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Chemical and Biological Engineering

Fall 2021 Department of Chemical and Biological Engineering Seminar Series
H. M. Comer 1026
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Self-assembled polymers for biomedical applications

Abstract: Although liposomes have been used for drug delivery and are now a key component of COVID-19 mRNA vaccines, they typically require a multi-step synthesis and often show poor physical and chemical stability. This talk focuses on polymeric vesicles (polymersomes) assembled from synthetic polymers, which boast increased mechanical stability, efficient drug entrapment, and controllable stimuli-triggered cargo delivery. We will discuss how the assembly and responsiveness of these vesicles can be controlled by the composition of ABA-type triblock copolymers with varying chain lengths and hydrophilic ratios. We will show how superior stability of polymersomes in vivo reduces cardiac toxicity induced by anticancer drug doxorubicin (DOX), while injection of DOX-loaded liposomes causes some toxicity manifesting as the decreased bodyweight of mice. Our work shows a promise for the development of next-generation drug carriers with minimal side effects, while the discovered mechanisms of the structural changes of the vesicles will provide design guidance for the development of stimuli-responsive polymeric vesicles.

Bio: Eugenia Kharlampieva is a Professor of Polymer Chemistry at the Department of Chemistry and College of Arts and Sciences Endowed Faculty Scholar at the University of Alabama at Birmingham (UAB). She received her Ph.D. in Polymer Science from the Stevens Institute of Technology and postdoctoral training in Materials Science and Engineering at the Georgia Institute of Technology. Her research centers at the intersection of polymer chemistry, nanotechnology, and biomedical science to develop polymer materials for therapeutic applications. Dr. Kharlampieva received the NSF CAREER Award, the UAB Dean's Award for Excellence in Mentorship, UAB Interdisciplinary Innovation Award, and Faculty Innovator Entrepreneurship Award. She serves as a Chair of the ACS Alabama Local Section and as an Associate Director of UAB Center for Nanoscale Materials and Biointegration.