

## The 3rd Australasian Symposium on Ionic Liquids (ASIL-3)

Jennifer M. Pringle<sup>A</sup>

<sup>A</sup>ARC Centre of Excellence for Electromaterials Science, Monash University, Wellington Road, Clayton, VIC 3800, Australia. Email: jenny.pringle@eng.monash.edu.au

The third in the series of the very successful Australasian Symposia on Ionic Liquids (ASIL-3) was held on the 15–16th May 2008 at Clayton, Australia. The symposium was co-hosted by the ARC Centre of Excellence for Electromaterials Science at Monash University and the CSIRO Divisions of Minerals, Energy Technology and Materials Science and Engineering. The symposium series first began in 2003, with a gathering of around 65 people who recognized the enormous potential of ionic liquids and were eager for a forum in which to discuss their work and explore the wide variety of applications of these new materials. Five years on, the field of ionic liquids has grown enormously and attendance at the 3rd ASIL had to be restricted to 100 delegates, which included visitors from six other countries. Keynote and invited speakers included Professors Ken Seddon and Robin Rogers from the Queen's University Ionic Liquids Laboratory in Northern Ireland, Professor Jim Davis from the University of South Alabama, Professor Frank Endres from TU Clausthal, Dr Nolene Byrne from Arizona State University, and Professor Andy Abbott from the University of Leicester. These speakers, and the local participants, covered a very broad but nonetheless detailed insight into the current state of the ionic liquids field. Research activities within the Australasian region have mirrored the worldwide trend, with both increasing numbers of researchers and a rapidly widening range of applications. The breadth of subjects presented in ASIL-3 reflects the diversity of the subject, with topics ranging from batteries to biopolymers, pharmaceuticals to corrosion inhibition. A selected subset of these is presented in this special issue of *Australian Journal of Chemistry – an International Journal for Chemical Science*.

Crystallographic analysis of ionic liquids plays an important role in enhancing our understanding of the influence that different anion and cation structures has on the physical properties of the resultant ionic liquids. Dean et al.<sup>[1]</sup> report the synthesis and crystal structure analysis of a series of novel ionic liquids utilizing trihalide anions. By studying a series of ionic liquids with systematic changes in either the cation or the anion the role of different interactions can be assessed. Such structural studies help to bring the ultimate goal of target-specific ionic liquid design one step closer. Our understanding of these complex systems can also be significantly enhanced using theoretical modelling techniques, and the use of these various methods is discussed by Gray-Weale.<sup>[2]</sup>

From single crystals to large-scale reactions, Abbott et al.<sup>[3]</sup> demonstrate the potential of ionic liquids, in the form of Deep Eutectic Solvents, for large-scale processes such as the extraction of zinc and lead. The components of these eutectics can be specifically chosen to optimize solvent viscosity and solubilizing properties and the selective extraction of the desired metal. The concept of utilizing eutectic mixtures is an important, and as yet underutilized, one in the ionic liquid field. While the widespread

use of many salts is currently hampered by undesirably high melting points, the addition of a second salt (or different structural isomer) may be a simple method of achieving lower melting, more fluid solvents.

Another potentially large-scale use of ionic liquids is their use for carbon dioxide absorption, which is reviewed by Huang et al.<sup>[4]</sup> The removal of CO<sub>2</sub> from emission sources such as flue gases is highly desirable for obvious environmental reasons, and the search for materials that can efficiently achieve this is intense. Ionic liquids generally absorb significantly more CO<sub>2</sub> than molecular solvents, and strategies such as task specific design can further improve their performance.

Another rapidly expanding aspect of ionic liquid research reviewed is that of phosphonium-based ionic liquids.<sup>[5]</sup> The use of alkylated phosphonium cations, rather than the more conventional alkylated ammonium ones, can result in improved properties and superior performance in a range of applications. Such ionic liquids are becoming more commercially available and many can be purchased in large quantities for relatively low cost.

The versatility of ionic liquids is also demonstrated by their use in the synthesis of  $\beta$ -acetamido ketones catalyzed by ytterbium triflate,<sup>[6]</sup> and also their role in the synthesis and use of PEDOT-coated counter electrodes for dye-sensitized solar cells.<sup>[7]</sup>

Finally, Byrne and co-workers demonstrate the unprecedented stability that ionic liquids can impart to proteins.<sup>[8]</sup> It is reported that the ability of a protein to reversibly unfold in protic ionic liquids can be predicted by simple NMR measurements. It is also suggested that the stabilization of proteins by such salt solutions may have played a role in the evolution of life!

Major sponsorship for the ASIL-3 symposium was received from Merck.

### References

- [1] P. M. Dean, B. R. Clare, V. Armel, J. M. Pringle, C. M. Forsyth, M. Forsyth, D. R. MacFarlane, *Aust. J. Chem.* **2009**, *62*, 334. doi:10.1071/CH08456
- [2] A. Gray-Weale, *Aust. J. Chem.* **2009**, *62*, 288. doi:10.1071/CH09056
- [3] A. P. Abbott, J. Collins, I. Dalrymple, R. C. Harris, R. Mistry, F. Qiu, J. Scheirera, W. R. Wisea, *Aust. J. Chem.* **2009**, *62*, 341. doi:10.1071/CH08476
- [4] J. Huang, T. Ruether, *Aust. J. Chem.* **2009**, *62*, 298. doi:10.1071/CH08559
- [5] K. J. Fraser, D. R. MacFarlane, *Aust. J. Chem.* **2009**, *62*, 309. doi:10.1071/CH08558
- [6] A. Kumar, M. S. Rao, I. Ahmad, B. Khungar, *Aust. J. Chem.* **2009**, *62*, 322. doi:10.1071/CH08557
- [7] J. M. Pringle, V. Armel, M. Forsyth, D. R. MacFarlane, *Aust. J. Chem.* **2009**, *62*, 348. doi:10.1071/CH09006
- [8] N. Byrne, J. Belieres, C. A. Angell, *Aust. J. Chem.* **2009**, *62*, 328. doi:10.1071/CH08441