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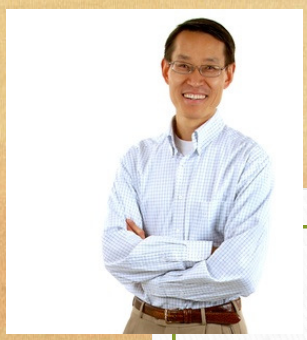

Materials Seminar

Monday, May 5, 2014

3:30 pm, 1315 Chemistry

"Bioinspired Design of Dynamic and Self-healing Polymers"

One research goal of my group is attempting to merge supramolecular chemistry and material chemistry for the design of advanced polymeric materials with dynamic properties. Many natural biopolymers not only have advanced mechanical properties such as high modulus, toughness, and elasticity, but also exhibit dynamic properties. Inspired by Nature, we have designed a series of biomimetic modular polymers with folded nano-domains as the repeat units. These new material manifest an exciting combination of key mechanical, as well as adaptive, properties that have until now proven difficult to achieve in man-made systems. Single molecule force was used to correlate the exceptional mechanical properties with their molecular structures. Recently, we developed a biomimetic multiphase design of stiff and spontaneous self-healing polymers. In contrast to previous designs, our system spontaneously self-heals as a single-component solid at ambient conditions without the need of any external stimulus, healing agent, plasticizer, or solvent. Most recently, we reported self-healing polymer design by dynamic covalent bond exchange via olefin metathesis. In this presentation, I will discuss the design, synthesis, and single molecule and macroscopic property studies of our biomimetic dynamic polymers, including stiff and autonomic self-healing systems.