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Dielectric properties of Liquefied Dimethyl Ether + Ethanol + Water Mixtures at 303.2 K
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Abstract (less than 300 words)
<p>To investigate the separation process with controlled volatility and polarity, we have previously reported dielectric properties of liquid mixture for dimethyl ether (DME) + ethanol and propane + ethanol system [1, 2]. The static dielectric constant of water is about 78.5 at 298 K and water has a solubility of 7 mass% in DME [3]. Ethanol aqueous solution is well miscible with DME over a whole composition at 303.2 K. By using liquefied DME + ethanol + water mixture, it is expected that the range of polarity control depending on the composition can be expanded. In this study, complex dielectric spectra of liquefied DME + ethanol + water mixture were measured at 303.2 K and composition dependence of dielectric constant and dielectric relaxation time for DME + ethanol + water mixture was examined.</p> <p>Complex dielectric spectra of liquefied DME + ethanol + water mixture liquid mixture studied were measured by frequency domain method with the network analyzer in the frequency range of 0.5 – 15 GHz. Frequency dependence of the complex dielectric spectra was fitted by single-phase Debye equation, and the static dielectric constants and the dielectric relaxation times of liquefied DME + ethanol + water mixture at 303.2 K were determined.</p> <p>The static dielectric constants of liquefied DME + ethanol + water mixture studied decreased with increasing DME and increased with water at 303.2 K. The dielectric relaxation times of mixture studied showed minima around 0.8 mole fraction of DME, and DME composition of dependence the dielectric relaxation times studied became smaller in DME-rich region at 303.2 K. Excess dielectric constants of liquefied DME + ethanol + water mixture liquid mixture studied were negative over a whole composition of DME and increased with increasing ethanol. Excess values of reciprocal dielectric relaxation time showed maxima around 0.8 mole fraction of DME.</p>
References
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