

UNIVERSITY OF CALIFORNIA, IRVINE

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

IS PROUD TO HOST A SEMINAR BY

“SUSTAINABLE CIRCULARITY IN PLASTICS”



DR. BRETT A. HELMS

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LAWRENCE BERKELEY
NATIONAL LABORATORY**

Thursday, January 23, 2025

2:00 PM - 3:20 PM

McDonnell Douglas Engineering Auditorium

Abstract: One of the goals of a circular economy is to design-out waste by re-orienting industry around materials that can be reused and recycled. For polymers used in plastics, elastomers, and thermosets, those in use today were never designed to be recycled. As a result, they have accumulated in both terrestrial and aquatic ecosystems throughout the world in such alarming quantities that a global plastics treaty is under development, regulating future plastics use. If circularity is to be realized, new polymer chemistries are needed for deconstructing both simple and complex products, such that monomers, additives, fillers, and other materials may be reused without loss in performance or aesthetics. I will describe our efforts to address these challenges using polydiketoenamine resins (PDK), which undergo reversible polymerization using atom- and energy-efficient processes. I will describe how the building blocks of PDK resins can be produced from renewable feedstocks using biosynthesis using engineered proteins and microorganisms. These biorenewable PDK resins lay the groundwork for how to commodify polymers as highly valuable, renewable resources for a circular economy.

Bio: Brett A. Helms is a San Francisco-Bay Area native. He received his B.S. from Harvey Mudd College in 2000 and his Ph.D. in 2006 at the University of California, Berkeley with Jean M. J. Fréchet in designing branched polymer architectures for catalysis. His postdoctoral research was conducted at the Technische Universiteit Eindhoven with E. W. (Bert) Meijer where his focus was on supramolecular chemistry. In 2007, he began his independent career at Berkeley Lab and has since risen to the rank of Senior Scientist. His research program there is devoted to materials discovery and development to solve outstanding challenges in energy and sustainability. He is the co-founder of two deep-tech Bay Area Start-Ups: Sepion Technologies and Cyklos Materials.

