

User Meeting 2020

Contribution ID: 236

Type: Oral

Solvent properties of protic ionic liquid-water mixtures, and their application to biological molecules

Thursday, 19 November 2020 14:10 (20 minutes)

Protic ionic liquids (PILs) are cost efficient “designer”solvents which can be tailored to have properties suitable for a broad range of applications. PILs are also being combined with molecular solvents to enable more control over the solvent environment, driven by a need to reduce their cost and viscosity. However, there are relatively few structure-property studies which look at these more complex mixtures. We have explored the solvation properties of common PIL-molecular solvents using various techniques,[1] and have identified many interesting solvent properties of these solutions, and their interactions with solutes.

In this presentation I will discuss how we are using our understanding of PIL-water solvent properties to design and characterise solvents for biological molecules. In particular, we are targeting being able to control protein solubility and stability, which are critical for applications in bioprocessing, biocatalysis, protein crystallography and cryopreservation. We have explored lysozyme as a model protein in various PIL-water systems, predominantly using spectroscopic techniques and small angle x-ray scattering (SAXS).[2-3] From this we have been able to identify which PILs are more biocompatible, and to identify specific conformational changes of lysozyme due to the presence of PILs.[4] More recently, we have used protein crystallography to identify specific binding sites of the PIL ions and water to lysozyme.[4]

References

1. Yalcin, D.; Drummond, C. J.; Greaves, T. L., High throughput approach to investigating ternary solvents of aqueous non-stoichiometric protic ionic liquids. *Phys. Chem. Chem. Phys.* 2019, 21, 6810-6827.
2. Wijaya, E. C.; Separovic, F.; Drummond, C. J.; Greaves, T. L., Activity and conformation of lysozyme in molecular solvents, protic ionic liquids (PILs) and salt-water systems. *Phys. Chem. Chem. Phys.* 2016, 18, 25926-25936.
3. Arunkumar, R.; Drummond, C. J.; Greaves, T. L., FTIR Spectroscopic Study of the Secondary Structure of Globular Proteins in Aqueous Protic Ionic Liquids. *Frontiers in Chemistry* 2019, 7, Article 74.
4. Qi, H.; Smith, K. M.; Darmanin, C.; Ryan, T. M.; Drummond, C. J.; Greaves, T. L., Lysozyme conformational changes with ionic liquids: spectroscopic, small angle x-ray scattering and crystallographic study. *Journal of Colloid and Interface Science*, Accepted 8th October 2020.

Primary authors: Dr HAN, Qi (Hank) (RMIT University, College of Science, Engineering and Health); Prof. DRUMMOND, Calum (RMIT University); GREAVES, Tamar (RMIT University)

Presenter: GREAVES, Tamar (RMIT University)

Session Classification: Session 6 - Chemistry, Catalysis & Soft Matter

Track Classification: Chemistry, Catalysis and Soft Matter