Abstract

In the present study, poly (vinyledene fluoride) based polymer electrolytes were prepared by the solution cast technique. The polymer salt complex gives very low ionic conductivity of the order of 10^{-7} S/cm. The ionic conductivity of the polymer electrolyte is enhanced further by the addition of plasticizers such as dimethyl formamide, methyl formate and ethylene carbonate. The ionic conductivity enhancement is more in the case of DMF plasticizer than the other plasticizers used in the present investigation. The temperature dependent ionic conductivity studies (log σT Vs 1000/T (K^{-1})) follow Arrhenius type behaviour. This implies the fact that ionic conduction in polymer electrolyte is similar to that of the ionic crystals. X-ray diffraction analysis gives information regarding the semi-amorphous nature of the polymer electrolytes. FTIR and XPS spectroscopic studies show that there is a strong interaction between the plasticizer and the salt and the interaction is mainly with the oxygen atom of the plasticizers. The XPS studies ascertain the fact that there is an interaction between the salt and the polymer and this interaction is with fluorine atom of PVDF and the Li cation of the salt. The SEM analysis provides detailed picture about the plasticizer in altering the surface of the polymer electrolyte sample. The thermal studies on plasticized polymer electrolyte systems suggest that the thermal stability is better and the crystallinity of the polymer electrolyte is reduced considerably. This reduction in crystallinity is prominent in the case of DMF plasticizer than the other plasticizers used in the present study. Polymer batteries were assembled for all the high conducting plasticizer based polymer electrolyte systems. The batteries were analyzed galvanostatically. The battery discharge curve shows poor capacity for all the batteries. This low capacity may be due to the formation of surface layer on the lithium metal, high internal resistance of the battery due to the electrode/electrolyte interface and the low ionic conductivity of the polymer electrolytes. Studies are on to improve the ionic conductivity of the polymer electrolytes further and replacing the lithium metal with lithium transition metal oxides.