

# Physics Seminar

## Michigan Technological University

Friday, May 17, 2013

at 11:00 am

Room 130 Fisher Hall



### Polymer Electrolytes: Materials and Device Aspects

**Prof. Rakesh Agrawal**

**Pt. Ravishankar Shukla University**

**Raipur, INDIA**

**Abstract:** Polymer Electrolytes, a novel kind of ion conducting electro-active polymers in thin/flexible film form, are attracting a great deal of technological attention in recent years. Majority of commercially available batteries are based either on  $\text{Li}^+$ -ion salt solution immobilized in inert polymer matrix and/or dry polymer electrolytes. However, in spite of impressive advancement in  $\text{Li}^+$ -ion rechargeable battery technology since 1990s, Li-chemicals based batteries encounter many serious limitations including fire-hazard / explosion. Hence, it is strongly felt to explore some non-Lithium chemicals for battery applications.  $\text{Mg}^{2+}$ -ion polymer electrolytes/ Mg-metal electrode are looked upon as the appropriate replacement to  $\text{Li}^+$ -ion polymer electrolytes/ Li-metal electrode. However, the current status of  $\text{Mg}^{2+}$ -ion polymer electrolytes is not much encouraging as they exhibit poor ionic conductivity at room temperature. Nevertheless, the ionic conductivity as well as other physical properties can be improved significantly by dispersing nano-filler inert materials into SPEs or introducing nanoionic effects. The present talk will highlight the materials aspects of polymer electrolytes along with their broad classification and synthesis routes with special focus on dry polymer electrolytes viz. Solid Polymer Electrolytes (SPEs)/ Nano Composite Polymer Electrolytes (NCPEs) i.e. nano filler particle dispersed SPEs. A brief mention on variety of experimental techniques often used to characterise materials/ ion transport properties will be made along with electrochemical device aspects. Some of the results on number of SPEs/NCPEs synthesised at present laboratory will also be presented.

**Bio:** Rakesh Agrawal is a Professor and Chair of the school of studies in Physics and Astrophysics at Pt. Ravishankar Shukla University, Raipur, India. His group has been working in the area of solid state ionics and superionic solids. He received his PhD in 1980, worked as a postdoctoral fellow at Benaras Hindu University, Varanasi and then joined Pt. Ravishankar Shukla University, Raipur in 1988. He has received several research grants to work on ion conducting electroactive polymers and has published 100+ research papers in peer-reviewed publications.