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Dielectric Spectroscopic Study of the Binary Mixtures of Amino Silicone Oil and Methyl Ethyl Ketone in the Frequency Range of 100 Hz to 2 MHz at 298.15 K Temperature

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Abstract

Complex dielectric function $\varepsilon^*(\omega) = \varepsilon'(\omega) - \varepsilon''(\omega)$ of the binary mixtures of amino silicone oil and methyl ethyl ketone were measured using precision LCR meter in the frequency range 100 Hz to 2 MHz at 298.15 K temperature. Complex dielectric function data are represented in different formalisms like complex a.c. conductivity $\sigma^*(\omega)$, complex modulus $M^*(\omega)$ and complex impedance $Z^*(\omega)$. The refractive index of the same system was determined at 298.15 K temperature using Abbe's refractometer. These presentations are used to find out different parameters such as electrode polarization relaxation time (τ_{EP}), relaxation time (τ'_{EP}), ionic conduction relaxation time (τ_{σ}), dc conductivity (σ_{dc}) and static permittivity (ε_0) of the liquid samples. Determined parameters are used to gain information about the effect of concentration variation on dielectric and electrical properties of the mixtures. Complex impedance $Z^*(\omega)$ data were fitted to an equivalent circuit, having four elements including capacitance (C_2) representing electrode double layer capacitance. The geometric relaxation time was calculated using product of resistor (R_2) and capacitor (C_1) of the equivalent circuit. Lower frequency dielectric data is dominated by the EP effect. The systematic change is observed in all the parameters with change in concentration of amino silicone oil in methyl ethyl ketone. Viscosity dependence of dc conductivity of the system is also investigated.

Keywords

Methyl ethyl ketone, Amino silicone oil, Precision LCR meter, Electrode polarization, Complex Permittivity, Complex Impedance

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