

Project Title: Self-Sensing Polymers

Advisers: Meredith N. Silberstein (Post Doc. Beckman) and Prof Nancy R. Sottos (MatSE)

Project Description:

Mechanically-induced chemical reactivity is a promising means for designing self sensing and autonomous materials. Mechanically sensitive chemical groups called mechanophores can be covalently linked into polymers in order to trigger specific chemical reactions upon mechanical loading. Our group has been developing this capability with a mechanophore that changes both color and fluorescence when mechanically activated. The optically detectable activation makes this mechanophore ideal both for understanding in-situ activation and for studying solid state polymer mechanics. This research opportunity will focus on understanding the role of molecular orientation in activation. The student will gain experience with both polymer synthesis and opto-mechanical characterization techniques.

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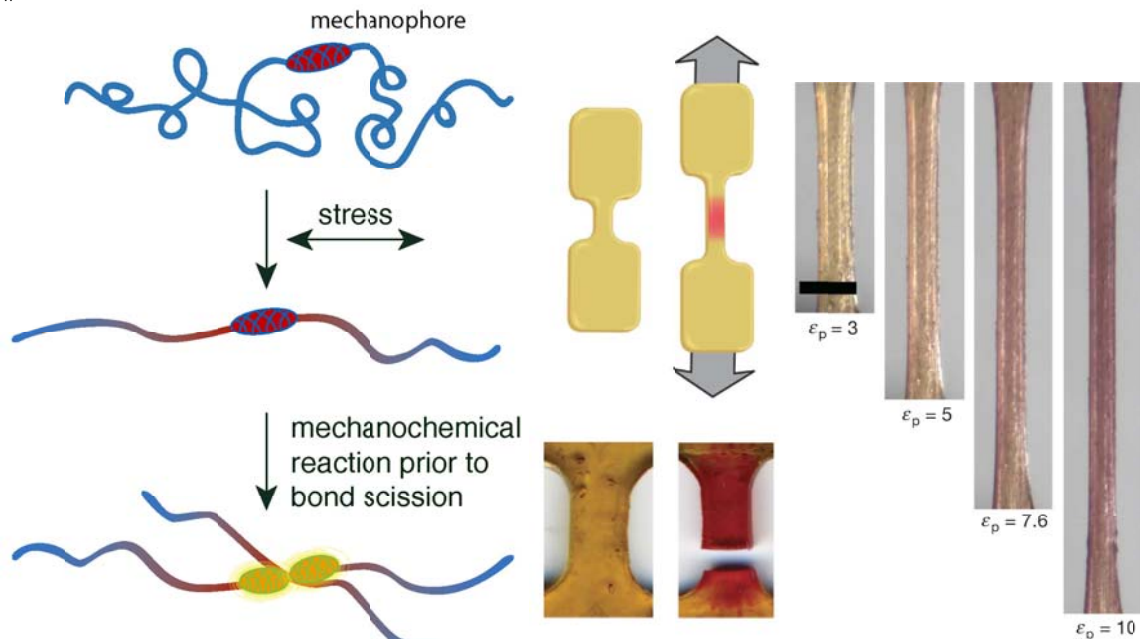


Figure 1. Left: Schematic of mechanophore concept. Middle Top: Schematic of tensile loading of polymer with covalently linked color changing mechanophore. Middle Bottom: Polymethacrylate (PMA) linked with color changing mechanophore before tensile testing and after failure. Right: PMA linked with color changing mechanophore during tensile testing.

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Student background and expected research activities:

The applicant should be enthusiastic about material design and open to learning new polymer processing and characterization methods. Prior experience with polymer synthesis and/or mechanical testing preferred but not required. The student will be responsible for synthesizing mechanophore-linked polymer specimens, performing opto-mechanical testing, and performing data analysis.

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