"Novel Electrolyte Design to Control Electrochemistry in Energy Storage Systems"

Wednesday
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3:00 pm
Wu and Chen Auditorium
Levine Hall

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Abstract

To accelerate the electrification of transport, batteries based on a lithium metal anode, and an oxygen/sulfur-based cathode with high energy densities, have elicited great interest. However, electrolyte selection and degradation has limited the maximal energy that can be extracted, and reduced cycle life. In this talk, I will discuss my work on developing small molecule and polymer-based composite electrolytes that can decouple instability from ionic transport. I show novel ionic transport processes within these electrolyte architectures, and their ability to control electrochemical reactions at both the negative and positive electrode surfaces. Firstly, a gel polymer electrolyte is designed to control the oxygen reduction pathway in a lithium-air battery, and secondly, a small molecule electrolyte mixture is designed to reduce the overpotentials required for lithium metal deposition and stripping. Using the electrolyte to control electrochemical reactions provides an additional knob for the design of high energy density systems.

Bio

Chibueze Amanchukwu is a TomKat Center Postdoctoral Fellow in Sustainable Energy at Stanford University. His expertise involves the study of ionic transport processes in electrolytes for energy storage applications. Under the supervision of Professor Zhenan Bao at Stanford, and in collaboration with Professor Yi Cui, his work has focused on understanding ionic transport processes in small molecule electrolytes and controlling lithium metal deposition and stripping. During his Ph.D. with Professor Paula Hammond at MIT, and collaboration with Professor Yang Shao-Horn, he studied degradation processes and ionic transport in polymer electrolytes for lithium-air batteries. He is broadly interested in electrolytes and electrochemistry.

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