Electrochemical Applications of electrolytes based on ionic Liquids

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Due to environmental concerns, the search for novel less toxic fluid alternatives is motivated by the need for efficient methods for replacing of toxic or hazardous solvents. Room temperature ionic liquids (RTILs) may be considered an attractive alternative for reducing solvent emissions to the atmosphere comparatively to volatile organic solvents (VOCs).

During the last decade, a number of publications have appeared that deal with electrochemistry in ionic liquids due to their thermal stability, good conductivity, almost null volatility, wide electrochemical window, recyclability and non-flammability. Hence, there is currently interest in the use of those materials for a wide range of applications, namely in organic synthesis and electrochemistry field [1].

In the present work, we have explored the potential utility of those media as electrolytes for electrosynthesis. The electrochemical behavior of $[Ni(tmc)]Br_2$ complex at a glassy carbon electrode in the absence and in the presence of unsaturated halides in different RTILs has been examined by cyclic voltammetry. It was observed that $[Ni(tmc)]^{2+}$ complex is reduced in a reversible one-electron step and the electrogenerated $[Ni(tmc)]^{+}$ complex catalytically reduces the carbon-halogen bond of unsaturated halides.

The possibility to use natural ionic conducting polymer matrix was investigated in this study. Samples of natural macromolecules-based electrolytes with different ionic liquids, were prepared and characterized. Samples of solvent-free electrolytes were prepared and characterized by ionic conductivity measurements, thermal analysis, electrochemical stability, X-ray diffraction (XRD), scanning electron microscopy (SEM).

The preliminary studies carried out with electrochromic devices (ECDs) incorporating optimized compositions have confirmed that these materials may perform as satisfactory multifunctional component layers in the field of ECD-based devices [2].

[1] H. Ohno, Electrochemical Aspects of Ionic Liquids, 2nd Ed., John Wiley & Sons, Inc., NJ, USA, 2011.
[2] M.M. Silva, P.C. Barbosa, L. C. Rodrigues, A. Gonçalves, C. Costa, E. Fortunato, Optical Materials, 32 (2010) 719.