

57. Chain Length effect on Dielectric Relaxation and Thermo-Physical Behaviour of Organic Polymers Through Relaxation Dynamics Using TDR

Arvind V. Sarode, Ashok C. Kumbharkhane

ABSTRACT

Temperature and Chain length effect on dielectric relaxation and thermo-Physical behaviour of organic polymers which have Pharmaceuticals and biological importance play an important role in deciding molecular and structural dynamics has been studied through relaxation dynamics below room temperature. Organic liquid polymers such as Poly(propylene glycols) with molecular weights 425, 1000 and 2000 g mol⁻¹, Poly(ethylene glycols) having molecular weights 200,300,400 and 600 g mol⁻¹ has been studied in its pure form using Time Domain Reflectometry Technique in the frequency range 10 MHz – 20 GHz and temperature range 25⁰C- 00⁰C. Dielectric relaxation time (τ_0) obtained using TDR is used to study various thermo-physical parameters such as Free energy of activation ($\Delta F\tau$), entropy of activation ($\Delta S\tau$) and enthalpy of activation ($\Delta H\tau$) for the polymeric systems. The average free energy of activation $\Delta F\tau$ for both PEG and PPG molecules was found to be in the range 4–5 kcalmol⁻¹. The values of entropy $\Delta S\tau$ for PEG-200, PEG-400, PEG-600 and PPG-425, PPG-1000 molecules were found to be positive while entropy $\Delta S\tau$ for PEG-300 and PPG-2000 molecules was found negative, which confirms that the configuration of PEG-300 and PPG-2000 involved in the dipolar orientation has an activated state, which is more ordered than the normal state compared to PEG-200, PEG-400, PEG-600 and PPG-425, PPG-1000 molecules.

Keywords: Poly(Propylene glycol); Poly (ethylene glycols); Dielectric Relaxation; Thermo-Physical Parameters.