Ionic Liquids as Green Solvents: Progress and Prospects

Sponsored by the

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August 18-22, 2002, Boston, MA

Robin D. Rogers, The University of Alabama
Kenneth R. Seddon, The Queen's University of Belfast

Sunday, August 18th, Morning

I: Tutorials: Everything you wanted to know . . .
R. D. Rogers and K. R. Seddon, *Organizer, Presiding*

8:50 – Introductory Remarks

9:00 – 1. Getting started with Ionic Liquids: An experience-based tutorial on synthesis and handling. J. D. Holbrey, W. M. Reichert, S. K. Spear, R. P. Swatloski, M. B. Turner, A. E. Visser, R. D. Rogers

10:40 – 2. Everything you ever wanted to know about ionic liquids and were afraid to ask. K. R. Seddon, M. J. Earle, W. R. Pitner, U. Fröhlich, M. Deetlefs, M. C. Lagunas

12:00 - Panel Discussion

Sunday, August 18th, Afternoon

II: Ionic Liquids Manufacture and Synthesis
A. J. Robertson, *Organizer, Presiding*

2:00 – Introductory Remarks

2:05 – 3. A versatile process for the manufacture of hydrophilic ionic liquids**.** R. D. Moulton

2:25 – 4. Ionic liquids and Merck KGaA. U. Welz-Biermann, J. Vaughan-Spickers, C. Janeck, M. Weiden

2:45 – 5. Challenges to the commercial production of ionic liquids. P. E. Rakita

3:05 – Break.

3:20 – 6. Industrial preparation of phosponium ionic liquids. C. J. Bradaric, A. Downard, C. Kennedy, A. J. Robertson, Y. Zhou

3:40 – 7. Commercial Ionic Liquid Production. C. Hilgers

4:00 – 8. Synthesis, Purification and Analysis of Ionic Liquids for ACROS Organics**.** J. Hamill

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Sunday, August 18th, Afternoon (continued)

III. Ionic Liquids Manufacture and Synthesis - Academic
K. R. Seddon, *Organizer, Presiding*

4:35 – Introductory Remarks

4:40 – 9. Seek and ye shall find: A search for low melting point salts in retail chemical catalogs. J. H. Davis

5:00 – 10. New functionalized ionic liquids - synthesis and applications. A. BÃ¶smann, P. Wasserscheid, R. van Hal

5:20 – 11. Preparation and Physical Properties of New Nitrogen-Containing Ionic Liquids. K. R. Seddon, M. Deetlefs**,** U. Fröhlich, M. Earle, S. Johnston

5:40 – 12. Clean synthesis of 1,3-dialkylimidazolium ionic liquids. J. D. Holbrey, R. D. Rogers

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Monday, August 19th, Morning

IV. Characterization and Engineering
Joan F. Brennecke, *Organizer, Presiding*

8:00 – Introductory Remarks

8:05 – 54. Electrochemical separation and concentration of carbon dioxide from nitrogen. P. Scovazzo, J. Poshusta, D. Finan, D. L. DuBois, C. Koval, R. D. Noble

8:30 – 55. Ion-Ion and Ion-solute interactions in imidazolium based ionic liquids. C. Hardacre**,** M. Deetlefs, S. McMath, M. Nieuwenhuyzen, O. Sheppard

8:55 – 56. Processes using Ionic Liquids and Permanent Gases. J. L. Anthony, A. M. Scurto, J. M. Crosthwaite, S. N. V. K. Aki, E. J. Maginn, J. F. Brennecke

9:20 – 57. Thermodynamic properties of liquid mixtures. A. Heintz

9:45 – Break

10:00 – 58. Molecular modeling of ionic liquid / gas mixtures. E. J. Maginn, J. K. Shah, T. I. Morrow

10:25 – 59. Simulation studies of solvation in imidazolium ionic liquids. R. M. Lynden-Bell, C. Hanke

