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Sulfur Electrochemistry in a Sparingly Soluble Electrolyte

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Owing to the low cost of sulfur and high theoretical materials-only energy density, Li-S battery chemistry continues to be studied worldwide. For Li-S chemistry to enable a truly disruptive technology for transportation applications, the ability to perform sulfur redox chemistry with high reversibility and high capacity under lean- or starved-electrolyte conditions is a critical requirement—as recently identified by techno-economic modeling carried out by JCESR.[1] Recent works using advanced electrolytes, referred to as solvates or nonsolvents,[2-5] show significant promise in minimizing the detrimental effects from polysulfide dissolution encountered in conventional Li-S batteries. The reduced dissolution allows for efficient, long-lived operation with high sulfur utilization. Additionally, these advanced electrolytes can potentially provide a path towards attaining lean-electrolyte operation. In this talk, we discuss recent fundamental studies at JCESR aimed at developing an energy storage system that uses a sparingly soluble electrolyte.

1. D. Eroglu, K. R. Zavadil, and K. G. Gallagher, J. Electrochem. Soc., **162**, A982-A990 (2015)
2. L. Suo et al., Nature Commun. **4**, 1481, (2013), doi:10.1038/ncomms2513
3. K. Dokko et al., J. Electrochem. Soc. **160**, A1304 (2013)
4. Y. Yamada et al., J. Am. Chem. Soc., **136**, 5039 (2014)
5. M. Cuisinier et al., Energy Environ. Sci., **7**, 2697 (2014)