Materials Panel Abstract & Speaker Biography

Development of High Area Loading and Stable Sulfur Electrode Through Polymer Binders Functionality Design for Lithium Sulfur Battery

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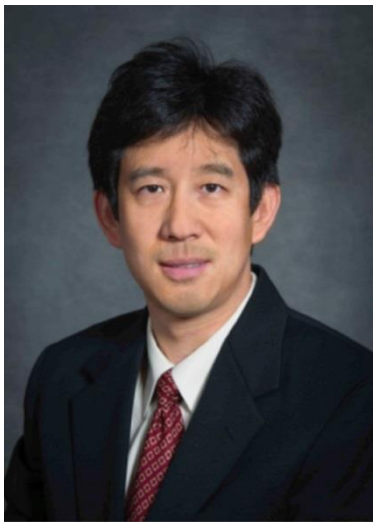
High area loading of sulfur is a critical parameter to achieve high energy-density Li-S battery. Interface properties between electrode and electrolyte play an important role in these batteries. Sulfur species dissolution, precipitation and phase transformation during the charge and discharge process strongly affect the performance of lithium sulfur (Li-S) batteries. In this work, we examine the chemical functionalities that are important to stabilize sulfur electrode. As an example, binders with different functionalities, which differs both in chemical and electrical properties, are employed to modify the interface between the conductive matrix and electrolyte. The phase transformation of sulfur species at this interface is studied in detail. Remarkable differences are observed among sulfur cathodes with different binders modified interface. More solid-phase sulfur species precipitation is observed with binders that have unique functional groups, which can strongly interact with polysufide. The unique electrochemical process is verified by in situ physical and chemical analysis. The electrochemical results show a high areal capacity of 6 mAh/cm^2 for more than 100 cycles at 0.05 C with minimum polysulfide dissolution in the electrolyte.

Speaker Biography:



Dr. Gao Liu is the Group Leader of the Applied Energy Materials Group in the Energy Storage and Distributed Resources Division at Lawrence Berkeley National Laboratory, specialized in materials and energy storage R&D. Dr. Liu has led research projects for the U.S. Department of Energy and industry.

He has over 100 peer-reviewed publications and over 20 patents and patent applications. He has received numerous awards from his work on electrochemical energy storage materials and systems. The most recent awards include R&D100 Award in 2013 for the conductive polymer for lithium-ion battery application, and FMC Scientific Achievement Award in 2014 for the understanding fundamentals of prelithiation, and R&D 100 Award in 2015 for the high capacity lithium-ion anode design.