10:50 – 60. Spectroscopic investigations within multicomponent solvent mixtures containing room-temperature ionic liquids. S. Pandey, K. A. Fletcher, R. A. Redden

11:15 – 61. Aspects of dynamic and bio-solvation within room temperature ionic liquids: An emerging view. G. A. Baker, S. N. Baker

Monday, August 19th, Afternoon

V. Novel Applications
J. D. Holbrey, *Organizer, Presiding*

1:30 – Introductory Remarks

1:35 – 70. Specific heat capacities of common ionic liquids: an examination of the potential for using ionic liquids as thermal fluids. J. D. Holbrey, W. M. Reichert, R. G. Reddy, R. D. Rogers

2:00 – 71. Contaminant effects on thermal properties of ionic liquids. M. E. Van Valkenburg, R. L. Vaughn, M. Williams, J. S. Wilkes

2:25 – 72. Ionic Liquids for Advanced Material Syntheses. S. Dai

2:50 – 73. Ionic Liquid Electrolytes for Electrochemical Actuators. D. R. MacFarlane, S. Forsyth, G. Wallace, G. Spinks, M. Forsyth

3:15 – Break

3:30 – 74. Plasticizing effects of imidazolium salts in PMMA: high and low temperature stable flexible engineering materials. C. S. Brazel, M. P. Scott, M. G. Benton, M. Rahman

3:55 – 75. Transition-metal nanoparticles in imidazolium ionic liquids: Recyclable catalysts for biphasic hydrogenation reactions. J. Dupont

4:20 – 76. Ionic Liquids: new solvents for non-derivitized cellulose dissolution. R. P. Swatloski, S. K. Spear, J. D. Holbrey, R. D. Rogers

Tuesday, August 20th, Morning

VI. Separations
R. D. Rogers, *Organizer, Presiding*

8:00 – Introductory Remarks

8:05 – 85. Recent advances in the design and application of "task-specific" ionic liquids. J. H. Davis

8:30 – 86. Conventional aspects of unconventional solvents: Room-temperature ionic liquids as ion exchangers and ionic surfactants. M. L. Dietz, J. A. Dzielawa, P. G. Rickert, M. P. Jensen, M. A. Firestone

8:55 – 87. Insight into the solvent properties of ionic liquids: a comparative study of solute partitioning in organic/ionic liquid biphasic systems. W. M. Reichert, J. D. Holbrey, R. D. Rogers

9:20 – 88. An investigation of actinide and fission product extraction in room temperature ionic liquids: Liquid/liquid separations and in-situ solution analysis. A. E. Visser, M. P. Jensen, K. L. Nash, R. D. Rogers

9:45 – Break

10:00 – 89. Effect of CO_2 on the solvent properties of room-temperature ionic liquids. J. Lu, C. L. Liotta, C. A. Eckert

10:25 – 90. In situ destruction of chlorinated aromatics in hydrophobic room temperature ionic liquids using advanced oxidation technologies. Q. Yang, D. D. Dionysiou, R. Qian, G. D. Botsaris

10:50 – 91. Liquid-liquid extraction from ionic liquids using renewable plant-based soybean oil methyl ester as alternatives to organic solvents. S. K. Spear, W. M. Reichert, R. D. Rogers

Tuesday, August 20th, Afternoon

VII. Biotechnology in Ionic Liquids
R. A. Sheldon, *Organizer, Presiding*

1:30 – Introductory Remarks

1:35 – 100. An overview of biocatalysis in ionic liquids. R. A. Sheldon, F. van Rantwijk, R. M. Lau

2:00 – 101. Enzymatic catalysis in ionic liquids and supercritical carbon dioxide. P. Lozano, T. De Diego, D. Carrié, M. Vaultier, J. L. Iborra

2:25 – 102. Biocatalysis and enzyme stability in ionic liquids. A. M. Jesionowski, M. Erbeldinger, J. L. Kaar, A. J. Russell

2:50 – 103. Efficient Lipase-catalyzed Enantioselective Acylation under Reduced Pressure Conditions in an Ionic Liquid Solvent System. T. Itoh, Y. Nishimura, M. Kashiwagi, M. Onaka

