Surface Engineering with Polymer Brushes through Light Mediated Polymerization

Sai Dileep Kumar Seera[1], Christian W. Pester[1,2,3]

(1) Department of Chemical Engineering, The Pennsylvania State University, University Park, PA 16802, USA
(2) Department of Chemistry, The Pennsylvania State University, University Park, PA 16802, USA
(3) Department of Materials Science and Engineering, The Pennsylvania State University, University Park, PA 16802, USA

Abstract: Our research is dedicated to the development of advanced functional surfaces by combining photoredox chemistry with surface-initiated photopolymerization. This approach results in polymer brushes that are covalently attached to surfaces and have inherent advantages over traditional physisorbed coatings. Advantages include e.g., enhanced stability, tunable thickness, and versatility with wide range of monomers. In detail, we developed surface-initiated photoinduced electron transfer-reversible addition-fragmentation chain transfer polymerization (SI-PET-RAFT). SI-PET-RAFT affords robust and user-friendly functionalization of both inorganic and organic surfaces with spatiotemporal control, oxygen tolerance, under ambient conditions. The light-mediated nature of this chemistry allows for spatiotemporal control, complex topographies, and chemical patterning on the micron scale. Here, we will emphasize our work and demonstrate the utility of SI-PET-RAFT in the engineering of anti-fogging coatings, organic electronics, anti-biofouling, and antibacterial coatings.