Effect of poly (ethylene oxide) molecular weight on the performance of poly(vinylidene fluoride-trifluoroethylene)/ poly(ethylene oxide) membranes for solid polymer electrolytes

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Solid polymer electrolytes (SPEs) based on polymer blends have been extensively studied for lithium ion applications. In portable devices such as mobile phones and computers, lithium ion batteries are the main source of energy [1].

The battery separator is essential in all electrochemical cells and its function depends on the specific application, but in general it serves as a medium for the transfer of ions between the electrodes, being also a critical element in battery safety [2, 3].

Poly(vinylidene fluoride-trifluoroethylene) (PVDF-TrFE) is a semicrystalline polymer with a relatively high melting temperature and a low value of the HOMO band, being therefore stable in cathodic environment and interesting for SPEs applications. SPEs are continuously under investigation and the incorporation of different fillers (ceramic particles: TiO_2, Al_2O_3, etc) and the fabrication of polymer blends are two ways to improve SPE performance.

SPEs based on PEO present the ability to solvate a wide variety of salts [4], therefore, the present work investigates the production of polymer blends membranes based on poly (vinylidene fluoride-trifluoroethylene), P(VDF-TrFE) and poly(ethylene oxide), PEO with different molecular weight (10,000 and 100,000 g/mol). Solvent casting has been used to prepare different polymer blend compositions in order to tailor membrane morphology and performance.

The performance of the membranes for battery applications will be discussed as determined through the investigation of the morphological, thermal and electrical properties. The electric properties were investigated through impedance spectroscopy (Nyquist and bode diagram) and cyclic voltammetry.

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