International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.9, No.05 pp 383-391, 2016

Effect of Al_2O_3 on PVP based Polymer electrolyte films doped with $Mgcl_2\,6H_2O$ For Solid State Battery applications

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Abstract : A new Mg^{2+} ion conducting solid polymer electrolytes was prepared with the influence of Nano sized Al_2O_3 particles,PVP (poly vinyl pyrrolidone) has a host polymer with $Mgcl_26H_2O$ salt by solution casting technique. Several experiments techniques have done to fabricate of a battery. The salvation between (PVP, $Mgcl_26H_2O$ and Al_2O_3) has been observed from FTIR.The Glass Transition temperature, melting point was measured form DSC.The D.C Conductivity was measured at temperature range 303K to 373K. The ionic conductivity of PVP Polymer electrolyte is about $1.02x10^{-9}$S/cm at Room temperature. It was found that the Nano sized Al_2O_3 doped polymer films conductivity is found to be 4.03 $x10^{-6}$ S/cm at 373K, for 85:15 compositions. The ionic conductivity in the conduction process to be the Arrhenius-type thermally activated process. From the transference number it is confirmed that the polymer electrolyte with the Nano fillers having charge transport in is mostly due to ions and minority of charge carriers by the electrons and it is calculated by using Wagner's polarization technique. The total ionic and electronic transference number was found to be 0.98 and 0.02in these solid polymer electrolytes.By using these polymer electrolytes an electrochemical cells has been fabricated with the configuration of Mg^{+}/(PVP+$Mgcl_26H_2O$+ Al_2O_3)/(I_2+C+electrolyte) and discharge characteristics were studied under the constant load of 100kΩ various cell parameters such as open-circuit voltage (OCV),short circuit current (SCC),energy density, and power density has been calculated.

Keywords: FTIR, DSC, Polymer electrolytes, Ionic Conductivity, Transference number, Electrochemical cell, Discharge characteristics.

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