Dynamic polymer networks for sustainability and biomedicine

Speaker: Dr. Julia Kalow, Northwestern University

Abstract: Polymer networks are ubiquitous in modern life, in the form of rubbers, adhesives, synthetic resins, and gels. When the molecular interactions that hold together the infinite network are irreversible covalent bonds, these materials cannot be mended after fracture, cannot be recycled, and cannot adapt to applied stress. However, these properties are desirable across disparate fields: as we learn more about the mechanics of biological tissue, and as plastics accumulate in our oceans, the need for materials that change in response to stimuli—dynamic networks—increases. In the Kalow lab, we use our expertise in synthetic and physical organic chemistry to design reactions that enable bond rearrangement within polymer networks. In particular, we are interested in using light-controlled reactions and switches to make polymer networks that are responsive to light. Light is one of the most appealing stimuli because it can be delivered remotely with precise control over space, time, intensity, and color. The materials we pursue are inspired by problems in sustainability and biomedicine.

Biography: Julia was born and raised in Newton, MA. She obtained her BA at Columbia University in 2008, where she studied chemistry and creative writing. She pursued graduate studies at Princeton University under the supervision of Prof. Abigail Doyle. After completing her PhD in 2013, she was a postdoctoral fellow at MIT with Prof. Timothy Swager. She started her independent career at Northwestern’s Department of Chemistry in July 2016, where her group develops strategies to control the synthesis and properties of polymeric materials with light. Her group’s research has been recognized with the Air Force Office of Scientific Research Young Investigator Award, a NSF CAREER award, and the 3M Non-Tenured Faculty Award.