P.26 Modifications of the study of dielectric properties of a polycarbonate plastic (Makrofol KG) induced by Si^{7+} heavy ion irradiation

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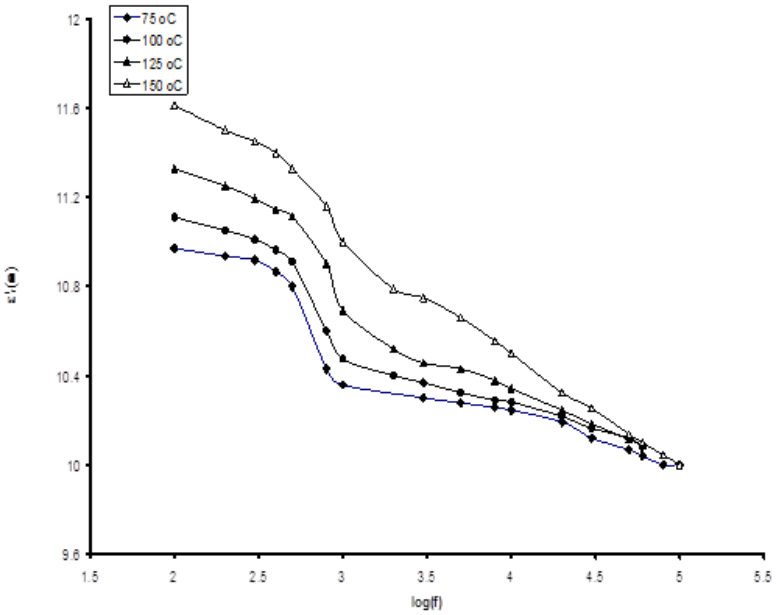
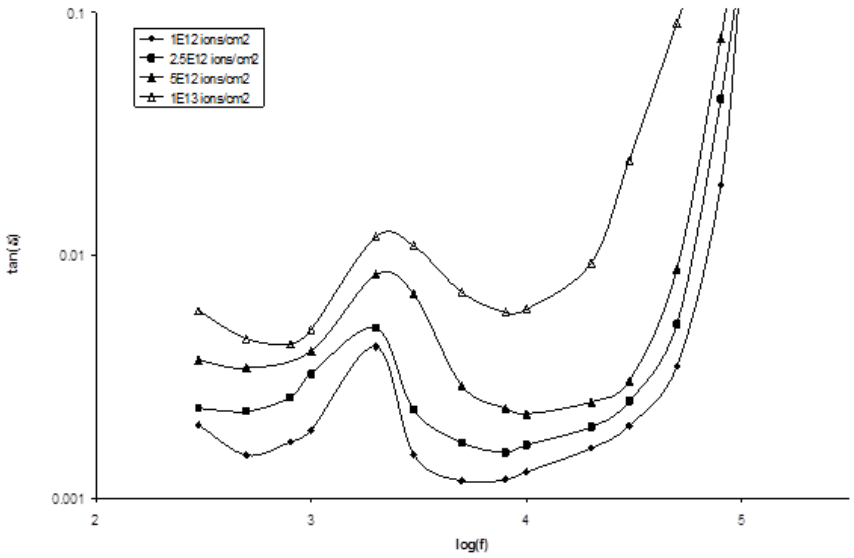
When dielectrics, which have few free electrons, are placed in an electric field, polarization takes place and the electric dipole moments per unit volume are developed. The motion of the charge carriers in the insulating materials is very important at high temperature. Here, in this paper, we discuss using dielectric spectroscopy about the motion of the dipole movement and charge carrier, when dielectrics are subjected to alternating electric field. High energy heavy ion irradiation of polymers affects their dielectric constant and loss factor. Structural changes produced in the polymer owing to the breaking of its long molecular chains by heavy ions are responsible for such modifications in the polycarbonate plastic. Dielectric constant and loss factor are studied by irradiating samples with 100 $MeV^{28}Si$ ions with the fluence which varied from $1x10^{11}$ to $1x10^{13}$ ions/cm^2. The study is carried out for different frequencies of applied electrical field ranging from 1 k Hz to 100 k Hz and at various temperatures starting from room temperature to 125 ^{0}C both for the pristine and ion irradiated samples. We find that due to irradiation process polar groups C=O and methyl group CH_3 became free and when they are subjected to the electric field, they rotate. We find two relaxation processes namely α and β one at frequency 20kHz and other at frequency 60 kHz. This relaxation is long range and localized. Their tan δ versus log f characteristic tells that the number of polymers taking part in the molecular motion increasesbecause of the increase in free volume. The activation energy in the case of pristineand $100MeV^{28}Si$ ion irradiated samples was respectively found to be 102.1 kJ/mol and 74.4 kJ/mol.





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