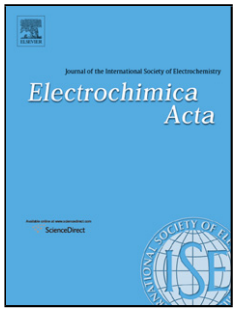

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PII: S0013-4686(14)01529-1
DOI: http://dx.doi.org/doi:10.1016/j.electacta.2014.07.110
Reference: EA 23148

To appear in: *Electrochimica Acta*

Received date: 19-2-2014
Revised date: 18-7-2014
Accepted date: 18-7-2014

Please cite this article as: Z. Guo, T. Zhang, M. Khan, S. Gao, T. Liu, J. Yu, Electrochemical Behavior of Iron-based Imidazolium Chloride Ionic Liquids, *Electrochimica Acta* (2014), http://dx.doi.org/10.1016/j.electacta.2014.07.110

Electrochemical Behavior of Iron-based Imidazolium Chloride Ionic Liquids

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Abstract: In order to study the electrochemical properties of the iron-based imidazolium chloride ionic liquids, two kinds of ionic liquids - trivalent (Fe(III)-IL) and trivalent / divalent coexisting system (Fe(III/II)-IL) - were constructed by mixing 1-butyl-3-methylimidazolium chloride (BmimCl), $FeCl_3 \cdot 6H_2O$ and $FeCl_2 \cdot 4H_2O$. $[Bmim]^+$, $[Bmim_2Cl]^+$, $[FeCl_4]^-$ and $[Fe_3Cl_7]^-$ in Fe(III/II)-IL were detected by UV-vis absorption spectroscopy and liquid chromatography - mass spectrometry with an electrospray ionization source (ESI-MS). The electrochemical behaviors of $[FeCl_4]^-$ and $[Fe_3Cl_7]^-$ on a platinum electrode were investigated by cyclic voltammetry. Platinum microelectrode was used to reduce the effect of poor conductivity of these ionic liquids. Cyclic voltammetric data indicated that the electrode reaction of $FeCl_4^-/[Fe_3Cl_7]^-$ at platinum electrode was a quasi-reversible process. The electrode reaction of $FeCl_4^-$ in the ionic liquids was followed by a homogeneous reaction. Both migration and diffusion of electroactive ions affected the electrochemical behavior of Fe(III)/Fe(II) on Pt microelectrode. The values of apparent diffusion coefficient, viscosity, and conductivity of Fe(III)-IL and Fe(III/II)-IL over the temperature range from 293 K to 333 K were measured, and the corresponding activation energies for

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