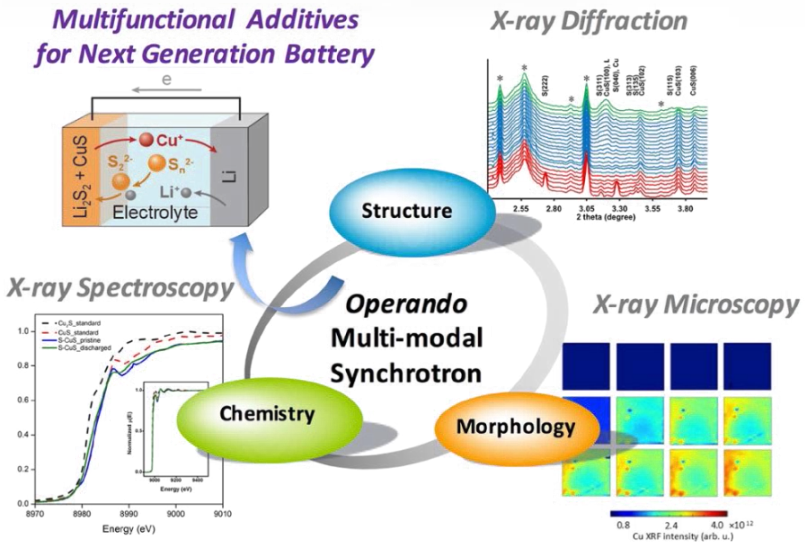
Multimodal Approach Provides Insight into Lithium-Sulfur Batteries



To fully understand the fundamental behavior and the reaction mechanisms of lithium-sulfur batteries with S/CuS hybrid electrode, the scientists used three different synchrotron techniques to study the chemistry, structure and morphology of the battery.

K. Sun, C. Zhao, C. Lin, E. Stavitski, G. Williams, J. Bai, E. Dooryhee, K. Attenkofer, J. Thieme, Y. K. Chen-Wiegart & H. Gan. *Sci. Rep.* **7**, 12976 (2017)

Work was performed at Brookhaven National Laboratory

Scientific Achievement

The detailed mechanism of CuS dissolution and its participation in electrochemical discharge of a Li-S battery were uncovered using an in operando multimodal approach.

Significance and Impact

Lithium-sulfur (Li-S) batteries are promising new electrochemical energy storage devices but their fundamental chemistry needs to be understood.

Research Details

- Conductive metal sulfide additives such as CuS in a Li-S battery can improve sulfur cathode conductivity.
- Mechanistic understanding is important to mitigate the possible & unwanted secondary reactions.
- The battery was studied under working (operando) conditions at three beamlines at NSLS-II:
  - X-ray diffraction at the XPD beamline resolved the cathode structural evolution during the battery cycling.
  - X-ray microscopy at the SRX beamline monitored the Cu species migration from cathode to anode.
  - X-ray spectroscopy at the ISS beamline determined the chemical evolution of cathode materials.