Sandwich-like polythioetherimide-decorated polypropylene (Celgard2400) composite separators with heat resistance and wettability for safety lithium-ion batteries

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doi: 10.20964/2020.01.68

Received: 9 September 2019 / Accepted: 30 October 2019 / Published: 30 November 2019

We describe a sandwich-like composite separator with two sheath layers of polythioetherimide (PTEI) and a core layer of Celgard2400 to improve the heat-resistance and wettability properties of polypropylene (Celgard2400) separators for lithium-ion batteries (LIBs). The porous PTEI membranes were prepared by a wet phase inversion process and coating with Celgard2400 via engaging a simple process without adhesive. The separators were characterized by thermogravimetric analysis, scanning electron microscopy, and contact angle measurements, and the electrochemical performances were evaluated. The results showed that the PTEI/Celgard2400/PTEI composite separators exhibited excellent thermal stabilities (-37% at 180°C), improved wettabilities, liquid electrolyte uptakes (298%) and ionic conductivities (0.59 mS cm⁻¹) relative to Celgard2400. Compared to the Celgard2400 separator cell, the PTEI/Celgard2400/PTEI composite separators exhibited almost identical electrochemical properties. Such composite separators with high heat-resistance and wettability properties have a great potential for applications in high-safety LIBs.

Keywords: Polythioetherimide; Heat resistance; Composite separator; Electrochemical performance; Lithium-ion battery

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