IONIC LIQUIDS FROM SOLCHEMAR AS FUNCTIONAL ORGANIC MATERIALS

Luís C. Branco[1,2]

[1]Solchemar Lda; Research and Development

[2]REQUIMTE- Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa

Email: l.branco@fct.unl.pt

Keywords: Ionic Liquids; Lubricants; Smart Materials; Magnetic and Luminescent Materials

Introduction: Ionic Liquids (ILs) [1] have been largely studied in last two decades as an attractive class of ionic organic compounds. The simplest definition of ILs is a low temperature-melting salt (liquids at temperatures lower than 100 ºC) composed by the combination of large organic cations with a variety of organic or inorganic anions. The cation is generally a bulky organic structure with low symmetry. ILs have some peculiar and tunable properties, such as almost negligible vapor pressure, high ionic conductivity, chemical and thermal stability as well as significant ability to solubilize organic, inorganic and polymeric materials.

Applications of ILs include their use as alternative solvents or co-catalysts in many catalytic and non-catalytic synthetic methodologies comprising separation processes, including extractions with scCO2 and use as supporting liquid membranes. [2,3]

Solchemar [4] was founded in 2004 in Portugal, and relies on highly motivated experts committed to the development of high quality Ionic Liquids, useful molecular probes and key intermediates for chemical synthesis, to ensure our customers the best R&D success.

Results and discussion: If in the past years, the synthesis of ILs was focused on obtaining unique chemico-physical properties (1st ILs generation), such as the absence of volatility or high thermal stability, or a specific targeted behavior (2nd ILs generation), now one of the main goals is to achieve of specific desirable biological features (3rd ILs generation).

Examples of task-specific ILs that Solchemar are interested to explore and test in potential applications in particular as:

a) lubricants (energy and fuels) more efficient, stable and versatile for several types of surfaces as well as biodegradable;

b) smart materials (e.g. chromogenic materials) including intrinsic photochromic and electrochromic ionic liquids [5];

c) magnetic and luminescent materials including ferromagnetic ILs as well as lanthanide ILs (e.g. terbium, dysprosium, gadolinium, among others) which can be magnetic and luminescent simultaneously [6].

In the course of our work in the IL research field it has been possible to develop several functionalized ILs based on ammonium, imidazolium, phosphonium, sulfonium and pyridinium and an exclusive class of cations called tetraalkyldimethylguanidinium cations [dmg]. All of these organic cations have been combined with organic and inorganic anions including chiral ones.

Summary: This paper describes a brief overview of Ionic Liquids from Solchemar which they are developed in last seven years. Novel Task Specific ILs have been prepared according an appropriate cation/anion combination and using optimized and sustainable synthetic methods.

Our research team showed novel ionic liquids useful for chemical, biochemical, medical and engineering applications.

Ionic Liquids should be considered efficient and versatile materials for future in particular they can be explored as novel lubricants, smart materials, magnetic and luminescent materials, among others.

References:

1. Luís C. Branco, Gonçalo V.S.M. Carrera, João Aires-de-Sousa, Ignacio Lopez Martin, Raquel Frade, Carlos A.M. Afonso "Physico-Chemical Properties of Task-Specific Ionic Liquid"; in Ionic Liquids, Theory and Applications, Intech, 2011.
2. Luis C. Branco, Ana Serbanovic, Manuel N. da Ponte, Carlos A. M. Afonso; Chiral Guanidinium Ionic Liquids for asymmetric dihydroxylation of olefins with recycling of the catalytic system by Supercritical CO2; ACS Catalysis, 1(2011) 1408.
3. Luís C. Branco, João G. Crespo, Carlos A. M. Afonso, Highly Selective Transport of Organic Compounds by Using Supported Liquid Membranes Based on Ionic Liquids, Angew. Chem. Int. Ed. 41 (2002) 2771
4. www.solchemar.com
5. Luis C. Branco, F. Pina, Intrinsically Photochromic Ionic Liquids; Chem. Comm. 2009, 6204. b) Aida Branco, Luis C. Branco, Fernando Pina; Magneto-Electrochromic Ionic Liquids, Chem. Commun. 47 (2011) 2300
6. Aida Branco, Luis C. Branco, Carlos Pinheiro, Fernando Pina; Portuguese Patent Application 20101000067779, August of 2010.