UNIVERSITY OF RHODE ISLAND
Department of Chemistry
SEMINAR

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Prof. Thomas H. Epps, III

Thomas & Kipp Gutshall Professor
Chemical and Biomolecular Engineering
Materials Science & Engineering
University of Delaware
Newark, Delaware

"Nanostructure-Forming Polymers for Sustainability and Human Health"

HOST

Jimmie Oxley
Department of Chemistry
401-874-2103

Nanostructure-Forming Polymers for Sustainability and Human Health

Thomas H. Epps, III
Thomas & Kipp Gutshall Professor of Chemical & Biomolecular Engineering
Professor of Materials Science & Engineering
University of Delaware

Abstract

The design, synthesis, and self-assembly of nanostructure-forming block copolymers (BCP)s can facilitate the development of new materials for many emerging applications. In the Epps group, we are focused on elucidating the structure/property/function relationships inherent in nanostructured polymers to create unique systems exhibiting molecular-level assembly. A particular interest in our research group is the coupling of thermodynamic and kinetic constraints in self-assembling polymers for a variety of potential platforms including lithium battery membranes, green and bio-based materials, and drug delivery capsules. Two areas of recent progress in the group involve: *(1)* designing new stimuli-responsive copolymers for gene therapy applications, and *(2)* synthesizing new bio-based alternatives, based on lignin, for thermoplastics and adhesives applications. In the first area, we use photo-responsive functionalities, as well as our understanding of solution self-assembly, to create nanoscale nucleic acid delivery vehicles. These systems show increased cellular uptake, stable packaging, on-demand unpackaging, and controlled/tunable/efficient delivery relative to standard nucleic acid transfection agents. In the second area, we modify lignin model compounds and 'real' biomass-derived compounds for use in the controlled synthesis of bio-based materials. One recent task has been the investigation of styrene-alternatives for BCPs with tunable glass transition and degradation temperatures that are suitable for thermoplastic elastomer, pressure sensitive adhesive, and battery electrolyte applications.