Short Communication

Electrolyte Solutions: Measurement and Correlation of the Solubility of Et₄NBF₄ in Different Solvents at Temperatures from (263.15 to 323.15) K

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doi: 10.20964/2020.10.26

Received: 17 May 2020 / Accepted: 13 July 2020 / Published: 31 August 2020

The efficient organic liquid electrolyte for supercapacitors requires the stable solubility of electrolyte salt and the high permittivity solvents over a wide temperature range. The solubilities of tetraethylammonium tetrafluoroborate (Et₄NBF₄) in propylene carbonate (PC), γ -butyrolactone (GBL), N, N-dimethylformamide (DMF), and acetonitrile (ACN) were determined by a synthetic method at temperatures ranging from (263.15 to 323.15) K under atmospheric pressure. The liquid–solid equilibrium process of these mixture was studied by a laser in-situ observing technique. The experimental solubilities were correlated by the van't Hoff equation, the modified Apelblat and the λh equations. It is found the calculated solubility data shows good consistency with the experimental values. The thermodynamic properties of the solution process, including the Gibbs energy, enthalpy, and entropy were calculated by the van't Hoff analysis and the Gibbs equation. These results concerning the solubility of Et₄NBF₄ in different solvents under atmospheric pressure will provide fundamental data in the commercial application of Et₄NBF₄ in supercapacitors.

Keyword: Organic liquid electrolyte, Tetraethylammonium tetrafluoroborate, Solubilities, Different temperatures, Thermodynamic properties, Supercapacitors

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