Li-air batteries: O_2 electrochemistry in Li ion-bearing nonaqueous electrolytes

Bryan D. McCloskey
Department of Chemical and Biomolecular Engineering, UC, Berkeley
Energy Storage and Distributed Resources Division, LBNL
bmccloskey@berkeley.edu

Abstract

Multiple directions in battery research are now being pursued with the goal of advancing beyond the specific energy limits imposed by conventional Li-ion battery electrode materials. For example, 'beyond Li-ion' battery chemistries, such as Li-O_2, Li-S, and Mg-ion, are currently being explored given their very high theoretical specific energies. Nevertheless, severe technical challenges have prohibited these potential battery chemistries from supporting practical systems. The objective of this presentation is to provide an assessment of such challenges facing the electrochemistry in nonaqueous Li-air (O_2) batteries. Results will be presented on product formation mechanisms in Li-O_2 batteries and how these mechanisms can be manipulated through electrolyte engineering to potentially alleviate problems associated with product deposition on the cathode.

Biography

Bryan D. McCloskey joined the Department of Chemical and Biomolecular Engineering at the University of California, Berkeley in 2014, and holds a joint appointment as Faculty Engineer in the Energy Storage and Distributed Resources Division at Lawrence Berkeley National Laboratory. His laboratory focuses on characterization of fundamental electrochemical processes to provide guidance for the development of energy storage, electrocatalytic, and corrosion-resistant materials. He was previously a Research Staff Member (2012-2013) and postdoc (2009-2011) at IBM Almaden Research Center, where he worked on understanding fundamental characteristics of electrochemical processes occurring in Li-O_2 batteries. His PhD thesis (2009), supervised by Benny Freeman at the University of Texas at Austin, focused on molecular transport through microporous and dense polymeric membranes, with a particular emphasis on membranes for water purification. He received his B.S. (2003) in Chemical Engineering at the Colorado School of Mines where his research, supervised by Drs. Thomas McKinnon and Andrew Herring, focused on employing molecular beam mass spectrometry to characterize aromatic hydrocarbon formation during pyrolysis of cellulosic chars.