EFFECT OF HIGH ENERGY RADIATION ON POLY (ETHYLENE OXIDE) COMPLEXED WITH COPPER THIOCYANATE

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Study of 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 different 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 wide temperature range and it follows the VTF (Vogel-Tamman-Fulcher) behaviour. At room temperature the conductivity of the unirradiated system is about 10^{-9} S cm^{-1} and as temperature increases the conductivity increases. However, the conductivity of irradiated systems will decrease over the above temperature range.

The results of 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, increases in the irradiated system. The DSC results show an increase of glass transition temperature after irradiating the polymer sample. Therefore, it can be concluded that the absorption of high energy radiation by the polymer electrolyte lead to produce more crosslinking than chain damage. Another observation can be seen after irradiation is the decrease of ionic transference number of the system. DC polarization test revealed that the ionic transference number of irradiated polymer decreases while electronic transference number of it increases. This is attributed to the crosslinking effect and formation of free radicals under irradiation.