CHARACTERISATION OF SOME IONIC LIQUIDS BY VARIOUS TECHNIQUES

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Introduction: Nowadays room temperature Ionic Liquids (RTILs) becomes major class of attention due to its numerous industrial applications in various fields. [1-3]. Due to its high cost and demand of ionic liquids for various application studies it becomes necessary to synthesize them in lab. After synthesis, characterization of ionic liquid becomes important task before their use for particular type of application for purity concern and their structural elucidation. In the present study, an imidazolium based ionic liquid, 1-butyl-2-methyl imidazolium [BMIM][BF_4] synthesized in our laboratory, was characterized by various spectroscopy technique (UV-Vis, FT-IR, Mass and NMR spectroscopy).

Experimental: In the synthesis of ionic liquids the possibility of impurities remaining in the ionic liquid samples (chloride, water and/or other solvents) has been reported [4]. All imidazolium based RTILs shows significant absorption in entire ultraviolet (UV) region and long tail in visible region [5] due to extended hydrogen bonded. Long tail absorption of RTILs is due to presence of large number of varied size energetically different supramolucular aggregates which shows specific absorption maxima [6]. Also, RTILs show weak absorption at 300 nm and at longer wavelength due to imidazolium salt and not due to impurity [7]. Because of this, UV-vis spectroscopy becomes useful tool for absorption study of imidazolium based ionic liquids. Absorption spectra of [BMIM][BF_4] is presented in this work using a 8453 UV-Visible Spectrophotometer.

Fourier transform infrared spectroscopy (FT-IR) spectra of imidazolium based ionic liquids reveals information of interaction between imidazolium cation with different inorganic anions. Imidazolium based RTILs show different absorption in IR spectra due to relative position of anion with respect to imidazolium cation [8]. Structural factors like position of cation and anion determine the physical and chemical property of the RTILs. Therefore, in present study [BMIM][BF_4] was carefully analysed with FT-IR spectroscopy for structure determination of the molecule. The equipment used is a Jasco FT/IR-600 Plus FT-IR spectrometer.

Mass spectroscopy is an important characterization technique to characterize organic and inorganic compound. RTILs show peaks corresponding to the isolated cation (or anion)

and to ionic liquid aggregates in electrospray ionisation mass spectra, both in positive and negative ion mode [9]. The work describes the spectra of [BMIM][BF_4] with electrospray ionisation mass spectroscopy (ESI-MS) by monitoring relative abundances of precursor and fragment ions. The spectrometer used is a Agilent G3250AA LC-MSTOF model.

Nuclear Magnetic Resonance (NMR) is a well suited technique for in situ structure investigation of ionic liquids [10]. In present work, [BMIM][BF_4] formation and organic solvent impurities studied with the help of a Varian NMR System 400 spectrometer is reported.

These investigations shed light on spectroscopic characterization of imidazolium based ionic liquids and its importance before use it for any kind of application.

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