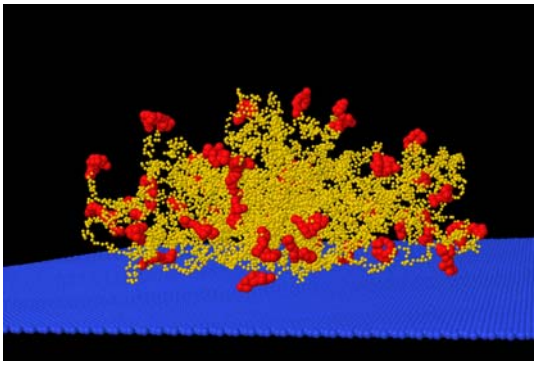
Georgia Institute of Technology

SCHOOL OF CHEMICAL & BIOMOLECULAR ENGINEERING
FALL 2009 SEMINAR SERIES
OCTOBER 21

DR. S. MICHAEL KILBEY II

Associate Professor
Department of Chemistry
University of Tennessee, Knoxville
Oak Ridge National Laboratory (ORNL) Joint Faculty in the Center for Nanophase Materials Sciences

"Self-assembly and Dynamics of Architecturally Complex Block Copolymers"



Manipulating the composition of block copolymers is a well-known and often-utilized route for altering the microphase segregated morphology of bulk films or the structure of self-assembled micellar ensembles formed in preferential solvents. Another way the information content of copolymers may be altered is by changing the macromolecular architecture. Along these lines we have focused our recent efforts on elucidating the impact of chain architecture on the structure and dynamics of supramolecular aggregates formed in solution, as well as their preferential adsorption onto surfaces. The overarching goal is to understand how complex macromolecules and their ensembles accommodate and unpack themselves at solid-fluid interfaces. Specifically, several sets of well-defined branched block copolymers have been synthesized and investigated, including amphiphilic star-block copolymers, mikto-arm (mixed arm) stars having a branched structure, and hetero-arm star copolymers. Results from static and dynamic light scattering are consistent with the idea that branched polymers have more compact structures compared to their linear analogs, influencing their dynamics and interactions when preferentially adsorbed at the solid-fluid interface. Our results clarify the importance of surface reorganization events in comparison to near-surface transport, and also show that in some cases self-assembly of highly-branched materials onto surfaces proceeds by a random sequential adsorption process. The implication of the dynamic

equilibrium that exists between unimers and micellized species on kinetics of adsorption and surface relaxations will also be described. Our activities at and interactions with the Center for Nanophase Materials Sciences (and Spallation Neutron Source) at Oak Ridge National Laboratory will be highlighted as well.