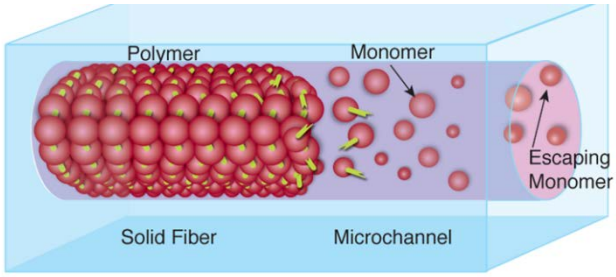
Project Title: Development of a Sacrificial Materials Library for Multifunctional Composites

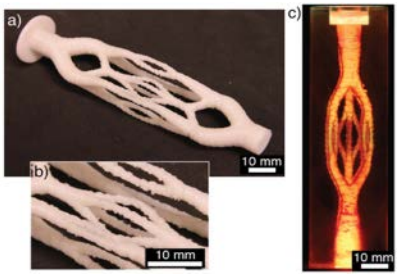
Advisors: Mayank Garg (2nd year PhD Student, MatSE), Prof. Nancy Sottos, Prof. Scott White

Project Description:

Sacrificial materials are embedded in a host material and later removed to reveal an inverse replica void structure for use in multifunctional applications including self-healing, self-sensing, material regeneration and thermal homeostasis. Fugitive inks using direct write assembly, melt extraction of soldered wires, dissolution, or chemical etching of a sacrificial template (e.g. in microelectronics), and thermal vaporization of thermoplastics are some recent examples of sacrificial materials. In our research we have shown accelerated thermal degradation of poly (lactic) acid (PLA) polymer blended with tin oxalate particles at 200 °C using the Vaporization of Sacrificial Components (VaSC) technique. However, fabrication of sacrificial materials which can be triggered to degrade in other ways (e.g. chemical, radiative, electrical) and are compatible with a wider range of matrix materials (e.g. low T_g thermosets, thermoplastic polymers) remains a challenge. As an undergraduate student, you'll be responsible for helping in synthesis, processing and characterization of different polymer systems for sacrificial material applications.



(i)



(ii)

(i)Schematic of VaSC technique showing PLA degradation in a polymer matrix to form a microchannel and (ii) Epoxy matrix after VaSC of an embedded 3D printed hierarchial PLA network.

Student Background and Expected Research Activities:

We are seeking an enthusiastic student, who is interested in learning polymer synthesis and a variety of characterization techniques for polymeric materials. A background with and an interest in organic chemistry and polymer science is preferable. Laboratory experience is also preferred, but not required. The student should have an aptitude for experimental research. He/she should be willing to learn and follow safety guidelines and proper procedures provided by their mentor and lab management on every piece of equipment they operate.

Points of Contact: Mayank Garg (mgarg7@illinois.edu), Prof. Nancy Sottos (n-sottos@illinois.edu), Prof. Scott White (swhite@illinois.edu)

Funding: Air Force Office of Scientific Research