

THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT WINTER
COLLOQUIUM SERIES PRESENTS:

Dr. Timothy Long

Biodesign Center for Sustainable Macromolecular Materials and
Manufacturing (SM3)
Arizona State University



Asking more from polymer scientists and engineers: Balancing reactivity, rheology, resolution, rate, and reversibility (5Rs) in light-driven 3D printing

This lecture begins with our motivation for next generation engineering polymers, suggesting the necessity for monomaterialization and dematerialization as pathways to achieve unprecedented performance and less polymer consumption. Additive manufacturing (AM) allows for unprecedented, bio-inspired, three-dimensional form factors with micron-scale geometric complexity to reduce polymer consumption with enhanced mechanical performance. Our research has focused on the printing of high-performance engineering polymers whose thermal, rheological, and chemical characteristics generally complicate legacy processing modalities; however, 3D printing micron-scale adaptive organogels allows polymerization in the printed precursor for process intensification. Polyimides offer exceptional thermal, chemical, flame, and radiation resistance for many emerging transportation, electronic, and aerospace applications. Thus, recent efforts involve vat photopolymerization (VPP) of aqueous polyimide latexes to form hydrogel precursors. 3D printed aromatic polyimides enable conversion to carbonaceous objects from water upon pyrolysis as confirmed with various measurements. The lecture will highlight our latest hot lithographic printing of unsaturated polyesters that offer latent reversibility and polymeric polyimide ionic liquids that enable solvent- and water-free advanced fabrication processes.

Tim Long received his Ph.D. in Chemistry from Virginia Tech, and he subsequently joined both Eastman Kodak and Eastman Chemical companies for eight years upon graduation. He joined the faculty in the Department of Chemistry at Virginia Tech, where he also served as the Director of the Macromolecules Innovation Institute until 2019. In 2020, Prof. Long accepted an interdisciplinary faculty position across the School of Molecular Sciences (SMS) and the School for Engineering Matter, Transport, and Energy (SEMTE) at Arizona State University (ASU) where he launched and now leads the Biodesign Center for Sustainable Macromolecular Materials and Manufacturing (BCSM3). In addition to over 450 peer-reviewed publications, his research awards include the 2023 3M Excellence in Adhesion Award, 2022 Paul J Flory Award, 2020 Virginia Outstanding Faculty Award, 2015 Virginia Scientist of the Year, 2010 Virginia Tech Alumni Research Award, ACS PMSE Collaborative Research Award, PSTC Carl Dahlquist Award, 2019 ACS Rubber Division Thermoplastic Elastomer Award, and the ACS POLY Mark Scholar Award. His most recent research efforts address the need for tailored advanced macromolecules for advanced manufacturing (3D printing), including vat photopolymerization, direct ink write, binder jetting, powder bed fusion, and melt extrusion. His research ranges from controlled polymerization processes for block copolymers to high performance engineering polymers for emerging technology with a lens of earth sustainability.

Tuesday, Feb. 17th • 4 pm CT • Ford ITW

In person only; no Zoom

Questions? Contact allison.macknick@northwestern.edu