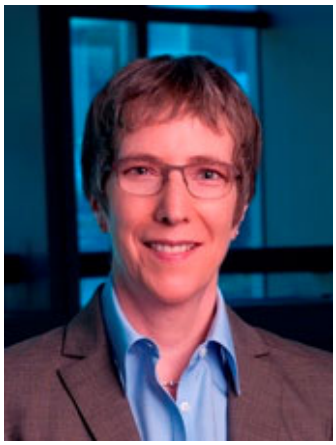
UCF | Materials Science and Engineering

UNIVERSITY OF CENTRAL FLORIDA

MATERIALS SCIENCE & ENGINEERING DISTINGUISHED SEMINAR SERIES



Karen I. Winey, Ph.D.

Professor and Chair

Department of Materials Science & Engineering

University of Pennsylvania

Friday

October 11, 2019

11:00AM — 12:00PM

HEC

Room 101

Contact: Dr. Tengfei Jiang

Materials Science & Engineering

Phone: 407-823-2284

Email: Tengfei.Jiang@ucf.edu

Self-Assembly of Periodic Polyethylene Sulfonates: Layered, Bicontinuous Gyroid, and Hexagonal Nanoscale Morphologies for Transport

The self-assembled nanostructures in ion-containing polymers are controlled by the chain architecture, particularly the spacer length between and the chemistry of the functional groups. This talk will focus on a new set of polyester sulfonates from Stefan Mecking's group with long polyethylene segments (23 or 46 carbons) and neutralized with Li^+, Na^+, or Cs^+ counterions. Polymers with the longer PE spacers crystallize into a well-defined nanoscale ionic layered structure at room temperature. *In situ* X-ray scattering measurements reveal that the layer ionic aggregates transform upon heating into the $Ia\bar{3}d$ gyroid morphology. The gyroidal ionic aggregates further evolve to hexagonal symmetry at higher temperatures. The ion transport behavior is strongly dependent on the ionic aggregate morphologies. Specifically, the 3D interconnected gyroid morphology of PES23Li exhibits higher ionic conductivity than the isotropic layered or hexagonal morphologies. This innovative polymer design produced the first percolated gyroidal morphology in an ionomer and provides a continuous pathway for fast transport.

Biography: **Karen I. Winey** is Department Chair, Professor and TowerBrook Foundation Faculty Fellow of Materials Science and Engineering at the University of Pennsylvania with a secondary appointment in Chemical and Biomolecular Engineering. Karen received her B.S. from Cornell University in materials science and engineering and her Ph.D. in polymer science and engineering from the University of Massachusetts, Amherst. Following a postdoctoral position at AT&T Bell Laboratories, she joined the faculty of the University of Pennsylvania in 1992. Karen characterizes and manipulates nanoscale structures in ionomers and associating polymers to develop materials with improved mechanical and transport properties. Recently, she discovered new structures in several acid- and ion-containing precise polyethylenes. Karen also designs and fabricates polymer nanocomposites to understand and improve their mechanical, thermal, and electrical properties, particularly transparent conductors. Polymer motion in the presence of nanoparticles and in nanoconfinement are currently areas of interest. Across these research areas, Karen couples experimental studies with simulation and theory, either within her group or with collaborators. Karen has served the research community as Chair of the Division of Polymer Physics within the American Physical Society (2013) and as Chair of the Polymer Physics Gordon Research Conference (2010). Winey also served as an Associate Editor for *Macromolecules* (2010-14), the leading journal in the field. Karen has numerous honors including Fellow of the American Physical Society (2003), George H. Heilmeier Faculty Award for Excellence in Research (2012), Fellow of the Materials Research Society (2013), Visiting Miller Research Professor at the University of California, Berkeley (2014), Fellow of the PMSE Division within the American Chemical Society (2016) and the Trustees Council of PennWomen Award for Undergraduate Advising (2018).