr. Michael W. Ellis

Virginia Tech



Michael Ellis holds a B.S. degree in Mechanical Engineering from the University of Tennessee and M.S. and Ph.D. degrees in Mechanical Engineering from Georgia Tech. He is currently an Associate Professor and John R. Jones Fellow of Mechanical Engineering at Virginia Tech. Dr. Ellis has 25 years of experience in engineering, research, and education related to the development and application of advanced energy systems. Currently, his work focuses on the development and evaluation of materials for PEM fuel cell membranes and diffusion media, investigation of novel PEM fuel cell manufacturing processes, development of physics based models of fuel cell performance that incorporate liquid water transport, and investigation of fuel cell based energy systems for buildings. He teaches undergraduate and graduate courses in thermodynamics, fuel cell systems, sustainable energy systems, and mechanical systems design. Dr. Ellis is the director of the Sustainable Energy Research Program in Virginia Tech's Institute for Critical Technology and Applied Science and is Vice-Chair of ASME's Advanced Energy Systems Division.

Thursday, Sept. 30, 2010 4:00 – 5:00 p.m. Room 112, ME-EM Bldg.

Evaluation of Water Transport Characteristics of PEM Fuel Cell Diffusion Media

Polymer electrolyte membrane (PEM) fuel cells are under development for a wide range of portable power, transportation, and stationary applications. Proper water management in the electrodes of PEM fuel cells is essential to achieving efficient operation. Detailed multi-physics models of transport processes within the electrodes have been developed over the last decade. However, in several areas, the development of experimental techniques for characterizing the electrode transport properties has not kept pace with modeling advances. Recently developed techniques provide approaches for measuring critical gas diffusion media transport properties including the dependence of capillary pressure on liquid saturation and the dependence of liquid relative permeability on saturation.

We have demonstrated experimental techniques relevant to gas diffusion media that allow us to measure the relationship between liquid saturation and capillary pressure and to measure the relative permeability of the media to both liquid and gas phases. These techniques provide an experimental basis for relating diffusion media characteristics to factors such as compression and wet-proofing, thus providing guidance for diffusion media design and for overall improvement of PEM fuel cell performance.