Design and Synthesis of Ionic liquids for Sensing and Biomedical Applications

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Abstract: Ionic Liquids (ILs) have been identified as promising candidates in a number of areas such as sensing, catalysis, organic synthesis, nanotechnology, solar cells, pharmaceutics and medicine owing to their unique physicochemical properties, which can be modulated by judicious selection of the cation and/or anion for specific applications.[1] Although ILs have been extensively explored as sensors, there are a number of challenges to be addressed in this field. For instance, gel-based sensors are rarely reported with ILs, which is expected to enhance their practical applications.[2] In the present study, this issue is addressed by designing IL based gelator molecules which can form hydrogel, resulting the possibility of sensing analytes in aqueous medium. The design strategy also includes the incorporation of proton abstraction units and fluorophores in the gelator, which enable reversible sensing through regulating the pH of the medium as well as light-based monitoring of the sensing process. The hydrogel developed based on novel poly (alkyl ether) based pyridinium ILs was effectively utilized for detecting toxic cyanide ion (CN^-) in aqueous medium.

In addition to sensing, ILs can also be used as antibacterial, antifungal, antiproliferative, and anti-cancerous agents.[3] However, these applications are seriously affected due to toxicity and limited solubility of several ILs. These issues have been addressed by encapsulating the ILs in cyclodextrin to preserve the biological activity of the IL and also ensuring the gradual delivery of the IL, along with the reduced toxicity and enhanced aqueous solubility. The inclusion complexes were formed between novel benzimidazole-pyridinium based ILs and cyclodextrin β or γ).

The details of the sensing[4] and the inclusion complex study of the ILs will be presented during the seminar.

References:

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