3:15 – Break

3:30 – 104. Dramatically more efficient lipase-catalyzed acylations of polar substrates in ionic liquids. R. Kazlauskas, S. Park, F. Viklund, K. Hult

3:55 – 105. Biocatalysis in ionic liquids: Enhancing the selectivity and stability of enzyme. M. Kim, J. K. Lee

4:20 – 106. Ionic Liquids as Novel Solvents for Enzyme Catalysis. N. Kaftzik, M. Eckstein, J. Kröckel, U. Kragl

4:45 – 107. Peroxidase activity in ionic liquids. J. A. Laszlo, D. L. Compton

Wednesday, August 21st, Morning

VIII. Catalytic Chemistry
T. Welton, *Organizer, Presiding*

8:00 – Introductory Remarks

8:05 – 118. A new palladium catalyst for C-C coupling reactions in ionic liquids. T. Welton, P. J. Smith

8:30 – 119. Application of new, halogen-free ionic liquids in catalysis. P. Wasserscheid, R. van Hal, A. BÃ¶smann

8:55 – 120. Catalytic epoxidations and comparative kinetics in room-temperature ionic liquids. M. M. Abu-Omar, G. S. Owens, A. Durazo

9:20 – 121. Metal-catalyzed olefin polymerization in polar, non-coordinating ionic liquids. K. H. Shaughnessy, M. A. Klingshirn, S. J. P'Pool, J. D. Holbrey, R. D. Rogers

9:45 – Break

10:00 – 122. Multiphase catalytic oxidation in an ionic liquid. C. A. Thomas, E. K. Barefield, T. Belcher, C. L. Liotta, C. A. Eckert

10:25 – 123. N-Heterocyclic carbenes in homogeneous catalysis. S. P. Nolan, G. A. Grasa, M. S. Viciu, R. M. Kissling

10:50 – 124. The importance of H-bonding to catalysis in ionic liquids. J. Xiao, J. Ross

11:15 – 125. The activation, tuning and immobilisation of homogeneous catalysts in an ionic liquid/compressed CO_2 continuous flow system. W. Leitner, M. Solinas, E. Janssen, E. Janssen, G. Francio, P. Wasserscheid, P. Wasserscheid, A. Boesmann

Wednesday, August 21st, Afternoon

IX. Non-catalytic Chemistry
M. J. Earle, *Organizer, Presiding*

1:30 – Introductory Remarks

1:35 – 135. Clean Synthesis in Ionic Liquids. M. Earle

2:00 – 136. Ionic Liquid-Phase Organic Synthesis. R. X. Ren, J. X. Wu, L. D. Zueva, W. Ou, Y. Luo, W. Woodland, N. Blondin

2:25 – 137. Lewis Base Ionic Liquids. D. R. MacFarlane, S. Forsyth, J. Golding

2:50 – 138. Polarity variation of room-temperature ionic liquids and its influence on a Diels-Alder reaction. R. A. Bartsch, S. V. Dzyuba

3:15 – Break

3:30 – 139. Connecting physical properties with reactivity in ionic liquids: Miscibility with water and acid reactivity. T. Welton, S. Kazarian, L. Crowhurst, J. M. Perez-Arlandis, P. Salter

3:55 – 140. Hydroformylation of long chain olefins in ionic liquids. V. Kruger-Tissot, F. Favre, H. Olivier-Bourbigou

4:20 – 141. Theoretical assessment on how ionic liquids influence chemical reactivity and stereoselectivity of organic reactions. J. D. Evanseck, O. Acevedo

4:45 – 142. Unprecedented synthesis of 1,3-dialkylimidazolium-2-carboxylate: a carbon dioxide transfer agent to active C-H bonds. I. Tommasi, M. Aresta, I. Tkatchenko

