The Influence of Thermophysical Properties of Ionic Liquids in Chemical Process Design

João França [S], Carlos Nieto de Castro [C] and Manuel Matos Lopes
Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal

Valentim Nunes
Instituto Politécnico de Tomar, Tomar, Portugal

Ionic liquids are presently a significant challenge to both scientists and chemical companies, not only because of their interesting properties, but also for their actual and potential applications in the chemical industries. It has been proven in the past, with common liquids, that the values of their thermophysical properties have a significant effect on the design of chemical separation and reaction units[1], influencing directly the design parameters and performance of equipment such as heat exchangers, distillation columns and reactors. Recently, we have analyzed the same effect for molten alkali nitrates, which have emerged as high-temperature fluids for several technological processes, such as high-temperature energy storage in batteries and solar plants, waste treatment and demonstrated that the knowledge of accurate data for the transport coefficients of these fluids is very important[2]. Values of the uncertainty found in high temperature properties of molten salts are smaller than those found in the published data on properties of ionic liquids, as their accurate measurement pose some delicate problems[3]. In this paper we have analyzed the effect of the uncertainty of thermophysical data of ionic liquids (heat capacity, thermal conductivity and viscosity) in the design of some current equipment, used in processes as solvents or heat transfer fluids. Data has been collected from IL Thermo[4] for alkylmethylimidazolium liquids, with $[BF_4]$ and $[Tf_2N]$ cations. Results obtained show that the influence of actual errors in the thermophysical properties of ionic liquids can render any future design as not working or having excessive cost. Moreover the heat storage capacity of these ionic liquids has been analyzed, for consideration as possible replacements of current silicon based heat transfer fluids.

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[4] Ionic Liquids Database- (ILThermo), NIST Standard Reference Database #147, © 2006, US Secretary of Commerce