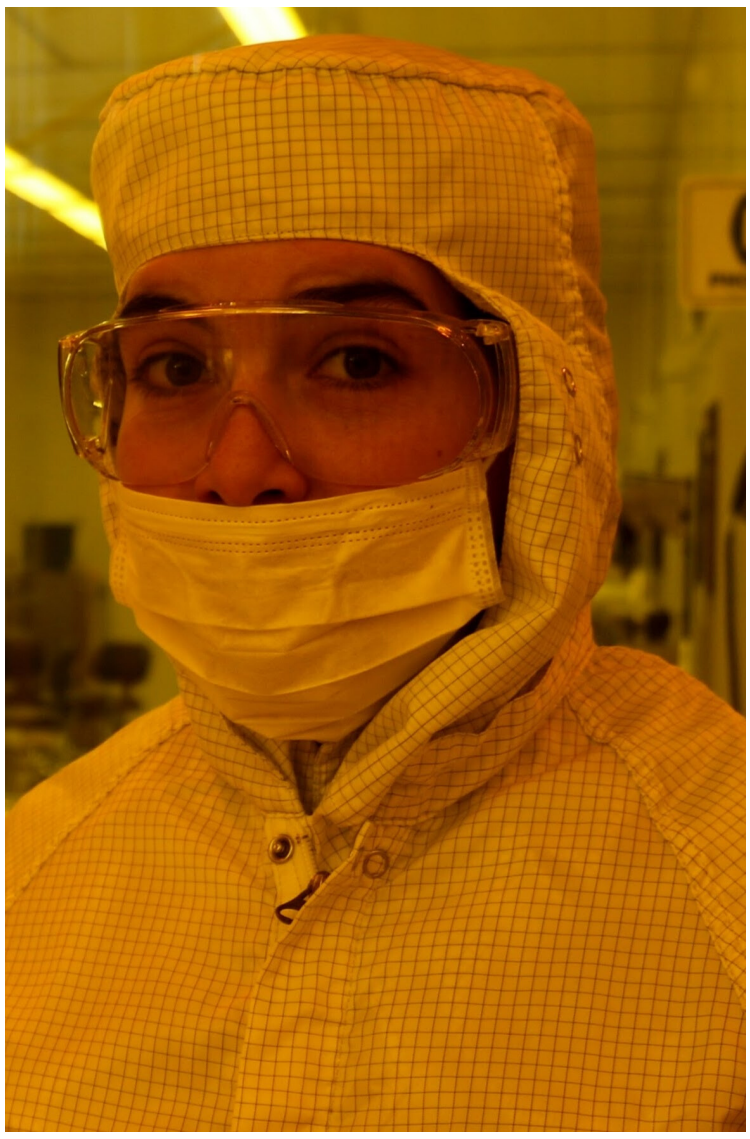
COMPOSITE POSTS FOR ENHANCED AND TUNABLE ADHESIONGENIUS

Dr. Helen Minsky

Carleton College



Wednesday February 19
3 - 4 p.m. | RNS 210

Helen Keays Minsky is an assistant professor of physics at Carleton College. She holds a BS in Physics and Chemistry from Bates College and a BE from Cooper union. She completed her PhD in Mechanical Engineering with Kevin Turner at the University of Pennsylvania before postdocing with Matteo Ciccotti and Costantino Creton at the École Supérieure de Physique et de Chimie Industrielles de la Ville de Paris (ESPCI).

Soft interfaces have unique mechanical properties that are critical to understanding and properly designing adhesives, coatings, robotic grippers, and composite materials. This talk will focus on creating tunable adhesives through a composite post geometry. Tunable adhesion is the ability for the same surface to have high adhesion under one set of conditions and low adhesion under another. It has a variety of applications, including transfer printing of micro- and nano-scale components, climbing and perching robots, and material handling in manufacturing. Approaches to tunable adhesion often rely on van der Waals forces to achieve dry adhesion. Previous strategies for dry tunable adhesives have generally exploited complex fibrillar structures that are inspired by nature. This work investigates a different strategy for enhanced and tunable adhesion based on composite structures with simple geometries. These composite posts, consisting of stiff insets surrounded by a compliant shell, are used for achieving enhanced and tunable adhesion. This composite structure has a high effective adhesion strength under normal loading and low adhesion when shear is applied. Experiments as well as finite element (FE) analysis are used to understand the mechanics of these posts under both types of loading. This work established the mechanics of composite posts for achieving enhanced and tunable adhesion.

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