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Nanoscale Structure of Lithium-ion Battery Cathodes Probed Using Contrast Variation Neutron Scattering

Understanding the link between how porous lithium-ion battery (LIB) electrodes are manufactured and the structure-function relationships that determine their performance is critical to accelerating the development of emergent battery technologies with higher rate cycling and capacity. Porous electrodes are manufactured by suspending a mixture of micron-sized electrochemically active material, polymer binder, and carbon black (CB) in a solvent and depositing it onto a metallic current collector. The complex processing conditions encountered during formulation and coating create many challenges for developing quantitative structure-property relationships. Neutron scattering measurements, performed through collaborations at National Laboratories, are essential to discovering these relationships and exploiting them for lithium-ion battery design. In this talk, I will describe our group's collaboration with Oak Ridge National Laboratory to develop unique sample environments and analysis methods for neutron scattering measurements applied to battery science. In particular, I will focus on the use of contrast variation to elucidate the nano- and micro- scale interphases within the porous electrode.

Topical Area

Emerging research and multimodal techniques

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