

Ionic Conduction in MWCNTs Dispersed PVDF-HFP Based Nanocomposites Gel Polymer Electrolytes for Li-Ion Batteries

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Nanocomposites gel polymer electrolytes are gaining more and more attention among the researchers worldwide due to their possible applications in various electrochemical devices particularly in solid-state Li-ion batteries [1, 2]. In the present work the effect of multi wall carbon nanotubes (MWCNTs) dispersion in PVDF-HFP based gel polymer on the electrical properties has been investigated. The length and diameter of MWCNTs used are in the ranges of 10-30 μm and 10-20 nm, respectively. The electrolytes have been synthesized by solution casting technique with varying the MWCNTs content. The impedance spectroscopy analysis shows that the incorporation of MWCNTs into PVDF-HFP-(PC+DEC)-LiClO₄ gel polymer significantly enhance the ionic conductivity of the electrolyte system. The enhancement of ionic conductivity seems to be correlated with the fact that the dispersion of MWCNTs to PVDF-HFP prevents polymer chain reorganization due to the high aspect ratio of MWCNTs, resulting in reduction of polymer crystallinity, which gives rise to an increase in ionic conductivity. The decrease of crystallinity of PVDF-HFP due the addition of MWCNTs has been confirmed by X-ray diffraction study. The interaction of MWCNTs with various constituents of polymer electrolytes has been studied by Fourier transform infrared spectroscopy. Transmission electron microscopy results show that uniform distribution of MWCNTs in the polymer electrolytes. Moreover MWCNTs added gel polymer electrolytes offer better thermal stability as compared to that of electrolytes without MWCNTs as confirmed by thermal gravimetric analysis.

Keywords: Polymer electrolytes; MWCNTs; Ionic conductivity; XRD; TEM; FTIR; TGA.

References

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