Is Proud to Host a Seminar by:

POSTDOCTORAL RESEARCHER
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Thursday, April 27, 2023
2:00-3:20 PM
Location:
McDonnell Douglas Engineering Auditorium

Materials Synthesis and Processing for Additive Manufacturing by Direct Ink Writing

Abstract: The formulation of customized materials for direct ink writing requires consideration of the balance between the targeted materials performance and the printability of the material. At Lawrence Livermore National Laboratory, we consider these factors when we synthesize, process, and evaluate new materials for direct ink writing for a variety of applications like those that relate to energy absorption, optics, and responsive materials. I'll discuss our efforts in these areas. For energy absorbing materials, we have evaluated silicone foams where the porosity is dictated by the print geometry. These foams have 3D-patterned architectures that are specially designed for specific energy absorbing properties. Furthermore, the formulations can be modified to tailor the mechanical properties and to introduce additional intrastrand porosity. The chemical composition of these silicone forms can be further altered to enable new functionality. For optics and other applications, we can match refractive indexes of formulation constituents by modifying the chemical structure of the base polymer. I'll describe how we can print these inks by direct ink writing to create transparent elastomers. Finally, I'll discuss our efforts to explore printability in multifunctional materials. I will outline our approach to formulating an ink that would produce photoresponsive polymers that can change shape (liquid crystal elastomers) and are processable by direct ink writing, specifically focusing on the use of gold nanorods (AuNRs) in these inks. These printed materials respond to light or heat, and the use of direct ink writing was leveraged to form multiresponsive architectures, making these promising functional materials for soft machines.

Bio: I am currently a staff scientist at Lawrence Livermore National Laboratory (LLNL), working on a wide range of projects related to scintillators, functional polymers, and additive manufacturing of custom polysiloxane inks. My position at LLNL follows a postdoctoral position in the Soft Machines Lab at Carnegie Mellon University. Under the direction of Prof. Carmel Majidi, I focused on the synthesis and characterization of new multifunctional materials for soft machines. I earned a PhD in Materials from the University of California, Santa Barbara, where I studied characterization and molecular design of organic semiconductors. In addition to my research activities at LLNL, I am a member of the Abilities Champions Employee Resource Group, which promotes the inclusion of interns and employees with physical, psychological, developmental and neurocognitive differences as valuable contributors to the Laboratory's mission.