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Electrospun separators for structural battery applications WISAWAT KEASWEJJAREANSUK, Worcester Polytechnic Institute/PhD Candidate (Mechanical Engineering), JIANYU LIANG, Worcester Polytechnic Institute/Mechanical Engineering — Lithium-ion battery (LIB) has been utilized in variety applications as energy source. Structural battery is a new approach that employs multifunctional material concept to use LIB with load-bearing capability to minimize the weight of the complete energy consumption system and maximize the efficiency. LIB usually consists of cathode, polymeric separator, and anode; in face, the separator has been known as the weakest part of conventional LIB. This work aims at creating electrospun (ES) polymer membranes (at room temperature) with nanostructures as next generation LIB separator with improved thermal resistance and mechanical properties. ES is simple, flexible also cost-effective at all scales. The ES employs the electrostatic force to control the production of nanofibers from polymer solutions. Solution and process parameters, such as type of polymer, solution concentration, acceleration voltage, and solution feed rate, have been studied to achieve the desirable membrane properties. Many characteristics of electrospun polymer membrane would affect the performance of it as the separator in LIB, including surface morphology, microstructure, thermal stability, mechanical property, and electrochemical performance. In this study scanning electron microscopy, dynamic scanning calorimetry, tensile testing and electrochemical testing have been used to characterize the ES membranes. Design of experiments techniques has also been utilized to optimize the parameters in creating separator for structural batteries.

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