THE UNIVERSITY OF RHODE ISLAND COLLEGE OF ENGINEERING

AMGEN

Fall 2021 Amgen Seminar Series in Chemical Engineering

October 7 th, 2021

Cherry Auditorium, Kirk Hall, 12:45 – 1:45 PM

Zoom Simulcast: https://uri-edu.zoom.us/j/95080747056

"Engineering bioinspired materials with controlled interactions with microorganisms"

Dr. Jessica Schiffman
Department of Chemical Engineering
University of Massachusetts, Amherst

By re-engineering materials using bioinspired or "greener" chemistries, we can reduce or potentially eliminate toxic solvents, which would benefit the design of medical devices, water purification membranes, wearable electronics, as well as countless additional devices. In this presentation, I will discuss a story from each of my lab's two synergistic research thrusts. First, I will discuss the effect that the fundamental properties of polymer coatings (i.e., molecular architecture, stiffness, and thickness) have on the adhesion of bacteria under quiescent conditions. By decoupling the effects of molecular architecture, stiffness, and thickness from coating chemistry, we have unlocked specific structure-property relationships that can be tailored to control the initial stage of bacterial adhesion. By understanding how materials properties influence bacterial adhesion, we may be able to decrease the concentration of commercial antibiotics needed to combat microbial biofilms. As an example of our work on green chemistry, I will highlight our recent research into nanofibers that form using only water and salt. Polyelectrolyte complexes (PECs) form due to the electrostatic complexation between oppositely-charged polymers. We have demonstrated that by exploiting the salt-driven plasticization of PECs, we can enable the electrospinning of robust fibers using an aqueous solution containing a pair of strong polyelectrolytes and salt. Electrospun PEC fibers are chemically and mechanically stable over a wide range of pH values, ionic strength conditions, and many organic solvents. The overall goal of this talk is to illustrate our recent findings and how these results can guide the green engineering of multifunctional materials.

Bio:

Jessica D. Schiffman is an Associate Professor and the Associate Department Head of Chemical Engineering at the University of Massachusetts Amherst. She holds B.S., M.Eng., and Ph.D. degrees in Materials Science and Engineering from Rutgers University, Cornell University, and Drexel University, respectively. Afterward, she was a postdoctoral associate in the Department of Chemical and Environmental Engineering at Yale University. Currently, Professor Schiffman directs an interdisciplinary and imaginative research group that engineers polymer-based materials that address grand challenges in human health by combining concepts and tools from chemical engineering, nanotechnology, and microbiology. Her most recent awards include being named in 2021 an Influential Researchers by I&EC Research, receiving the 2019 ACS Applied Materials & Interfaces Young Investigator Award and in 2020 the College of Engineering Outstanding Teaching Award. Currently, her lab is well-supported by the National Science Foundation, the Army Research Lab, and numerous industrial sponsors.

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