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Poly(vinylidene fluoride)-based, co-polymer separator electrolyte membranes for lithium-ion battery systems

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ABSTRACT

In the present paper we report and discuss the physicochemical properties of novel electrolyte membranes, based on poly(vinylidenefluoride-co-trifluoroethylene), PVdF-TrFE, and poly(vinylidenefluoride-co-hexafluoropropylene), PVdF-HFP, co-polymer hosts and the PVdF-TrFE/poly(ethyleneoxide (PEO) blend as separators for lithium battery systems. The results have shown that the examined separator membranes, particularly those based on the PVdF co-polymers, are able to uptake large liquid amounts which lead to high ionic conductivity values.

Tests performed on Li/$LiFePO_4$ and Li/Sn-C cells have revealed very good cycling performance even at high current rates and 100% of DOD, approaching the results achieved in liquid electrolytes. A capacity fading lower than 0.002% per cycle was observed. Particularly, the Li/$LiFePO_4$ cathode cells have exhibited excellent rate capability, being still able to deliver at 2C above 89% of the capacity discharged at 0.1C. These results, in conjunction with the about 100% coulombic efficiency, suggest very good electrolyte/electrode compatibility, which results from the high purity and stability of the electrolyte and electrode materials and the cell manufacturing.

KEYWORDS:

Poly(vinylidene fluoride) copolymers, polymeric blends, gel polymer electrolytes.

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