

Electron Transport Across Electrode-Active Material Interfaces in Lithium-Air Batteries

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Lithium-air batteries promise exceptionally high energy storage capacities if their high charging overpotential and poor cyclability due to electrolyte decomposition can be addressed. Understanding electron transport across the electrode-lithium peroxide interface is critical to solving both of these problems, as the high charging potential contributes to electrolyte decomposition.

Electron transport across the electrode-active material interface is highly dependent upon the nature of the interface, which in turn depends upon the morphology of the active material. The morphology of active material can potentially be controlled by using different electrode materials (electrocatalytic metal oxides, for example) or by growing the active material in a confined space, as in porous electrodes. Using polymeric architecture-directing agents and preformed nanocrystalline building units, we are able to independently control pore size, wall thickness, electrode composition, and electrode surface chemistry in order to study the structure-property relationships that dictate electron transport across electrode-active material interfaces in porous electrodes. Here, we present our recent progress in studying electron transport across electrode interfaces in mesoporous architected metal oxide electrodes using a variety of voltammetric and impedance techniques.