

## **PVDF-HFP Based Nanocomposite Gel Polymer Electrolytes Dispersed with ZrO<sub>2</sub> for Li-Ion Batteries**

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**Abstract :** 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. In this work we have investigated the effect of nanofibers on the electrical properties of PVDF-HFP based gel electrolytes. The nanocomposites polymer electrolytes have been synthesized by solution casting technique with 10wt% of ZrO<sub>2</sub>. By analysis of impedance spectroscopy it has been demonstrated that the incorporation of ZrO<sub>2</sub> into PVDF-HFP-(PC+DEC)-LiClO<sub>4</sub> gel polymer electrolyte system significantly enhances the ionic conductivity of the electrolyte. The enhancement of ionic conductivity seems to be correlated with the fact that the dispersion of ZrO<sub>2</sub> to PVDF-HFP prevents polymer chain reorganization due to the high aspect ratio of ZrO<sub>2</sub>, resulting in reduction in polymer crystallinity, which gives rise to an increase in ionic conductivity. The decrease of crystallinity of PVDF-HFP due the addition of ZrO<sub>2</sub> has been confirmed by XRD. The interaction of ZrO<sub>2</sub> with various constituents of polymer electrolytes has been studied by FTIR spectroscopy. TEM results show that the fillers (ZrO<sub>2</sub>) has distributed uniformly in the polymer electrolytes. Moreover, ZrO<sub>2</sub> added gel polymer electrolytes offer better thermal stability as compared to that of ZrO<sub>2</sub> free electrolytes as confirmed by TGA analysis.

**Keywords :** polymer electrolytes, ZrO<sub>2</sub>, ionic conductivity, FTIR

**Conference Title :** ICSME 2015 : International Conference on Structural and Materials Engineering

**Conference Location :** Kuala Lumpur, Malaysia

**Conference Dates :** February 12-13, 2015