



## ~~Special Polymer Physics Seminar ~~

**Professor Robert A. Weiss**

Department of Polymer Engineering  
University of Akron  
Akron, OH 44325-0301

**10:00 AM Tuesday**  
**April 12<sup>th</sup>, 2011**  
**301 Steidle Bldg.**

### **Properties of Ion-containing Polymers**

Ionomers are predominantly hydrophobic polymers that contain a small amount of bonded acid or salt groups. They were first invented by DuPont de Nemours in the mid-1960's and became intimately linked with golf balls in the late 1970's. Still today, they are widely used in the construction of golf balls. Yet, ionomers also find application in a wide variety of products, including other sporting goods, packaging, membranes, blend compatibilizers, coatings, adhesives, biomaterials and electrochromic devices. The desirable properties of ionomers arise from their amphiphilic nature that produces a self-assembled ion-rich nanophase within a hydrophobic continuous matrix. That microphase separated morphology produces a physically crosslinked network that leads to increases of the glass transition, modulus, viscosity and toughness compared with the unfunctionalized polymer. This talk will discuss the structure and properties of ionomers, including the unique dynamic behavior exhibited by these complex materials. For example, the introduction of only a few metal sulfonate groups per chain of a low molecular weight, unentangled polystyrene increases the zero shear viscosity and the terminal relaxation of the polystyrene by seven and nine orders of magnitude, respectively. It also produces significant elasticity of the polymer, even though there are no molecular entanglements, and it can even produce shear thickening behavior of a polymer melt.