COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
UNIVERSITY OF MICHIGAN

Mechanical Engineering Seminar Series

Designing electrolytes and interphases for scalable & cost-effective storage of electrical energy

Lynden A. Archer

James A Friend Family Distinguished Professor of Chemical and Biomolecular Engineering and David Croll Director of the Cornell Energy Systems Institute
Cornell University

Tuesday, April 14, 2020

4:00 p.m.

EECS 1500

Abstract

Rechargeable electrochemical cells based on earth-abundant metallic anodes, including sodium, zinc, and aluminum, offer the potential for low-cost storage of electricity that meet the stringent cost and performance demands for grid-scale storage. Such cells are under active development worldwide because they provide a path towards battery systems capable of managing intermittency of electric power generation from distributed solar and wind installations. Recharge of any metal anode requires reversible electrodeposition of metals onto themselves, a process that is fundamentally unstable. This talk considers the stability limits for metal electrodeposition processes in liquid and semisolid structured electrolytes and, on that basis, proposes electrode and anode/electrolyte interphase design principles for enabling stable electrodeposition of metals. The talk will also explore contemporary efforts to create minimal electrolytes and electrochemical interphases based on these principles and will discuss their effectiveness in enabling cost-effective energy storage systems with high levels of reversibility.

Bio

Lynden Archer is the James A Friend Family Distinguished Professor of Chemical and Biomolecular Engineering and David Croll Director of the Cornell Energy Systems Institute. His research focuses on transport properties of polymers and polymer-nanoparticle hybrid materials, and their applications for electrochemical energy storage. Archer received his Ph.D. in chemical engineering from Stanford University in 1993 and was a Postdoctoral Member of the Technical Staff at AT&T Bell Laboratories in 1994. He is a member of the National Academy of Engineering (NAE) and fellow of the American Physical Society (APS). His research contributions have been recognized with various awards, including the AICHE Nanoscale Science and Engineering Forum award, the National Science Foundation award for Special Creativity, a NSF Distinguished Lectureship in Mathematical & Physical Sciences, the American Institute of Chemical Engineer's MAC Centeniell Engineer award, and the Thompson-Reuters World's Most Influential Scientific Minds in Materials Science for 2014 & 2015 . At Cornell, he has been recognized with the James & Mary Tien Excellence in Teaching Award and thrice with the Merrill Presidential award as the most influential member of the Cornell faculty selected by a Merrill Presidential Scholar awardee. He previously served as Director of the Smith School of Chemical and Bimolecular Engineering at Cornell from 2010 to 2016.

Karen Brown karenar@umich.edu