

Sept 13, 2012

New Materials for Ion Conduction and Catalysis in Polymer Electrolyte Fuel Cells



Andrew Herring

Associate Professor

Department of
Chemical and
Biological
Engineering

Colorado School of
Mines

Golden, CO

Abstract: Electrochemical energy conversion devices, such as polymer electrolyte fuel cells, can potentially be much more efficient than heat engines at the relatively low temperatures at which they operation. All of these devices use a separator that conducts only ions and must be a barrier to electrons and reactants and may have stringent mechanical property requirements. Furthermore, as fuel cells cycle between open circuit and some lower operating voltage, and electrochemical reactions may be incomplete leading to a variety of reactive species being present, the separating materials may be constantly chemically attacked. At CSM we are fabricating a large portfolio of new polymeric materials for fuel cells that act as membrane separators. In this talk, after an introduction to why fuel cells could solve many of our energy elated problems, I will briefly describe our efforts and the challenges that will have to be met to incorporate these materials into practical energy conversion devices. The materials to be discussed will be proton exchange membranes, alkaline exchange membranes, and some of our work to interface these materials to electrocatalysts in fuel cell electrodes.

Biography: Prof Herring's interests are generally in materials to enable renewable energy, energy efficiency, and storage. He has been studying ion conduction for low and intermediate temperature fuel cells for the last 17 years. The Herring group has extensive experience in the fabrication of inorganic/organic nano-composites for ion conduction and the development of novel new hybrid polymeric proton conducting systems that show superior proton conduction under relatively hot and dry conditions. Prof Herring is an expert in advanced techniques for the characterization of transport and morphology in these systems. Dr. Herring has a B.Sc. Hons in Chemistry and a Ph.D. in Inorganic Chemistry from the University of Leeds. After postdoctoral appointments at Caltech and NREL, he joined the Colorado School of Mines as a Research Associate. After 17 years at CSM, Prof Herring is now an Associate Professor of Chemical and Biological Engineering.