Spring 2023 Seminar Series

Chemical Engineering

THE UNIVERSITY OF RHODE ISLAND
COLLEGE OF ENGINEERING

Location: Kirk Engineering Building, Auditorium
Zoom link: https://uri-edu.zoom.us/j/94153419785
Date: 01/26/2023 (Thursday)
Time: 12:45 pm – 1:45 pm (EST)

Incorporating Dynamics into Structure-Property Relationships for the Next Generation of Soft Matter

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Abstract:
Distinct from other classes of materials, soft matter is predominantly characterized by weak interparticle interactions between structural components. The force of these interactions is typically on the order of thermal energy, resulting in a dynamic nature in which the material structure evolves and relaxes over time. This evolving structure controls many important properties of soft matter, including viscoelasticity, processability, and conductivity. Here, we discuss two methods by which we exploit the dynamic nature of soft materials to drive changes to their rheological properties. First, we discuss a fundamental investigation of thixotropic yield-stress fluids to isolate a well-defined yield stress. This definition of a yield stress removes existing ambiguity in literature and represents the first formal definition of yielding in systems that express structural breakdowns. Second, we will discuss how triblock copolymers induce a permanent, irreversible network between emulsion droplets. The structure of this material mimics that of biological tissue, facilitating *in vitro* experiments of transport with improved correlations to *ex vivo* measurements. With this approach, we demonstrate the power of dynamics to dictate material properties, elucidating fundamental physics underlying soft matter and generating novel classes of biomimetic materials.

Bio-Sketch:
Dr. Ryan Poling-Skutvik is an Assistant Professor in the Department of Chemical Engineering at the University of Rhode Island. He received his B.E. in Chemical Engineering from the Cooper Union for the Advancement of Science and Art in 2013 and his Ph.D. in Chemical Engineering from the University of Houston in 2018. He joined the University of Rhode Island in 2020 after completing his postdoctoral research at the University of Pennsylvania. His research expertise combines rheology, microscopy, and scattering to identify hierarchical behavior in complex soft materials, which has received funding from RI-INBRE, the Department of Transportation, and the ACS Petroleum Research Fund Doctoral New Investigator award.

For additional information, please contact Claudia Prior at (claudia.prior@uri.edu), and/or Prof. Daniel Roxbury at (Roxbury@uri.edu).