

Ionic liquids as additives for enhancing the extraction, absorption and dissolution processes

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Abstract

Solvents are major contributors and high on the list of environmental damage chemicals, mainly because of their large usage and high volatility. The widespread use of volatile organic compounds (VOCs) in many industrial chemical processes is an issue of great environmental concern. It is an extremely important task to search of potentially green and environment friendly alternatives for VOCs. At least a partial solution to this problem may offer by a novel class of molten salts referred to as ionic liquids (having melting point, generally, below boiling point of water), as they possess unique combination of particular properties, namely negligible vapour pressure ($\sim 10^{-11}$ to 10^{-10} bar at room temperature), wide thermal window (~ -50 °C to $+250$ °C), wide electrochemical window ($\sim \pm 3$ Volt vs. NHE), non-flammability, high ionic conductivity and a highly solvating capacity for organic, inorganic and organometallic compounds. This unique combination of particular properties leads them to be exploited as “green solvents” and giving them increasing attention in academic and industrial research. Research areas on ionic liquids are growing very rapidly and the potential application are numerous, mainly due to the fact that simple changes in the cation and anion combinations or the nature of the moieties attached to each ion allow the physical properties of ionic liquids such as hydrophobicity, viscosity, density, coordinating ability, ion selectivity, and chemical and electrochemical stability to be tailored for specific applications. Proposed talk will include the introduction of green solvents, ionic liquids, general applications of ionic liquids and understanding unique thermophysical properties of novel ionic liquids for dissolution of tank bottom sludge, enhanced oil recovery (EOR), and desulphurization of fuels. Further, the effects of thermophysical properties of ionic liquids on these applications and current research trends on ionic liquids as green solvents for the petrochemical industry will be discussed.

Biography

Ramesh L. Gardas is Associate Professor in Chemistry at IIT Madras and mainly focused on ‘Chemical Thermodynamics’ and ‘Phase Equilibria’ of industrially important solvents and their mixtures. His research interests include synthesis and physico-chemical properties of novel, non-conventional and environmentally benign solvents (e.g. ionic liquids, deep eutectic solvents) and their mixtures with conventional solvents for an in-depth understanding of solute-solvent interactions and also to develop their structure-composition-property correlations. His group strives to design task-specific ionic liquids and to provide an important insight into physical chemistry to regulate their properties for varied technological applications such as phase-change materials, CO₂ capturing, dissolution of tank bottom sludge, absorbents for refrigeration system, desulfurization of fuels, extraction of metal ions and value-added products. He has more than 19-years of research and 10-years teaching experience. He is a co-author of 4 patents, 2 book chapters and 160 research papers which received more than 5600 citations with h-index=36.



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