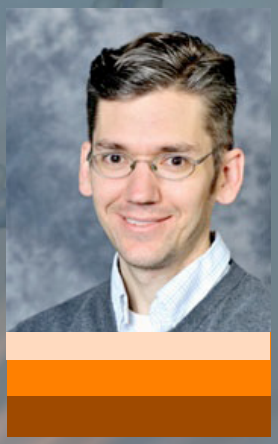
PPSM

Program in Polymers and Soft Matter

POLYMER SEMINAR



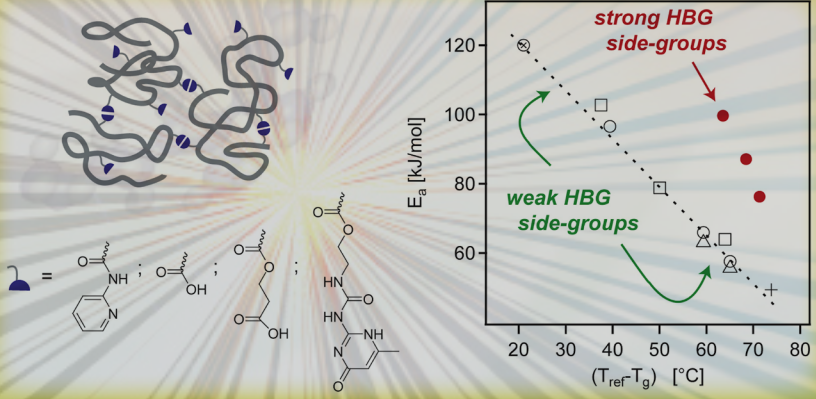
Prof. Mitchell Anthamatten

Department of Chemical Engineering
University of Rochester

"H-bonding Polymers: From glasses to shape-memory elastomers"

Summary

An overview of our efforts to understand the relevance of H-bonding within condensed polymer melts and elastomers will be presented. Reversible association of hydrogen-bonding side-groups of linear polymers and crosslinked elastomers sharply influences dynamic mechanical behavior, giving rise to valuable viscoelastic, shape-memory and self-healing properties. However, association of side-groups is often unpredictable owing to the presence of polymer backbones, chain entanglements and to nanophase segregation between of molecular parts. Through systematic synthesis of copolymers containing H-bonding monomers, we assess how H-bond strength, density, and type affect glass formation and viscoelastic behavior. The polymers behaved as rheologically simple melts but distinct differences were observed between copolymers containing "weak" versus "strong" hydrogen bonding side-groups. Time-temperature superposition shift factors were fit to the Vogel-Tamman-Fulcher and Arrhenius equations to compare the activation of viscous relaxation processes. Materials will also be discussed that contain both permanent (covalent, irreversible) and dynamic (reversible) net points. Remarkably, H-bonding interactions can effectively stabilize mechanically-strained states leading to shape memory elastomers. Unlike conventional shape-memory polymers, these elastomers contain dynamic bonds and lack a well-defined shape-recovery temperature. The influence of H-bonding on the mobility of small molecule penetrants will also be considered. Taken together, the results offer a perspective on H-bonding polymers that can guide material design.



WED. DEC 10th 2014 • ROOM 4-231

SEMINAR 3:30 - 5:00 PM • REFRESHMENTS 3:00 PM

http://polymerscience.mit.edu

Information: Greg Sands (gsands@mit.edu/253-0949)