

Viscosity Modeling of Ionic Solutions

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In the present work, an Eyring-theory model based on concepts of excess Gibbs energy of activation of the viscous flow has been developed for the accurate correlation and/or prediction of the dynamic viscosity of ionic solutions: inorganic salt (electrolyte) + solvent and organic salt (ionic liquid) + solvent. For the excess Gibbs energy of activation ($G^{EX,\ddagger}$), both thermal and mechanical contributions to the viscous flow were considered. Accordingly, a thermal $G^{EX,\ddagger}$ term was described by mixing rules of the Redlich-Kister type whereas the mechanical $G^{EX,\ddagger}$ term was computed from a simple cubic equation of state in an attempt to overall represent the main molecular interactions (between the ionic species and the solvent) affecting viscosity. The resulting model was successfully validated during the representation of experimental dynamic viscosities of various non-aqueous and aqueous ionic solutions within wide ranges of temperature, pressure and composition (or salt molality).