Metal-Free Ring-Opening Metathesis Polymerization

AJ Boydston
Associate Professor and Yamamoto Family Professor
Department of Chemistry, University of Wisconsin
Madison, Wisconsin 53706, USA

Abstract:
A major synthetic effort of our program centers on the development of photoredox-mediated, metal-free methods for polymer synthesis. Recently, we discovered that visible light photoredox catalysis is a viable approach for conducting ring-opening metathesis polymerization (ROMP) of strained cycloalkenes. The divergence from metal-mediated ROMP introduces a new mechanistic theme with unique synthetic outcomes. Since the initial discovery that anodic oxidation of vinyl ethers could initiate ROMP of norbornenes, we have engaged in mechanistic studies, exploration of functional group compatibility, copolymerization strategies, and characterization of the materials properties for this polymerization. In this seminar, I will present our fundamental studies on the mechanism of this polymerization and updates on our applications-oriented research toward commercialization.

Bio:
Dr. Boydston began studying chemistry as an undergraduate at the University of Oregon under the guidance of Professor Michael M. Haley. His research focused on the synthesis and study of dehydrobenzoannulenes. After completing BS and MS degrees, he began doctoral research at the University of Texas at Austin. In 2005, Dr. Boydston joined the group of Professor Christopher W. Bielawski and was co-advised by Professor C. Grant Willson. Dr. Boydston completed his thesis research focused on the synthesis and applications of annulated bis(imidazolium) chromophores in 2007. After graduating, he moved to Pasadena, California to take an NIH postdoctoral position at the California Institute of Technology. There, he worked under the mentorship of Professor Robert H. Grubbs to develop new catalysts and methods for the synthesis and characterization of functionalized cyclic polymers. He returned to the Pacific Northwest as an Assistant Professor of Chemistry at the University of Washington in the summer of 2010. In summer 2018, he moved to the University of Wisconsin as the Yamamoto Family Professor of Chemistry. His research group currently focuses on developments in the areas of electro-organic synthesis, polymer synthesis, mechanochemical transduction, triggered depolymerization, polymers for therapeutic applications, and additive manufacturing (3D printing). His research and teaching efforts have been recognized through the NSF CAREER Award, Army Research Office Young Investigator Award, Cottrell Scholar Award, Camille Dreyfus Teacher-Scholar Award, and University of Washington Distinguished Teaching Award.