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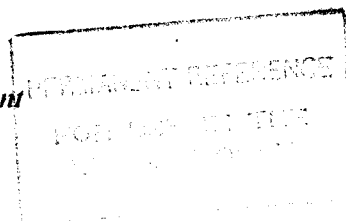
**SYNTHESIS AND CHARACTERIZATION OF SOME
COMPOSITE POLYMER ELECTROLYTES BASED ON POLY
(ETHYLENE OXIDE) (PEO)**

A THESIS PRESENTED BY

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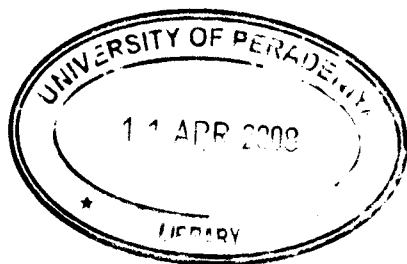


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SYNTHESIS AND CHARACTERIZATION OF SOME COMPOSITE POLYMER ELECTROLYTES BASED ON POLY (ETHYLENE OXIDE) (PEO)

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Due to the increasing demand for energy, development of materials for electrical power generation and storage systems are receiving much attention. An electrolyte is an essential component in batteries and in other electrochemical devices. Polymer based electrolytes have tremendous advantages compared to conventional liquid/solid electrolytes except their low ionic conductivity at ambient temperatures. Much research has been carried out to improve the ionic conductivity of polymer electrolytes in order to use them in practical applications. Poly (ethylene oxide) (PEO) is the commonly used host polymer in polymer electrolyte research.

In this work, several PEO based polymer electrolytes have been synthesized and characterized using Impedance Spectroscopy, Dielectric Spectroscopy, Differential Scanning Calorimetry (DSC) etc.

Several methods have been used to enhance the ionic conductivity of PEO, LiTf polymer electrolyte throughout this project such as incorporating various types of ceramic fillers to the PEO, LiTf, incorporating ceramic filler and a plasticizer to the PEO, LiTf, incorporating a second salt to the PEO, LiTf and incorporating two ceramic fillers together with PEO, LiTf polymer electrolyte.

Among the different types of ceramic filler incorporated PEO₉ LiTf electrolytes, the one incorporating the TiO₂ gave maximum enhancement and it would be due to the high Lewis acid character of TiO₂ compared to other fillers used.

Incorporating Ethylene Carbonate (EC) with PEO₉ LiTf : TiO₂ electrolyte resulted in further increase in conductivity due to the plasticizing effect of EC. DSC results also exhibit a reduction in T_g showing that the segmental flexibility of the polymer chains is increased and that could be the reason for conductivity enhancement. Mixed-filler incorporated samples did not show any enhancement in conductivity. It could be due to filler-filler interactions caused by the dielectric constant gradient between the filler particles.

Incorporation of NiCl₂ as a second complexing salt with PEO₉ LiTf and with PEO₉ CuSCN showed an enhancement in conductivity, possibly due to the increased amorphous phase produced by the second salt. DSC results obtained also correlate this assumption.