Materials Science and Engineering Department

Fall Seminar Series

Interfacial Photopolymerization (IPP): A Method for Light-Based Printing of Thermoplastics

Prof. Megan Creighton
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November 13, 2024
11AM-12PM | Hill Seminar Room (LeBow 240)

The Creighton group is collaboratively working to develop the first additive manufacturing (AM) technique that utilizes photopolymerization to produce high-resolution objects made of recyclable thermoplastics. Currently, AM techniques for recyclable thermoplastic polymers rely on local heating to melt and reshape the material. Other AM methods use photopolymerization, which can produce parts with superior surface finish and detail. In these methods, the polymer solid polymer forms within a bath containing the monomer. These methods rely on an intrinsic crosslinking mechanism in thermoset polymers-- therefore the intricate detail and quality achieved in the output products come at the expense of compatibility with large-scale recycling processes.

In this seminar, we present a new process called interfacial photopolymerization (IPP) which enables photopolymerization printing of linear chain polymers. We demonstrate the integration of IPP in a proof-of-concept projection system for printing of polyacrylonitrile (PAN) films and rudimentary multi-layer shapes with in-plane and out-of-plane resolutions comparable to conventional photoprinting methods. We will discuss ongoing work to further adapt IPP for mechanically recyclable thermoplastic systems such as poly methyl methacrylate.

Megan A. Creighton is an assistant professor in the chemical and biological engineering department. Prior to joining Drexel in the winter of 2021, Creighton was jointly appointed as a research scientist in the mechanical engineering department of the Massachusetts Institute of Technology and as an Air Force Science and Technology Fellow in the Materials and Manufacturing Directorate of the Air Force Research Laboratory in Dayton, Ohio. Dr. Creighton also spent several years as a Senior Research Engineer in the 3M Corporate Research Materials Laboratory in St. Paul, Minnesota, where she served as the company's subject matter expert in carbon materials and worked on technology development in support of all five of the company's business groups.
The central theme of Creighton's research lies in developing fundamental understanding of nanomaterial colloid systems balanced with practical impact on the development of manufacturable materials and devices. This requires building an ecosystem of understanding material sets themselves and safe, efficient processing techniques that enable their desired performance in larger, more complex systems. Her current research interests are in materials, nanotechnology, surface and interfacial science, complex fluids, and green manufacturing.

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