
Materials Panel Abstract & Speaker Biography**Enhanced Polysulfide Trapping and Suppressed Lithium Dendrite Forming for Lithium-Sulfur Battery Improvement***Bingqing Wei^{1,2}*¹ Department of Mechanical Engineering, University of Delaware, Newark, Delaware 19716, USA² Center for Nano Energy Materials, Northwestern Polytechnical University, Xi'an 710072, China

The next-generation batteries require a higher energy storage density than the current Li-ion batteries (LIB) for the future electrical grid, electric vehicles, and portable electronic applications. The ultra-high theoretical specific energy (2600 Wh kg⁻¹) has enabled lithium-sulfur (Li-S) battery to become a promising next-generation electrochemical energy storage system. However, the uncontrollable formation of dendritic Li, as well as the resulting safety hazards and poor cycle stability, have hindered its practical applications. In addition, the undesired rapid capacity decay originated from the polysulfide shuttle challenges the actual applications of the Li-S batteries. Hence, new strategies to conquer both the Li dendrites and shuttle effect of Li-S batteries are highly desired.

In this presentation, several new approaches will be discussed, and the proof-of-concepts will be demonstrated, including applying a dispersive effect, employing a new cell configuration, homogenizing the electric field distribution, and displaying a new polysulfide entrapping strategy based on the ferroelectric effect. By applying these new approaches, the specific capacity, the rateability, and the lifetime of the Li-S batteries can be significantly improved at the same time without any Li dendrite formation on the surface of the Li-metal anode. And therefore, the critical issues arising from both the S-based cathode and Li-metal anode can be solved. These new strategies offer new options for the Li-S battery improvement and also, shed light on next-generation electrochemical energy storage devices with a metal electrode.

Speaker Biography:

Dr. Bingqing Wei (B. Q. Wei) received his Ph.D. degree in 1992 from Tsinghua University, Beijing, China. He is a Professor in the Department of Mechanical Engineering at the University of Delaware, USA. Dr. Wei was an Assistant Professor in the Department of Electrical & Computer Engineering and Center for Computation & Technology at Louisiana State University from 2003 to 2007. He was a Research Scientist at Rensselaer Polytechnic Institute, Department of Materials Science and Engineering and Rensselaer Nanotechnology Center from 2000 to 2003. Dr. Wei was a visiting scientist at Max-Planck-Institut für Metallforschung, Stuttgart, Germany in 1998 and 1999. From 1992 to 2001, he was a faculty member at Tsinghua University in Beijing. Prof. Wei has published more than 240 scientific papers in refereed international journals and his research work has been intensively cited more than 14000 times by peer scientists with the h-index of 60.

