
Materials Keynote Abstract & Speaker Biography

Rational Design of Polymeric Materials for Ion and Electron Transport in Lithium–Sulfur Batteries

Brett Helms

The Molecular Foundry, Lawrence Berkeley National Laboratory, One Cyclotron Road, Berkeley, California 94720, United States

In the past, active materials in energy devices have largely been discovered by chemical intuition and by analogy to natural systems. As physical models of complex materials phenomena get into their stride alongside increasingly robust computing prowess, it is now possible to invert the process of materials design. To that end, I will present our work in using materials genomics to guide the design of new polymeric materials as ion-selective membranes and, separately, as reconfigurable charge-transporting molecular networks. Our efforts validate theoretical predictions with deep experimental insight, and will be showcased in the context of lithium-sulfur batteries. There remains much to be learned about the origins of their structural, electronic, and dynamic properties, and how they feed back across multiple length and time scales.

Speaker Biography:

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 macromolecular design. His postdoctoral research was conducted at the Technische Universiteit Eindhoven with E. W. (Bert) Meijer where his focus was on supramolecular chemistry and systems.



In 2007, he began his independent career at Lawrence Berkeley National Lab. His research program there is devoted to understanding transport phenomena in mesostructured systems assembled from organic, polymeric, and nanocrystalline components as they relate to outstanding challenges in energy, health, water, and food quality.