

International Summit on Past and Present Research Systems of Green Chemistry

August 25-27, 2014 Hilton Philadelphia Airport, USA

Protic ionic liquids: Physicochemical properties, mesostructure and solute interactions

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Ionic liquids (ILs) are liquid salts which consist of cations and anions, with no additional solvent present. The properties of ILs can be extensively modified through simple changes to the chemical structure of the cation or anion. For example, ions could be selected to achieve an IL with a low melting point, low viscosity, high conductivity, negligible vapour pressure, etc., and hence ILs are often referred to as “designer” or “tailorable” solvents. Protic ionic liquids (PILs) are a subset of ILs which are made through the stoichiometric combination of a Brønsted acid and a Brønsted base. PILs are significantly cheaper and easier to make than their more conventional aprotic counterparts, and usually consist of less toxic ions. We have developed structure-property relationships for the thermal and physicochemical properties of a broad range of PILs which are related to the most well known PIL of ethylammonium nitrate. We have explored the effect of changing alkyl chain lengths, the presence of hydroxyl groups, mono-, di- and tri-substitution on the ammonium cation, and various inorganic and carboxylate anions. Many PILs (and aprotic ILs) have a complicated mesostructure consisting of polar and non-polar domains which arise due to segregation of the alkyl chains. We have investigated the mesostructure of these PILs, and how it effects their interactions with solutes such as water, ethanol, butanol, hexane and various amphiphiles.

Biography

Tamar Greaves was awarded her PhD in 2004 from the School of Physics and Materials Engineering at Monash University, Australia. Since then she has worked in the field of protic ionic liquids, publishing 25 papers which have collectively received more than 1300 citations. Currently, she is a Senior Research Scientist at RMIT University, Australia.

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