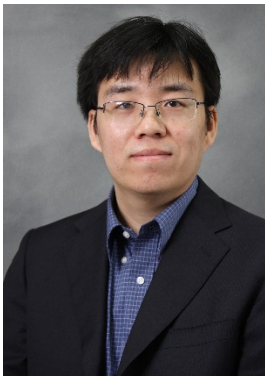




ME Department Seminar

Bridging mechanics and electrochemistry: Experiments and modeling on battery materials



Kejie Zhao

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Tuesday, April 2, 2019

4:00 - 5:00

EECS 1500

Abstract

Mechanical failure in batteries is ubiquitous and is well recognized. Less understood is the mechanical behavior of battery materials under chemical load, and the impact of stress on the kinetics of mass transport, charge transfer, interfacial reactions, and hence the potential and capacity of the electrochemical system. This talk focuses on the interplay of mechanics, such as large deformation, plasticity, and fracture, with chemical reactions in Li-ion batteries. I will discuss the theories of coupled diffusion and stress, stress regulated interfacial reactions, reactive flow, and corrosive fracture in batteries. I will introduce our recently developed operando experiments which probe the continuous evolution of material states during Li reactions and steady degradation of mechanical strength in batteries over cycles. Finite element modeling and atomistic simulations that emphasize on mechanistic understanding will also be discussed.

Bio

Dr. Kejie Zhao joins the faculty of mechanical engineering at Purdue University in 2014. He received his Ph.D degree in Engineering Science in 2012 from Harvard, and obtained his bachelor's and master's degrees from Xi'an Jiaotong University in 2005 and 2008, respectively. He worked as a postdoctoral associate at MIT in 2012-14. The research theme of his group focuses on the chemomechanics of energy materials using experimentation and multi-scale modeling approaches. He is also working on organic semiconductor molecules and polymers and borides chemistry for high-temperature ceramics.