Enabling Additive Manufacturing of Thermally Cured Thermoset Polymers Through Photothermal Heating

ABSTRACT
If additive manufacturing is to realize its full potential, it is critical to enable printing as wide a range of materials as possible. This talk focuses on one currently under-represented type of polymer: thermally cured thermosets. While optically cured thermosets are currently well-represented in the additive manufacturing space, the dearth of their thermally cured counterparts means there is a gap in the materials properties that can be realized by additive manufacturing. Though there are many significant technical challenges in realizing additive manufacturing of thermally cured thermosets, many of these ultimately reduce to difficulty in heating and cooling the pre-polymers with sufficient speed and precision. In this talk, I will demonstrate that photothermal heating provides both the required speed and precision and illustrate how this can be used to drive the curing of thermally cured thermosets, ultimately demonstrating this in the context of additive manufacturing.

BIOGRAPHY
Benjamin Lear was born in California, earning a B.S. in biochemistry at UC Davis. During that time, he worked for Prof. Andrew Fisher at UC Davis and Dr. James Tucker at Lawrence Livermore National Laboratory. He then earned his M.S. and Ph.D. at UC San Diego, under the mentorship of Prof. Clifford Kubiak. There he studied electron transfer in mixed valence complex formed from oxo-centered trinuclear ruthenium clusters. He then performed postdoctoral studies under the mentorship of the late Prof. Malcolm Chisholm at The Ohio State University, where we continued to study electron transfer in mixed valence systems, this time focusing on quadruply bonded Mo and W units. In 2010, he joined the faculty at Penn State, where his interests currently lie in understanding the interplay between nanoscale materials and their chemical environments.