HAJIM SCHOOL OF ENGINEERING & APPLIED SCIENCES
UNIVERSITY of ROCHESTER

Department of Chemical Engineering

Professor Sindee L. Simon

P.W. Horn Professor and Whitacre Department Chair
Department of Chemical Engineering, Texas Tech University

"The Glass Transition and Polymerization Kinetics in Nanoconfined Systems"

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3:25 p.m.
202 Gavett Hall

The behavior of materials confined at the nanoscale has been of considerable interest over the past several decades. Recent work in our laboratory has focused on the influence of nanoconfinement on polymerization kinetics, as well as the effects of synthesis under nanoconfinement on polymer properties. In the case of step-growth polymerization of cyanate esters and free radical polymerization of methyl methacrylate, we find enhanced reactivity with decreasing nanopore size. On the other hand, in the ring-opening polymerization of dicyclopentadiene, we find reduced reactivity and the presence of a side reaction not present in the bulk system. The results can generally be explained and modeled by competition between changes in local packing and diffusivity under confinement coupled with entropic and surface effects. A related area of research concerns changes in the calorimetric glass transition temperature for polymers confined to nanoscale dimensions, including recent measurements on single thing films using chip calorimetry. The influence of substrate interactions, free surfaces, and molecular stiffness on changes in T_g will be discussed in the context of unanswered questions in the field.