287/E1

Radiation effect on Poly (Ethylene Oxide) complexed with Copper Thiocyanate

P Ekanayake*
Department of Physics, University of Peradeniya

Effect of radiation on polymer materials is an area of rapidly increasing interest. Some high technology industries require polymers that exhibit a specific response upon exposure to high energy radiation.

AC impedance measurements, DC polarization test, Differential Scanning Calorimetry and Mechanical testing were performed on irradiated and unirradiated systems of $(PEO)_9CuCNS$ in order to study the effects of radiation on the polymer electrolyte. The conductivity variation of $(PEO)_9CuCNS$ polymer electrolyte has been studied over a temperature range of 25 – 100 °C and it follows the VTF (Vogel-Tamman-Filcher) type behavior. At 25 °C the conductivity of the unirradiated system is about 10^{-9} S cm^{-1} and it increases as temperature increases. However, the conductivity of irradiated systems decreases as temperature increases.

Mechanical testing of the above system revealed that the strain energy release rate G_{1c}, which is a measure of fracture toughness of the material, was increased from 3 to 81 kJ m^{-2} as the sample is irradiated over time duration of 0 to 1 month. The DSC results show an increase of glass transition temperature by ~2 °C after irradiating the polymer sample. DC polarization test revealed that the ionic transference number of irradiated polymer decreases by 3.5% while electronic transference number increases by 21%. This is attributed to the crosslinking effect and formation of free radical under irradiation. Therefore, it can be concluded that the absorption of high energy radiation by the polymer electrolyte lead to produce more crosslinking than chain damage.

*piyasiri2001@yahoo.co.uk Tel: 081-2394595