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SEMINAR SERIES

Wednesday, May 29, 2024
Seminar Presentation: 11:00am – 12:00pm
SME Room 248

"Controlled Polymerizations Applied to Organic Bioelectronics"

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Abstract: Organic bioelectronics refers to the use of organic materials, particularly (semi)conducting π-conjugated polymers, in electronic devices specifically designed for biological applications such as analyte biosensing, monitoring physiological signals, repairing nervous injuries or even treating Parkinson's disease. Currently, the vast majority of bioelectronics relies on inorganic (semi)conductors. However, these materials lack ionic conductivity, mechanical compliance, biocompatibility, and/or specificity, thereby limiting their translation. Polymers that are ionically- and electronically-conductive, i.e., organic mixed ionic-electronic conductors (OMIECs) could, in theory, address these problems. But, the commercial OMIEC currently used in >80% of studies, poly(3,4-ethylene dioxythiophene):poly(styrene sulfonate) (PEDOT:PSS) still suffers from similar problems and has a proprietary composition, which prevents material/device optimization and functionalization towards specific applications in biology. To solve challenges in bioelectronics, my team focuses on designing OMIECs by using controlled radical polymerizations (e.g., reversible addition-fragmentation chain transfer, RAFT) to precisely tune the properties and functionality of OMIECs in thin-film electronics and bulk conductive hydrogels. The first part of my talk will cover how the precise tailoring of the molecular weight and size distribution of PSS in PEDOT:PSS, led to electronic devices with 4-times higher performance than commercial materials. In the second part, I will discuss unpublished work on using block copolymers to achieve thermo-responsive conducting polymers for injectable electronics.

Biosketch: Biosketch: Prof. Laure Kayser is an assistant professor at the University of Delaware (UD) in the department of Materials Science and Engineering, and holds a joint appointment in the department of Chemistry and Biochemistry. After undergraduate studies and a M.Sc. degree in Chemistry and Supramolecular Chemistry at the University of Strasbourg in France, she did her Ph.D. at McGill University in Canada working with Prof. Bruce Arndtsen on multicomponent polymerization of conjugated polymers, and arrived in the United States for her post-doc in NanoEngineering at the University of California San Diego with Prof. Darren Lipomi working on stretchable electronics. She started her independent faculty career at UD in 2019, where her group uses innovative synthetic chemistry applied to solving problems in human health (conducting polymers for bioelectronics and haptics) and sustainability (plastic upcycling). Her current and past research led to several recognitions including the NSF CAREER award (2023), Beckman Young Investigator (2023), Rising Star in Polymers (ACS Polymers Au, 2023), ACS PRF doctoral new investigator award (2023), University of Delaware Research Foundation (UDRF) award (2022), best postdoc award (Department of NanoEngineering, UC San Diego, 2019), the emerging materials researcher award from the Canadian Society for Chemistry, and the Marcus Wallenberg Young Researcher Award. At UD, Prof. Kayser is the co-director of professional development of the NSF Research Traineeship in Computing and Data Science Training for Materials Innovation, Discovery, and AnalyticS (NRT-MIDAS) and a mentor and steering committee member for the NIH-funded Chemistry-Biology Interface (CBI) graduate training program.