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Probing the Organized Environments of the Ionic Liquids by Fluorescence Correlation Spectroscopy and Conventional Steady State and Time-resolved Fluorescence Techniques

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Room temperature ionic liquids (RTILs), which are salts comprising bulky ionic constituents and exist as liquid in ambient conditions, have attracted widespread attention of the researchers from different fields and have emerged as a new class of promising media for a variety of chemical reactions and applications due to their interesting properties [1].

Recognizing the potential of the RTILs, we have been exploring these substances for nearly a decade and half by studying the photophysical behavior of carefully chosen molecular systems, a large majority of which are dipolar fluorescent molecules, in these media [2-7]. These studies have significantly improved our understanding of the structure and dynamics of these complex liquids and also allowed us to exploit some of the unique properties of the RTILs to fine tune the fluorescence response of the systems of interest.

Our studies are based primarily on the time-integrated and time-resolved fluorescence, laser flash photolysis and fluorescence correlation techniques. By measuring the steady state fluorescence response of dipolar molecules we have quantitatively estimated the polarity of a series of RTILs and shown that these media are more polar than acetonitrile but less polar than methanol. By monitoring the time-dependent fluorescence Stokes shift of dipolar molecules we have been able to determine the time scale and mechanism of solvent reorganization dynamics in these media. We have demonstrated that unusual excitation wavelength dependent fluorescence behavior of some systems, as observed in these media, is a consequence of slow solvent relaxation in RTILs. With the help of time-resolved fluorescence anisotropy measurements we have studied the

rotational dynamics of solute molecules and demonstrated microheterogeneous nature of these media. By probing the kinetics of fluorescence recovery after photo-bleaching (FRAP) we have studied the translational diffusion of molecules in these media. Our study on photo-induced electron transfer reactions based on transient absorption measurements has revealed rapid recombination of the products of the electron transfer reactions in these media.

This talk will highlight some of the above results, which are suggestive of an organized structure of these viscous liquids.

[References]

- [1] M. Petkovic, K. R. Seddon, L. P. N. Rebelo and C. S. Pereira, *Chem. Soc. Rev.*, 2011, 40, 1383.
 - [2] S.N.V.K. Aki, J.F. Brennecke and A. Samanta, *Chem. Commun.* 2001, 413.
 - [3] A. Samanta, *J. Phys. Chem. Lett.* 2010, 1, 1557.
 - [4] A. Samanta, *J. Phys. Chem. B* 2006, 110, 13704.
 - [5] D. C. Khara and A. Samanta, *J. Phys. Chem. B* 2012, 116, 13430.
 - [6] S. Patra and A. Samanta, *J. Phys. Chem. B* 2012, 116, 12275.
 - [7] D.C. Khara, J. Praveen Kumar, N. Mondal and A. Samanta, *J. Phys. Chem. B* 2013, 117, 5156
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