Chapter 1

Introduction

Abstract
This Chapter covers the brief overview on the green chemistry and their needs along with its correlation with ionic liquids (ILs). As a task specific or designer solvent, various applications of ILs in different fields including synthesis, biology, for environment remedies, gel electrolytes is reviewed. At the end of the each section, aim and objectives of the proposed thesis work is described.
Chapter 2

Synthesis and characterization of Task Specific Ionic Liquids

Abstract

The synthesis and spectroscopic characterization of various hydrophobic TSIL are depicted here. The detailed synthesis protocol for CₙPyCl along with C₈PyDs (n = 4, 6, 8) is discussed. The physical properties of all the ILs including their solubility in various solvent are given. The synthesized ILs are characterized by ¹H-NMR, IR, MS and thermal methods. The C₈PyDs has very limited solubility in water, therefore they are making stable micelles and their geometry and size is determined by SANS measurements.
Abstract
Here, we discussed the use of C₈PyDs for the removal of various metal ions from the water. The % metal ion extraction as a function of pH, amount of IL loading, contact (shaking) time and concentrations of metal ions is studied. The dynamics of metal ion removal by C₈PyDs is studied by cyclic voltammetry. The metal ions used for this study are: Fe³⁺, Cu²⁺, Ni²⁺, Co²⁺, Pb²⁺ and Cd²⁺. The better separation and % extraction of metal is exhibited by non-fluorinated IL, C₈PyDs.
Abstract
This Chapter deals with the removal of dyes from aqueous media by C₈PyDs. Like metal ion removal, effect of various parameters such as pH, amount of IL loading etc. on % dye removal from water is discussed. Due to gel kind of nature, the dye adsorption isotherm follows Langmuir model which shows that C₈PyDs has identical adsorption cites. Both cationic and anionic dyes are used for this study. The amount of dye present before and after C₈PyDs treatment is determined by using UV-Vis spectroscopy.
Chapter 3(c)

Isolation of DNA and Protein Precipitation using TSIL and its Cytotoxicity Study

Abstract

A phenol and organic solvent free protocol is proposed for DNA isolation from complex DNA-protein mixture. The use of phenol/chloroform/IAA is substituted by C₈PyDs. The mechanism behind DNA isolation or protein precipitation by C₈PyDs is explained using computational study and extraction of pure BSA protein. The cytotoxicity of C₈PyDs is determined by studying MTT assay on human cancer cell line HeLa and FRAP assay.
Abstract

Silver nanoparticles (AgNPs) are synthesized using amphiphilic block copolymer, P123 as a reducing agent. The spherical AgNPs undergo shape transition to ribbon like shape in presence of hydrophobic IL, C₈PyDs. The size and shape of AgNPs are correlated with the size and shape of micelles of amphiphilic block copolymers/C₈PyDs and alkyl chain length of IL. The AgNPs are characterized by TEM and DLS, while size of P123 and C₈PyDs micelles are determined by SANS and DLS.
Chapter 5

Effect of hydrophilic IL on micelles of P123 and F127 block copolymers

Abstract

Here, we report the influence of various hydrophilic ILs on the surface activity and micellization of P123 and F127 block copolymers in water. The effect of alkyl chain length, concentration of IL, anion and cationic head group on the micellar size of block copolymer is given. The interaction of IL with PEO and PPO block is studied by $^1$H-NMR, which is supported by quantitative analysis of SANS curves and DLS spectra. The variation in CMC values and viscosity as a function of ILs is determined by surface tension and viscosity method respectively.
Abstract

A conductivity method for CMC determination of non ionic surfactant/block copolymer using C₄PyCl is proposed in this Chapter. The concentration and alkyl chain length or anion on IL are optimized in such a way that there should be negligible effect on CMC values of non ionic surfactants composed of different hydrophobic part and common polyethylene oxide block. The obtained CMC values are compared with the CMC values evaluated using classical conventional method such as surface tension.
Chapter 7

Summary and Conclusions

Abstract
This chapter summarizes the main conclusion drawn throughout the study under taken for thesis work.