

Functional Ionic Liquids for Solvent Sensing

Alexandru Tudor

Insight Centre for Data Analytics, National Centre for Sensor Research,
Dublin City University, Dublin, Ireland

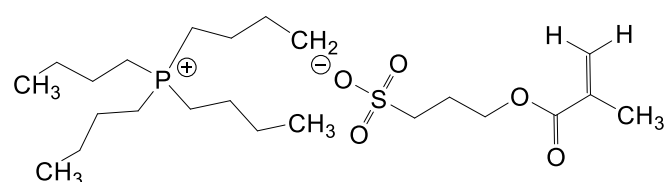
Centre for
Data Analytics



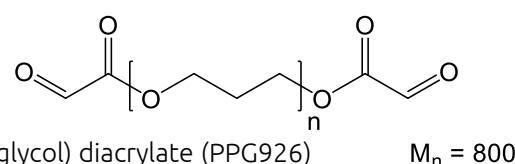
Introduction

Ionic liquids (ILs) have gathered a lot of interest in recent years, due to their properties such as high electrochemical and thermal stability, good solvation properties, and negligible vapour pressure, respectively. They also possess a high synthetic versatility and as such a multitude of IL subclasses were synthesized, including poly(ionic liquid)s (PILs) and fluorescent ionic liquids. Poly(ionic liquid)s (PILs) are a class of ionic liquids that feature polymerizable groups in their structure, while fluorescent ILs possess a fluorescent moiety in their structure. Herein we describe the synthesis of a fluorescent ionic liquid, followed by its incorporation in a crosslinked PIL matrix, to create fluorescent PIL ionogels that can be used for solvent sensing.

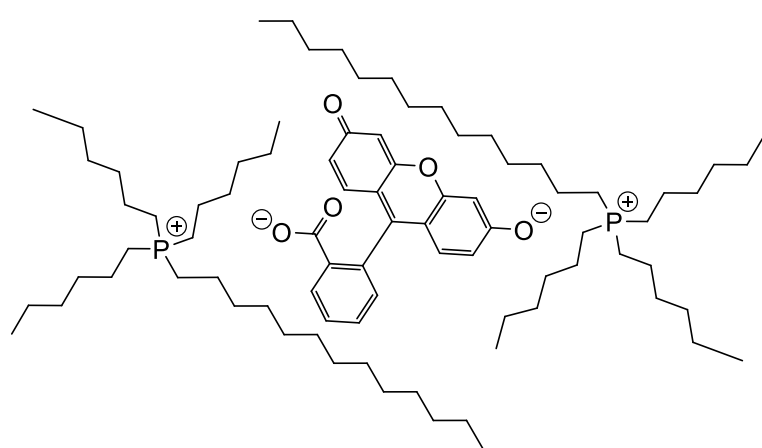
Molecular Structures



Tetrabutyl phosphonium 3-sulfopropyl methacrylate (PSPMA)

