

## ~~Special Polymer Physics Seminar ~~

**Professor Bryan D. Vogt**

Department of Polymer Engineering  
University of Akron

**10:00 AM Tuesday, September 13<sup>th</sup>, 2011**  
**301 Steidle Bldg.**

### **Insights into the thickness dependent properties of organic glass films**

For over two decades, there has been considerable controversy over changes in the glass transition temperature ( $T_g$ ) of organic glasses confined in nanopores or thin (<100 nm) films. Polymer thin films can exhibit apparent decreases in  $T_g$  by over 80 K in comparison to their bulk; as  $T_g$  is typically closely coupled with mechanical, transport and electrical properties, the size dependent behavior could be critical to understanding the mechanical stability of lithographic feature for microelectronics, performance of thin polymer membranes, and aging of organic electronics as examples. In this talk, I will discuss some of the proposed origins for the size dependent behavior and our experimental designs to test these hypotheses based upon examination of both  $T_g$  and the elastic moduli of these films. For small molecule glasses, I will focus on commonly utilized organic glasses for OLEDs. We find that the proximity of the test temperature to bulk  $T_g$  and the deposition conditions are critical to the thin film behavior, but facile engineering of molecular packing appears possible. For polymer thin films, the critical factors in controlling the thickness dependent behavior appear to be backbone rigidity, residual solvent, and quench depth into the glass. I will conclude with brief discuss of our speculative hypotheses and implications in emerging technologies.

**Brief Bio:** Bryan D. Vogt is an associate professor in the Department of Polymer Engineering at the University of Akron. He received his BS at Michigan Technological University in Chemical Engineering. He received his PhD in Chemical Engineering while working with Jim Watkins at the University of Massachusetts and was a NRC postdoctoral fellow with Wen-li Wu in the Polymers Division at NIST in Gaithersburg, MD.

He joined the faculty at Arizona State University in Chemical Engineering in 2006. He received an NSF CAREER Award in 2008. He recently moved to the University of Akron in fall 2011. His research interests focus on the interface between different materials on the nanoscale, particularly polymers. These interfaces can be exploited and tuned to enable self-assembly, but also can be a source of mechanical weakness. The focus of his research program is on fundamental phenomenon, but in the context to improve the mechanical stability of nanostructures, moisture resistance of adhesives, performance of battery electrodes, and sensitivity of sensors for energy and human health applications.