

Mechanics and Chemistry in Designing Polymers

Meredith Silberstein, PhD

Assistant Professor

Sibley School of Mechanical and Aerospace Engineering

Cornell University

Wednesday, February 22, 2017

221 MEC

1:00 to 2:25pm

Abstract:

The coupling of mechanics and chemistry is an emerging field leading to innovative material design. This talk will primarily focus on my group's work towards utilizing mechanochemistry in polymers and composites. Polymer and interface multifunctionality can be designed through the incorporation of chemical groups termed "mechanophores" that have a specific chemical transformation in response to applied force. Mechanophores have been developed that change color, emit light, alter polymer chain contour length, and trigger crosslinking. However, incorporating these force-driven molecules to create stress-driven functions in bulk materials can be tricky. We use a combination of computational, theoretical, and experimental approaches to understand how stress on the bulk scale is converted to mechanophore-scale force and then how those mechanophore state changes can in turn change bulk properties. We find that the microstructure of each material is critical to determining both the stress and time dependence of the mechanochemical reaction.

About the Speaker:

Meredith Silberstein is an Assistant Professor and Mills Family Faculty Fellow in the Sibley School of Mechanical & Aerospace Engineering at Cornell University. She received her PhD in June 2011 from the MIT Department of Mechanical Engineering with a major in solid mechanics and a minor in energy. Afterward, she served as a postdoctoral fellow at the Beckman Institute at the University of Illinois Urbana-Champaign, investigating mechanochemically active materials. In 2013 she received the Haythornthwaite Research Initiation Grant from ASME Applied Mechanics Division. In 2017 she received the NSF CAREER award. Meredith Silberstein's Mechanics for Materials Design (MMD) Lab is devoted to using mechanical experiments and modeling methods in material design, with particular focus on multifunctional, active, and polymeric materials.

For more information contact:

Prof. Shawn Chester, shawn.a.chester@njit.edu