

FALL 2024

# MSE 690 SEMINAR SERIES

FRIDAY, JANUARY 19TH | 3:30 REFRESHMENTS | 3:45PM SEMINAR | ARMS  
1010



## KELLY M. SCHULTZ

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### *“Rheological characterization of material evolution of gel scaffolds”*

**Abstract:** The evolution of gel scaffolds has implications in use of these materials for applications ranging from consumer products to synthetic materials that enhance wound healing. To use these materials, we must understand the spatio-temporal change in material properties and scaffold structure during phase transitions. We will discuss the characterization of two gel systems: a hydrogenated castor oil (HCO) colloidal gel and an enzymatically degradable human mesenchymal stem cell (hMSC)-laden polymerpeptide scaffold. We use multiple particle tracking microrheology (MPT) to measure dynamic material properties during phase transitions. MPT measures the thermal motion of embedded particles to measure rheological properties. HCO is a rheological modifier used in commercial products. A concern in design is whether the gradient that induces a phase change can overcome processing history. We characterize HCO evolution with MPT,  $\mu^2$ rheology (MPT in a microfluidic device) and bulk rheology. We conclude that equilibrium structures depend on the shear history of the material, which has implications in the end-use of products. To enhance wound healing, cell-laden hydrogel scaffolds that mimic aspects of tissue are being designed to be implanted and deliver additional hMSCs to wounds. We measure length-scale dependent rheology during pericellular cell-mediated remodeling using bi-disperse MPT. Bi-disperse MPT characterizes material evolution across length-scales by tracking bi-disperse particles. Characterization of spatio-temporal evolution due to cell-mediated degradation could lead to better design of implantable biomaterials for cell delivery to wounded areas.

### **Biography:**

Dr. Kelly M. Schultz is an Associate Professor in the Davidson School of Chemical Engineering at Purdue University. She obtained her B.S. in Chemical Engineering from Northeastern University in 2006 and a Ph.D. in Chemical Engineering with Professor Eric Furst from the University of Delaware in 2011 as a NSF graduate research fellow. Following her PhD, she was a Howard Hughes Medical Institute postdoctoral research associate at the University of Colorado at Boulder working with Professor Kristi Anseth. She began as an Assistant Professor at Lehigh University in 2013, was named a P.C. Rossin Assistant Professor (2016 – 2018) and was promoted to Associate Professor in 2019. Dr. Schultz was named a TA Instruments Distinguished Young Rheologists (2014), received a NSF CAREER award (2018), the Lehigh University Libsch Early Career Research Award (2019), the P.C. Rossin College of Engineering and Applied Science Excellence in Research Scholarship & Leadership (2020) and Diversity, Equity and Inclusion Award (2023) and a NIH – NIGMS Maximizing Investigators’ Research Award (2022) and is an Associate Editor of Physics of Fluids.



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