LiTFSI-Based Room Temperature Ionic Liquids For High Energy Secondary Lithium Ion Battery

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To meet the need for high energy power sources, a rapid development in lithium ion battery has occurred in recent years. One major obstacle facing the development of secondary lithium battery is the potential health hazards using electrolytes based on organic solvent. The room temperature ionic liquid (RTIL) provides an inherently safe electrolyte for lithium battery application due to its desirable physico-chemical properties[1,2] with virtually no vapor pressure which can cause explosion and fire hazards, as well as a high ionic conductivity and wide electrochemical window to deliver satisfactory electrochemical performance. The recently developed RTIL systems based on $[N(CF_3SO_2)_2]^-$ ($TFSI^-$) coupled with Li salt to form the binary LiTFSI-Py_{14}TFSI electrolytes is investigated for its application in secondary lithium ion battery as it possesses a wide electrochemical stability exceeding 5.5V. The compatibility with positive electrode materials such as $Li_{1+w}Mn_xCo_yNi_zO_2$ is investigated. Tin negative electrode has been prepared by the electrodeposition of tin onto the copper substrate from MEICl/$AlCl_3$/$SnCl_2$(3:2:0.5) ILs at a constant current density of 3.3 mA/cm^2 for 120s at 50^0C**.** The LiTFSI/ILs systems prepared are evaluated based on their electrochemical and physical properties such as conductivity, viscosity and density. The initial charging/discharging cycling of the tin electrode in Ils battery cell have been conducted successfully for more than 200 cycles with an average discharge capacity at about 140 mAh/g for a cycling current density of 0.4mA/cm^2.The results obtained for lithium battery application will be presented at the meeting.

References: 1)Y.S. Fung and R.Q. Zhou, *J. Power Sources*, 81-82, 891 (1999).

2)A. Guerfi , S. Duchesne , Y. Kobayashi , A. Vijha, K. Zaghib , *J. of Power Sources*, 866–873,175 (2008).