Thursday, August 22nd, Morning

X. Electrochemistry
W. R. Pitner, *Organizer, Presiding*

8:00 – Introductory Remarks

8:05 – 152. Ionic liquid electro-processing of reactive metals. D. Dreisinger, J. Lu

8:30 – 153. Acids, Bases and Weak Electrolyte Behaviour in Ionic Liquids. D. R. MacFarlane, S. Forsyth

8:55 – 154. Solvent-solute interactions in ionic liquid media: Electrochemical studies of the ferrocene/ferrocenium couple. M. C. Lagunas, W. R. Pitner, K. R. Seddon

9:20 – 155. Metal deposition from novel room temperature ionic liquids. A. P. Abbott, D. L. Davies, R. K. Rasheed

9:45 – Break

10:00 – 156. Electrochemically generated superoxide ion in ionic liquids: Applications to green chemistry. M. A. Matthews, J. W. Weidner, I. M. AlNashef

10:25 – 157. Development and implementation of inexpensive room temperature ionic liquids in the electrodeposition of metals. P. Meakin, A. J. Hill, T. Turney

10:50 – 158. Organic electrochemistry in ionic liquids. A. P. Doherty, C. A. Brooks

11:15 – 159. Nanoscale Electrodeposition of metals and semiconductors from ionic liquids. F. Endres

Thursday, August 22nd, Afternoon

XI. Photochemistry
C. M. Gordon, *Organizer, Presiding*

1:30 – Introductory Remarks

1:35 – 160. An overview of photochemistry in ionic liquids. R. M. Pagni

2:00 – 161. Photoinduced electron transfer in ionic liquids: mechanisms and synthesis. P. B. Jones

2:25 – 162. Steady-state and time-resolved spectroscopy in ionic liquids. F. V. Bright

2:50 – Break

3:05 – 163. Pulsed laser excitation studies of photochemical reactions in room temperature ionic liquids. A. J. McLean, M. J. Muldoon, C. M. Gordon, I. R. Dunkin, K. Swiderski, D. H. Vaughan, J. N. Chacon

3:30 – 164. Photochemistry in ionic liquids: reactive intermediates and applications. C. M. Gordon, M. J. Muldoon, A. J. McLean, I. R. Dunkin

3:55 – 165. Pulse radiolysis studies of reaction kinetics in ionic liquids. P. Neta, D. Behar, J. Grodkowski

4:20 – 166. Picosecond radiolysis of ionic liquids. J. F. Wishart, P. Neta, J. Grodkowski, S. I. Lall, R. Engel

Sunday Evening I&EC (8:00-10:00 p.m.) and Monday Evening Sci-Mix (8:00-10:00 p.m.)

XII. Poster Session

21. Hydrophobic *n*-alkyl-isoquinolinium ionic liquids: characterization, solvent properties, and use in separations. A. E. Visser, J. G. Huddleston, J. D. Holbrey, R. D. Rogers

22. Comparative solid state analyses of polymorphic 1-butyl-3-methylimidazolium halide ionic liquids. W. M. Reichert, J. D. Holbrey, R. D. Rogers

23. Cellulase activity in an ionic liquid. M. B. Turner, S. K. Spear, J. G. Huddleston, R. D. Rogers

24. Indium- and tin-mediated allylation reactions in ionic liquids. C. M. Gordon, C. Ritchie, M. Adam, A. Stark

25. Ionic Liquid-Phase Transfer Synthesis for Green Chemistry. R. X. Ren, J. X. Wu, L. D. Zueva, W. Ou, Y. Luo, W. Woodland, N. Blondin

26. Ionic liquids and related compounds in synthetic chemistry. J. Howarth, P. James

27. Solvent Extraction of Cesium Nitrate by Room Temperature Ionic Liquids Containing Crown Ethers. H. Luo, S. Dai, P. V. Bonnesen, A. C. Buchanan III

28. Transition structures and ionic cages in ionic liquids. O. Acevedo, J. D. Evanseck

29. NMR relaxation measurements on ionic liquid solvent systems. M. M. Hoffmann, J. D. Tubbs