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Dielectric and a.c conductivity relaxation processes of ion conducting amorphous polymer. BASKARAN NATESAN, NABA KARAN, RAM KATIYAR, University of Puerto Rico — The dielectric and a.c conductivity relaxation processes of lithium ion conducting amorphous polymer (PEO) films have been investigated using dielectric spectroscopy. The purpose of this work was to explore the effects of repeated heating/cooling treatments and the addition of nano-sized TiO_2, on the relaxation processes. The dielectric measurements (ε' and ε") were carried out as function of frequency at various temperatures. The temperature dependence of the ε' exhibited two slopes. The first slope break observed at –35 $^\circ$C was attributed to the onset of the glass-rubbery transition and the second at 60 $^\circ$C was due to the melting of PEO. From the frequency dependence of dielectric loss, a loss peak corresponding to segmental relaxation associated with the glass transition (α- process) was noticed from 30 $^\circ$C onwards. The α-relaxation was found to slow down during repeated heating/cooling cycles. Further, the skewness and width of the dielectric loss peak increased upon TiO_2 addition. The a.c conductivity relaxation was analyzed using electrical modulus formalism. The electrical modulus spectrum showed two relaxation peaks associated with the relaxation of lithium in two different polymer environments. The shape and the nature of the modulus spectrum reveal that the conductivity relaxation process follows a stretching exponential functional form, $\phi(t)=\phi_o \exp(-t/\tau)^\beta$, typical of disordered system.

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