ELECTRICAL AND THERMAL PROPERTIES OF $(PEO)_nCu(ClO_4)_2$ POLYMER ELECTROLYTE SYSTEM

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Polymer electrolyte membranes are receiving more attention in the recent past due to the possibility of using them as electrolytes in rechargeable batteries and other electrochemical devices. Among these electrolytes, copper salt-based electrolytes have several advantages over those based on lithium salts. Lower cost, environmental and chemical stability, possibility of using copper metal as an anode, are some of these advantages. In this work we have synthesized the $(PEO)_nCu(ClO_4)_2$ electrolytes with n = 3 to 15 and characterized them using electrical and thermal measurements.

Electrolyte films were prepared by the solvent casting technique starting with pre-vacuum dried Poly(ethylene oxide), (PEO) (mol. wt. $4x10^6$) and $Cu(ClO_4)_2.H_2O$ using acetonitrile as the common solvent. Resulting samples were vacuum dried further for 24 hours. Thermal properties were measured by the Perkin Elmer Pyris 1 Differential Scanning Calorimeter and the ionic conductivity was measured using the HP 4192A Impedance Analyzer.

The results show that out of the 8 compositions studied, the $(PEO)_6Cu(ClO_4)_2$ composition had the maximum conductivity from room temperature up to 80 °C. The room temperature conductivity of this sample was 2.55×10^{-5} S cm^{-1}. This composition also had the lowest T_g of -23.6 °C indicating that the highest conductivity is associated with the maximum segmental flexibility of the polymer chains.

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