Advanced Functional Coatings through Oxygen-Tolerant Photopolymerization

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Our group engineers advanced functional surfaces by combining photoredox chemistry with surface-initiated reversible deactivation radical polymerization (SI-RDRP). The resulting “polymer brushes” provide considerable benefits over conventional physisorbed coatings. The covalent bond prevents delamination and allows for smart coatings that can change their physical properties in response to their environment. Our research addresses these and other long-standing limitations to increase accessibility, versatility, and sustainability of SI-RDRP.

To this end, we developed surface-initiated photoinduced electron transfer-reversible addition-fragmentation chain transfer polymerization (SI-PET-RAFT). SI-PET-RAFT allows for oxygen-tolerant surface modifications of inorganic and organic coatings at ambient temperatures and using mild aqueous chemistries. The light-mediated nature of the approach also provides spatiotemporal control and opportunities for complex topographical and chemical patterning on the micron scale. This poster highlights the interdisciplinary impact of our work on polymer brushes by providing representative examples of SI-PET-RAFT’s utility in the engineering of anti-fogging coatings, organic electronics, anti-biofouling, and antibacterial coatings.