Materials Engineering Program

Texas Center for Superconductivity at the University of Houston

Center for Integrated Bio and Nano Systems

Polyelectrolyte Solutions and Brushes

March 29, 2024

Face to Face Only: 1:00 – 2:00 pm

Houston Science Center (HSC), Rm 102

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Abstract:

Polyelectrolytes exhibit unique solution properties compared to neutral polymers due to charge repulsion along the backbone that increases chain size and results in viscoelastic behavior even at low polymer concentration. Consequently, polyelectrolytes are extensively used in industrial applications, including as thickeners and rheology modifiers for aqueous coatings and flocculation agents for colloids and wastewater treatment. They also play a fundamental role in biological processes, including intracellular phase separation and joint lubrication. Polyelectrolytes may also be anchored onto surfaces to create brush architectures that offer flexible design parameters for imparting tailored interfacial functionality at the nanoscale. The influence of charge sequence and fraction on polyelectrolyte solution and brush behavior, however, is lacking. Here, we use solid phase peptide synthesis (SPPS) and surface-initiated copper (0) controlled radical polymerization (SI-CuCRP) to produce polymers with controlled sequence and charge fractions. Systematic studies using small-angle X-ray scattering (SAXS) and 3D single molecule tracking reveal that charge fraction and sequence influence polyelectrolyte solution conformation and phase behavior, as well as brush height and transport properties.

Bio: Amanda B. Marciel is an Assistant Professor and William Marsh Rice Trustee Chair of Chemical and Biomolecular Engineering at Rice University. She earned a B.S. in Chemical Biology from the University of California at Berkeley in 2008 and Ph.D. in Biophysics from the University of Illinois at Urbana-Champaign with Professor Charles Schroeder in 2015. She worked at the Institute for Molecular Engineering (IME) at The University of Chicago as a Postdoctoral Fellow with Professor Matthew Tirrell. The Marciel group investigates the influence of sequence and architecture on the static and dynamic behavior of polymer solutions, brushes and networks using light scattering, bulk rheology, and single molecule techniques.