

AC conductivity and dielectric behavior in lithium ion conducting blend polymer electrolyte

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Solid Polymer blend electrolytes based on poly (ethylene oxide) as host polymer, poly (acrylonitrile) as copolymer and LiPF₆ as salt have been synthesized using solution caste technique by varying the stoichiometric ratio (O/Li) of salt systematically. Dielectric spectroscopy is done to measure the dielectric properties of the medium as a function of frequency based on the interaction of electric dipole with external field and carried out at room temperature in a wide frequency range from 100 Hz to 1 MHz with input AC signal of 20 mV [1]. The dielectric study of PS films has been done which gives the two order decrement in relaxation time (i.e. 10⁻⁴ - 10⁻⁶) which is directly related to faster ion dynamics in blend polymer electrolytes. The dielectric peak has been observed to shift toward the higher frequency side with the addition of salt, suggesting the low sample viscosity and faster conduction of ions. The frequency dependent conductivity shows a plateau at low frequencies followed by dispersion at higher frequencies [2].

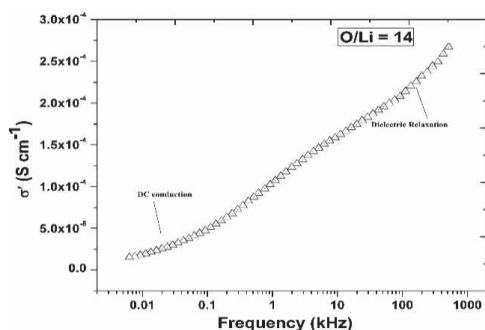


Figure 1: Variation of Dielectric loss and permittivity as a function of frequency at room temperature

Dielectric constant increases with increasing salt concentration due to increase in number of

charge carriers. There is decrease of dielectric constant at high frequency due to decrease in contribution of free charge carriers [3, 4]. There is shift in tangent delta peak with addition of salt toward higher frequency which is direct evidence of faster ionic transport as shown in Figure 1.

Figure 2 shows the variation of ac conductivity as a function of frequency. Here low frequency contribution is due to dc conductivity contribution and high frequency behavior shows dielectric relaxation phenomena [5].

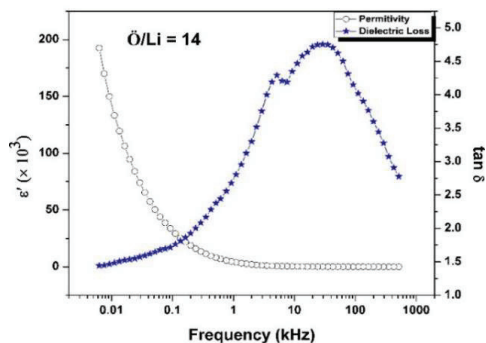


Figure 2: Variation of σ , as a function of frequency

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