ChemBE FALL 2019 Seminar Series
10:30 am, Thursday, Sept 26
Maryland Hall 110

Thomas P. Russell
Silvio O. Conte Distinguished Professor of Polymer Science and Engineering
University of Massachusetts in Amherst

Topic: Structuring Liquids

Ab: The ability to manipulate and lock-in the shape of one liquid in a second, i.e.: structuring the liquids, allows the generation of unique materials that have the dynamics and mobility of liquids but the structural integrity of a solid. Bicontinuous fluids for separations, novel encapsulants for delivery systems, or all-liquid charge transport systems can be envisioned. Yet, these fluids have shapes that are far removed from their equilibrium shape and developing routes to kinetically lock-in these non-equilibrium shapes while retaining the local fluidity is key. We describe the in situ generation of nanoparticle surfactants that assemble at the liquid/liquid interface. When the liquids are brought into non-equilibrium shapes, the nanoparticle surfactants will jam at the interface, freezing in the shapes of the liquids. The assemblies of nanoparticles surfactants assume in-plane mechanical properties that range from liquid-like to solid-like behavior, depending on the areal density of the assemblies. By integrating superparamagnetic nanoparticles into the assemblies, the structured liquids are found to exhibit rather unusual magnetic characteristics in response to an external magnetic field. External stimuli, as for example pH, electric or magnetic fields or temperature, can then be used to re-shape the liquids, so that the structured liquids can be adaptive. We will also describe the printing of water constructs in water by the formation of polycationic-polyanionic coacervates at the interface and the unique diffusive characteristics imparted to the printed assemblies.

Bio: Thomas P. Russell, the Silvio O. Conte Distinguished Professor of Polymer Science and Engineering at the University of Massachusetts in Amherst, received his PhD in 1979 in Polymer Science and Engineering from the University of Massachusetts Amherst, a Research Associate at the University of Mainz (1979-1981), a Research Staff Member at the IBM Almaden Research Center in San Jose, CA (1981-96). He is also a Visiting Faculty at the Materials Science Division in the Lawrence Berkeley National Laboratory, an Adjunct Professor at the Beijing University of Chemical Technology, and a PI at the Advanced Institute of Materials Research at Tohoku University. His research interests include the surface and interfacial properties of polymers, phase transitions in polymers, directed self-assembly processes, the use of polymers as scaffolds and templates for the generation of nanoscopic structures, the interfacial assembly of nanoparticles and wrinkling of thin polymer films. (for complete Bio go to http://bit.ly/2m4TMn4)

Refreshments served at 10 am. Attendance taken 10—10:45am.
Contact Sharon (SPunte1@jhu.edu) if you have additional questions.