

Recent Advances in Ionic Liquids: A Brief Report from COIL-3

Alistair W. T. King, Somdatta Deb, Kristiina Wähälä - University of Helsinki
Manu Lahtinen, Minna Kärnä - University of Jyväskylä
Pasi Virtanen - Åbo Akademi

The 3rd Congress on Ionic Liquids (COIL-3) was held in May 31st-June 4th, 2009 in the tropical city of Cairns in Queensland, Australia gathering ca. 400 participants. The meeting, organized by Prof. Douglas MacFarlane and Dr. Jenny Pringle, consisted of 42 oral presentations and 354 posters.

Ionic liquids can be described as salts that are molten at the reaction temperature, often below 100°C. ILs usually consists of combinations of organic cations and inorganic anions. The major benefit of ILs however is that those ILs with high 'ionicity' (i.e. degree of dissociation of ion pairs in the liquid state) typically have vapour pressures approaching zero. This means that they can be viewed as a replacement for volatile organic compounds (VOCs) for example in industry and may be regarded as 'Green Solvents', if a process that they are involved in is fully sustainable and the IL itself is recyclable.

The opening and plenary lecture was given by Prof. Peter Wasserscheid from the University of Erlangen-Nürnberg (Germany). His lecture focused on how a fundamental understanding of interactions between ions (and ion clusters) in ILs, with dissolved substances, affects their performance in synthetic and engineering applications. Merck KGaA presented a new range of ILs, containing new anions, such as $[(C_2F_5)_3PF_3]^-$ (FAP) and $[B(CN)_4]^-$ (TCB) exhibit much increased hydrolytic stability, whilst maintaining favourable viscosities, conductivities, wide electrochemical window and thermal stabilities. Some other major areas of interest for ILs research are in their bio-application such as enzyme catalysis in ILS (Dr. Christina Pereira) and biomass treatment, ionic liquid synthesis (structure refinement, synthesis of new and low toxicity ILs), CO₂ sequestration and the application of ILs as media for synthetic chemistry including supported ionic liquid phase (SILP) catalysis which involves the absorption of a homogenous catalyst into a film of ionic liquid.

Prof. Jim H. Davis Jr. from the University of South Alabama and Prof. Robin D. Rogers from the University of Alabama gave the concluding lectures. Prof. Davis is known of task-specific ionic liquids (TSILs). This refers to ILs that have their chemical structure tailored to a specific application, for example, primary amine functionalized ILs that are capable of scavenging CO₂. For these ILs, their presumed increase in cost of synthesis is offset by their potential recyclability. Prof. Davis discussed the constitutional dynamic systems of ionic and molecular liquids. Prof. Robin Rogers presented bioprocessing in ILs, extracting high molecular weight chitin and chitosan from crab shells, reducing the existing process to a few simple steps. Prof. Rogers' lecture encouraged the IL researchers to be innovative about the application of ILs and not to just use them as a high profile substitute for traditional technologies. Another assertion of the lecture was to remind the IL community what one of the original motivations for ILs research was. This was that IL research started out from the need to develop green technologies. Perhaps future IL research should be driven by the development of green technologies and not by application development. The direction IL research will take will perhaps be seen in the following IL conference which will be organized by Prof. Rogers in the USA in 2011.