UNIVERSITY OF DELAWARE

CHEMICAL & BIOMOLECULAR ENGINEERING

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SEPTEMBER 5, 2025 | 102 Colburn Lab @ 10:15 AM

ALLAN P. COLBURN MEMORIAL LECTURER

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NEUTRON REFLECTOMETRY AND HYDROGEL TRIBOLOGY

Hydrogels are compactly described as three-dimensional networks of hydrophilic polymer chains swollen in solvent. This class of materials has enjoyed widespread utility in biomedical applications (e.g., contact lenses, joint repair, surgical coatings) due to their ability to exhibit similar ranges in bulk mechanical properties as tissues (elastic modulus of about 1 to 100 kPa) by controlling water content and crosslink density. High water content hydrogels (>90% water) are often qualitatively described as “slippery” or “lubricious,” although their precise lubrication mechanisms are not well understood. Here, we present a first-of-its-kind sample environment, “tribometer”, designed for hydrogel friction measurements on the Liquids Reflectometer at Oak Ridge National Laboratory. Our initial results suggest that polymer density is correlated with increasing contact pressure -- in agreement with prior compression studies -- as well as sliding velocity. The results of this research may lead to the informed design of more robust and lubricious hydrogels and coatings for use in biomedicine.

Seminar co-hosted by Mechanical Engineering (MEEG)

Angela Pitenis is an associate professor in the Materials Department at the University of California, Santa Barbara. Her research interests are focused on understanding the fundamental mechanisms of friction, deformation, and wear across soft, biological, and bio-inspired materials. She leads a multidisciplinary team of materials scientists, mechanical engineers, and molecular biologists and has co-authored over 60 refereed journal articles. Angela also serves as the IRG-2 co-leader for the Materials Research Laboratory, a MRSEC Program of the National Science Foundation under Award No. DMR 2308708. She was awarded the NSF CAREER award in 2021, the UC Santa Barbara Margaret T. Getman Service to Students award in 2022, and the Society of Tribologists and Lubrication Engineers Early Career Award in 2024.