Physics Colloquium, University of South Florida
3:00 pm, Friday, Oct. 12th, 2018, ISA 2023
☞☞*Refreshment available* ☜☜

Dynamics and Mechanics of Confined Glass-Forming Materials

Dr. Robert A. Riggleman

Department of Chemical and Biomolecular Engineering, University of Pennsylvania, Philadelphia PA 19104

Despite their wide-spread use in engineering and technological applications, there are numerous outstanding fundamental questions surrounding the formation of disordered solids. There are numerous theories that describe the basic phenomenology of glass-formation where the dynamics of the constituent particles dramatically slow down on cooling, but designing experiments or simulations that can test or eliminate these theories remains a challenge. In this talk, I will describe our efforts at probing fundamental questions surrounding glasses and disordered solids using both molecular simulations and experiments. Our molecular simulations provide a wealth of information on the dynamics of glasses, particularly in the presence of surfaces, and the results broadly agree with experiments when compared at the appropriate time scales. However, on time scales inaccessible to simulations, experiments reveal a dramatic change in the dynamics of confined polymers that we have so far been unable to rationalize with existing models. Finally, if time allows, I will show our results describing how interfaces affect the mechanics of glasses far below the glass transition, where we observe a transition from a surface-dominated response to one where the bulk properties play an increasingly important role.

Robert Riggleman received a B.S. in Chemical Engineering from the University of South Carolina, Columbia, and a Ph.D. in Chemical Engineering from the University of Wisconsin, Madison, where he was co-advised by Profs. Juan de Pablo and Paul Nealey. After his postdoctoral studies at the University of California, Santa Barbara, with Prof. Glenn Fredrickson, he joined the faculty in the School of Engineering and Applied Science at the University of Pennsylvania in 2010. He has been recently promoted to Associate Professor with tenure, effective July 2017. His research uses molecular dynamics, Monte Carlo, and field-theoretic simulations to study fundamental problems related to the dynamics and thermodynamics of soft materials.