UNIVERSITY OF RHODE ISLAND
Department of Chemistry
SEMINAR

Room 105 Beaupre Center
3:00 p.m, Monday March 25, 2019

Ian Y. Wong

School of Engineering
Brown University

"Beyond 2D: Patterning, Printing, and Cancer Cell Invasion with Designer Soft Materials"

HOST

Jay Kim
Department of Chemistry
401-874-2143

“Beyond 2D: Patterning, Printing, and Cancer

Cell Invasion with Designer Soft Materials”

Abstract

Biologically-inspired materials can be engineered with dynamic, information-rich functionality to mimic biological behaviors and elucidate cancer biology. In this seminar, I will present recent results from my group to pattern and print soft materials, as well as to understand the epithelial-mesenchymal transition in cancer. First, we utilize mechanical deformations to wrinkle and crumple graphene oxide membranes into hierarchical architectures. We find that sequences of mechanical deformations generate unique structural features, suggestive of a mechanically encoded memory. These ultrastretchable coatings exhibit outstanding chemical resistance and may be utilized for smart fabrics and soft devices. Second, we utilize light-directed 3D printing to ionically crosslink alginate and other polyelectrolytes into hydrogels. We show that the mechanical stiffness and degradation kinetics can be dynamically encoded by ion concentration and is augmented by 2D nanomaterials. Finally, we engineer silk-collagen hydrogels to elucidate the epithelial-mesenchymal transition (EMT), which is implicated in malignant invasion and drug resistance. We demonstrate that cancer cells exhibit a range of phenotypic plasticity between collective and individual migration, with unexpected physical analogies to material solidification. Overall, we envision that large area patterning and printing of soft materials can be used for curved and stretchable multifunctional devices beyond wafer scale. Moreover, our biological research beyond 2D monolayer culture may enable fundamental insights into the tumor microenvironment, as well as physiologically relevant invasion assays for precision medicine.