



CHEMICAL AND BIOLOGICAL ENGINEERING DEPARTMENT SEMINAR SERIES

Fuel Cell Membranes that become Wetter as the Surrounding Air Gets Hotter

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Time: Wednesday, May 6; 3:15 – 4:30 pm

Location: Perlstein Hall Auditorium

Abstract

We establish a new systematic methodology for controlling water retention of polymer electrolyte membranes (PEMs) at elevated temperatures. Block copolymer membranes comprising hydrophilic phases with widths ranging from 2 to 5 nm become wetter as the temperature of the surrounding air is increased at constant relative humidity. Simple calculations suggest that capillary condensation is important at these length scales. The widths of the moist hydrophilic phases were measured by cryogenic electron microscopy experiments performed on humid membranes and in-situ small angle neutron scattering. The connection between moisture content and proton conductivity is demonstrated. The talk will begin with a discussion of the thermodynamic properties of hydrated PEMs before discussing transport properties. We show that the thermodynamic properties of hydrated PEMs are not in agreement with standard theories of polymer/solvent mixtures.

Biography

Nitash P. Balsara is a chemical engineer with a bachelor's degree from the Indian Institute of Technology in Kanpur, India in 1982, a master's degree from Clarkson University in Potsdam, New York in 1984, and a PhD from Rensselaer Polytechnic Institute in Troy, New York in 1988. He did post-doctoral research at the Department of Chemical Engineering and Materials Science at the University of Minnesota, and at Exxon Research and Engineering Company in Annandale, New Jersey. In 1992, he joined the faculty of Department of Chemical Engineering at Polytechnic University in Brooklyn, New York. He was promoted to associate professor in 1996 and professor in 1998. In 2000 he moved to the Department of Chemical Engineering at the University of California, Berkeley with a faculty staff appointment at Lawrence Berkeley National Laboratory.