Materials Science & Engineering Seminar Series

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presents

Bio-Inspired Metal-Coordination Dynamics: A Unique Tool for Engineering Soft Matter Mechanics

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Abstract

In soft material systems, mechanical properties are generally governed by transient, dynamic interactions of various types over many hierarchal length- and time-scales. However, explicit control over these dynamics is typically not possible, leaving open questions into how transient interactions can be exploited to design soft materials with unique properties. Inspired by the adhesive chemistry and tough mechanics of mussel byssal threads, we present several studies on various soft polymer material model systems to show the diverse array of properties that can be engineered using bio-inspired metal-coordination. For example, we have begun to understand how to control the explicit effects of hierarchical metal-coordination dynamics on bulk material mechanics. This and other lessons from our attempts to expand the toolset of soft material design will be presented.

Bio

Dr. Niels Holten-Andersen received his PhD at University of California, Santa Barbara working on characterizing the mechanical properties of mussel holdfast fibers with particular focus on the molecular origin of their selfhealing properties. Following his PhD work he pursued implementation of design principles distilled from Nature's materials in synthetic polymer materials design as a post-doctoral researcher at the Institute for Biophysical Dynamics, The James Franck Institute and Department of Chemistry at University of Chicago. He is now the head of the Laboratory for Bio-Inspired Interfaces at Massachusetts Institute of Technology in the Department of Materials Science & Engineering, where his group is continuing to try to distill the design strategies evolved through biological material adaptation and use them to expand the material properties of synthetic polymers.

Doherty Hall 2210, 11:30AM
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