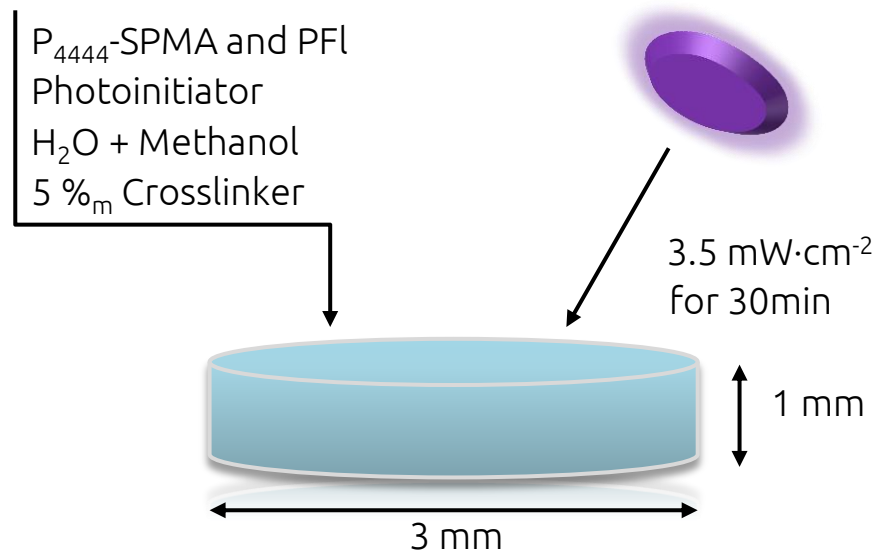


Poly(propylene glycol) diacrylate (PPG926) $M_n = 800$



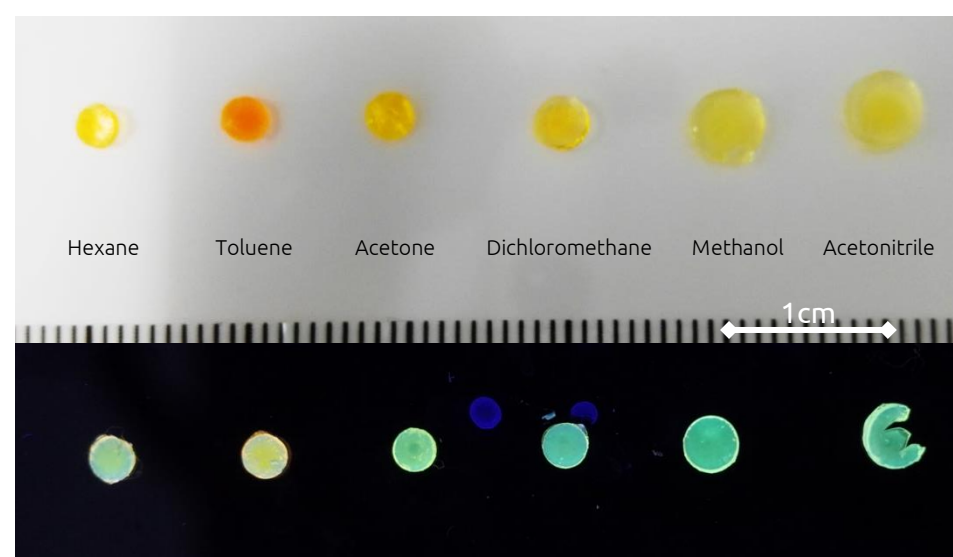
Trihexyltetradecyl phosphonium difluoresceinate (PFL)

Experimental Method

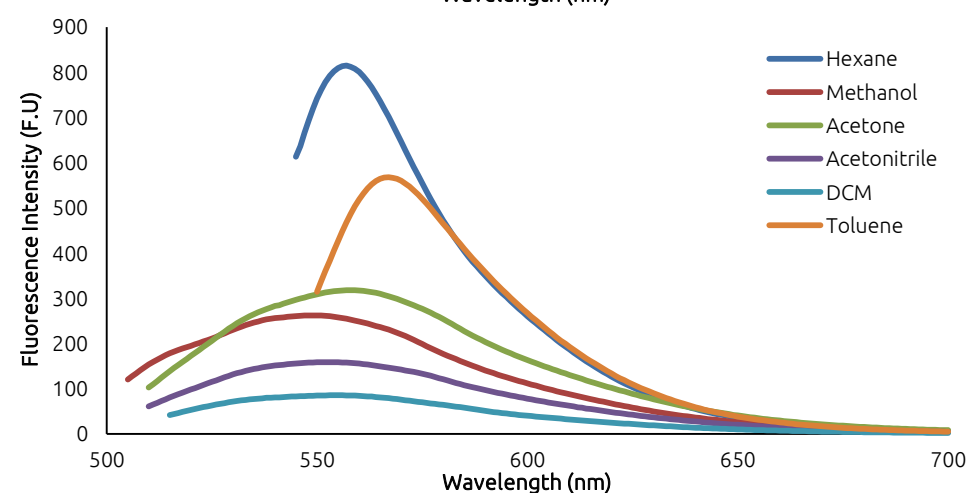
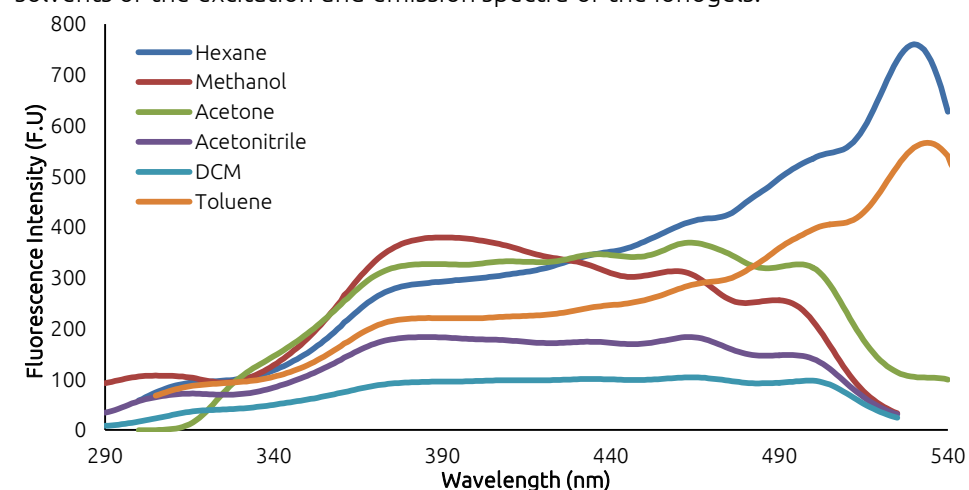


The ionogels were synthesized by dissolving all of the ingredients in the deionized water:methanol solution, followed by polymerizing them for 30 minutes in a UV curing chamber at a wavelength of 365 nm. Following this, the ionogels were left to swell in six different solvents: hexane, toluene, acetone, dichloromethane (DCM), methanol, and acetonitrile.

Results and Discussion



The ionogels were left to swell overnight to ensure they reached their maximum swelling capacity. Following this, they were imaged under ambient light and 365 nm UV light to determine if any changes took place. Based on the positive result, fluorescence spectra were gathered to determine the dependency on the solvents of the excitation and emission spectra of the ionogels.



Conclusion

A series of crosslinked PILs ionogels were synthesised using an ionic liquid monomer together with a fluorescent ionic liquid. It was shown that the fluorescence and swelling properties of these ionogels are dependent on the solvent in which they were swollen. Based on these properties, the use of these materials as solvent sensors will be further investigated.

Acknowledgements

The authors are grateful for financial support from the Marie Curie Initial Training Network funded by the EC FP7 People Programme OrgBIO (Marie Curie ITN, GA607896) and Science Foundation Ireland (SFI) under the Insight Centre for Data Analytics initiative, Grant Number SFI/12/RC/2289.