DREXEL UNIVERSITY
Materials Science and Engineering
College of Engineering

Department of Materials Science and Engineering,

PhD Defense

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Network-based Solid Polymer Electrolytes (SPEs) for Lithium Metal Batteries (LMBs) and Beyond

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Abstract

Lithium metal batteries (LMBs) are regarded as the next-generation energy storage devices due to the high theoretical energy density. In this dissertation, a series of network based SPEs were synthesized and characterized. The network chemistry selection was based on polymer physics and electrochemistry. A typical example is the crosslinked poly (ethylene oxide) (PEO) network. A systematic characterization has been conducted on this single network platform. Then, the network structure was transited from single network to interpenetrating network (IPN) in order to address some of the issues. In cell level, the performance of the SPEs was evaluated in a series setup such as symmetrical cell, half cell, and full cell. Besides, the formation, composition, and evolution of the solid electrolyte interface (SEI) were specially characterized, analyzed and correlated with the chemistry of SPE, salts and additives. The results demonstrated the concept of IPN is feasible in designing the SPEs for LMBs.