UNIVERSITY OF DELAWARE
ENGINEERING
DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING

SEMINAR SERIES

FEBRUARY 24, 2023 | ROBERT L. PIGFORD MEMORIAL LECTURE

RACHEL SEGALMAN

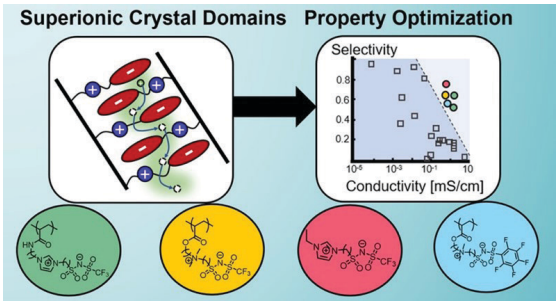
UNIVERSITY OF CALIFORNIA, SANTA BARBARA

Chair, Dept. of Chemical Engineering
Warren G. and Katherine Schlinger Distinguished Professor of Chemical Engineering
Edward N. Kramer Professor of Materials

Attend virtually: https://udel.zoom.us/j/99615073260

CHARGE-NEUTRAL POLYMER COMPLEXES AS BATTERY COMPONENTS

Polymeric components impart inherent mechanical durability of electrochemical devices and decreased flammability to electrochemical devices, but must have higher performance metrics in order to gain widespread use. This is a particular challenge as long-range Li-ion transport is generally directly related to matrix dynamics and is ultimately limited by the sluggish dynamics of polymers. In this talk, I will discuss superionic conductivity in which the ion motion is decoupled from matrix dynamics and instead occurs through free volume elements in the structure. Semi-crystalline zwitterionic polymers appear both to demonstrate superionic conductivity and also very high salt solubilities due to their polarizability. As a result, they have both high Lithium ion conductivities (10-3 S/cm) and cation transport numbers (t+=0.67) despite their modest glass transition temperatures (0-25°C). I will also discuss new coacervate-based battery binders that demonstrate both high ion and electron conductivities and their use to in composite electrodes compatible with polymer electrolytes.



ACS Cent. Sci. 2022, 8, 2, 169-175

ABOUT THE SPEAKER

Rachel A. Segalman received her B.S. from the University of Texas at Austin and Ph.D from the University of California, Santa Barbara. She was a postdoctoral fellow at the Université Louis Pasteur before joining the faculty of UC Berkeley and Lawrence Berkeley National Laboratories from 2004-2014. During a portion of this time she also served as the Materials Science Division Director at Lawrence Berkeley National Laboratories. In 2014, she moved to UC Santa Barbara to be the Kramer Professor of Chemical Engineering and Materials and became Department Chair of Chemical Engineering in 2015. In 2018 she also became the Schlinger Distinguished Chair of Chemical Engineering and the Associate Director of the UT/UCSB/LBL EFRC: Center for Materials for Water and Energy Systems. She is the co-editor of the Annual Reviews of Chemical and Biomolecular Engineering and an associate editor of ACS Macro Letters. Segalman's group works on controlling the structure and thermodynamics of functional polymers for energy applications including polymeric ionic liquids and semiconducting and bioinspired polymers. Among other awards, Segalman received the Andy Acrivos Professional Progress Award from the American Institute of Chemical Engineers, the E.O. Lawrence Award from the U.S. Department of Energy, the Dillon Medal from the American Physical Society, and is an Alfred P. Sloan Fellow and a Camille Dreyfus Teacher Scholar. She is also a Fellow of the American Physical Society and the American Institute of Chemical Engineers and was elected to the American Academy of Arts and Sciences and the National Academy of Engineering.