ABSTRACT

Microemulsions are regarded as a particular and flexible reaction media for a wide range of chemical processes, including formulation of nanoparticles, preparation of organic compounds, and various other bio-organic syntheses. Room Temperature Ionic liquids (RTILs) have piqued the interest of various researchers due to their unique characteristics such as high thermal stability, recyclability, a wide liquid range, and low vapour pressure.

In the present work, we have formulated a ternary microemulsion system in which a typical hydrocarbon solvent (*n*-alkanes) is replaced by a hydrophobic ionic liquid, 1–butyl-3-methylimidazolium hexafluorophosphate [Bmim][PF_6], and a polar solvent (water) is substituted by a polar ionic liquid, Ethylammonium nitrate (EAN). We've also switched to sugar-based non-ionic surfactants in place of traditional non-ionic surfactants. To validate the effect of sugar-based non-ionic surfactants on the phase behaviour and microstructure of a microemulsion system, we created phase diagrams for each microemulsion system after each compositional modification.

The goal of this research is to reduce the amount of surfactant that is used to solubilize two immiscible liquids (Water and Hydrophobic Ionic Liquid or Polar Ionic Liquid and *n*-Alkanes). Instead of using non-ionic alkyl polyglycol ether surfactants (C_iE_j), a greener option is used in the form of non-ionic sugar-based surfactants in a ternary system to formulate a microemulsion systems that are stable across a wide temperature range. The phase diagrams are then produced, and their potential application areas are explained.

The phase diagrams were used to investigate the solubilization of Sudan Red G, a hydrophobic lysochrome azo dye. In addition, microemulsion systems were employed to recover the metal ions from metal complexes. This research is critical for the efficient recovery of inorganic metals from aqueous or solid wastes, both economically and environmentally.

Keywords: Room Temperature Ionic Liquids, Sugar-based Surfactants, Microemulsion, Dye Solubilization, Inorganic Metal Extraction.