Structural Impacts of Electrochemically Doping Simultaneous Ionic and Electronic Conducting Block Copolymer Electrolytes in the Solid-State

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Block copolymer electrolytes that simultaneously conduct electrons and lithium ions have recently been demonstrated as a revolutionary binder material for advanced lithium battery technology[1]. These electrolytes, composed of poly(3-hexylthiophene)-block-poly(ethylene-oxide) (P3HT-b-PEO) mixed with lithium bis-(trifluoromethanesulfonyl) imide salt (LiTFSI), self-assemble on the nanometer length-scale, providing conductive pathways for both electrons and ions to facilitate the electrochemical reactions occurring in the battery cathode. Recent work has shown that the P3HT block becomes electrochemically doped during the battery charging step, which effectively increases the electronic conductivity of the copolymer by orders of magnitude. Here we will demonstrate the structural impacts of such doping by performing *in-situ* X-ray scattering while electrochemically oxidizing P3HT-b-PEO/LiTFSI in a solid-state battery geometry.

References

1. Javier, A. E.; Patel, S. N.; Hallinan, D. T.; Srinivasan, V.; Balsara, N. P. Angew. Chem. Int. Ed. **2011**, 50, (42), 9848-9851.