Energy II and miscellanea

s4-001
Faiz Ahmed (Energy and Materials, Konkuk University, Chungju, Korea), Sabuj Chandra Sutradhar, Inhwan Choi, Whangi Kim, Md. Mahabubur Rahman, Taewook Ryu, Nasrin Siraj Lopa, Sujin Yoon
Novel Non-Aqueous Electrolytes and Enhancement of its Electrochemical Performances by using Sulfonyl Imide as Additives for Li-ion Battery

s4-002
Faiz Ahmed (Energy and Materials, Konkuk University, Chungju, Korea), Sabuj Chandra Sutradhar, Inhwan Choi, Whangi Kim, Jin Lee, Taewook Ryu, Sujin Yoon
UV-cured Novel Polymer Electrolyte Directly Pendant Lithium Fluorosulfonimide (LiFSI) for Li-ion batteries

s4-003
Jose Manuel Amarilla (Energy, Environment and Health, Instituto de Ciencia de Materiales de Madrid (CSIC), Madrid, Spain), Carmen del Rio, B. Herradon, E. Mann, E. Morales, M.B. Vazquez-Santos, J.F. Velez
Geminal Pyrrolidinium and Piperidinium Dicationic Ionic Liquid Electrolytes. Synthesis, Characterization and Cell Performance in LiMn$_2$O$_4$ Rechargeable Lithium Batteries

s4-004
Jose Manuel Amarilla (Energy, Environment and Health, Instituto de Ciencia de Materiales de Madrid (CSIC), Madrid, Spain), G. Santoro, P. Tartaj, M.B. Vazquez-Santos
Anatase TiO$_2$ Mesocrystals as Anode Materials for Na-ion Batteries. In Operando Synchrotron Measurement of Na$^+$-Storage Mechanism

s4-005
Mustafa Celik (Metallurgical and Materials Engineering, Sakarya University, Sakarya, Turkey), Hatem Akbulut, Mustafa Can, Tugrul Cetinkaya
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s4-006
Shuo Dong (School of Chemistry, Monash University, Melbourne, Australia), Diogo Cabral, Douglas Macfarlane
Fe(II) Mixed Ligand Complexes for High Energy Density Non-aqueous Redox Flow Batteries
Geminal Pyrrolidinium and Piperidinium Dicationic Ionic Liquid Electrolytes. Synthesis, Characterization and Cell Performance in LiMn$_2$O$_4$ Rechargeable Lithium Batteries

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Rechargeable lithium-ion batteries are excellent candidates for the next generation power sources because of their high gravimetric and volumetric energy compared to other cell chemistries. Conventional LIB’s, based on organic carbonate liquid electrolytes, suffer from potential thermal and chemical threats associated with the thermal runaway hazard, low thermal stability, low flash points, toxicity, high volatility and flammability. Aprotic ionic liquids, represent a safe alternative to organic carbonates, due to their negligible vapor pressure, wide liquid range, high thermal stability, non-flammability, high ionic conductivity and wide electrochemical stability window. However, problems associated to their high viscosity, especially when lithium salts have been added, low stability of the solid electrolyte interphase (SEI), and high cost need to be solved. In this work, we report on the synthesis and characterization of a series of novel room temperature dicationic ionic liquid electrolytes, based on pyrrolidinium and piperidinium cation moieties linked by short oligo(ethylene glycol) chains. Electrochemical performance of Li-half cells assembled using LiMn$_2$O$_4$ spinel (LMO) as cathode material and 1M LiTFSI doped dicationic ionic liquid electrolytes have been tested.

Results obtained indicate that the length of the oligo(ethylene glycol) chain has a crucial role in the properties of the ionic liquids; in fact, both pyrrolidinium and piperidinium ionic liquids linked by short chains are crystalline solids, while increasing the spacer chain lead to liquid samples. Regarding electrolytes, the highest ionic conductivity ($\approx 10^{-4}$ S cm$^{-1}$ at room temperature) was obtained for the pyrrolidinium-based ionic liquid electrolyte with the intermediate length chain length spacer. It has to be pointed out that all electrolytes have a high potential electrochemical stability. Another noticeable data is that cell performance is not only controlled by electrolyte ionic conductivity, but other magnitudes, such as interactions taking place between the ionic species of the electrolyte, modify the Li$^+$ ion diffusion, and so the kinetics of the insertion/deinsertion process, in good agreement with previous data [1].

![Graph 1](image1.png)

Fig. 1. Temperature dependence of ionic conductivity for geminal pyrrolidinium and piperidinium 1M LiTFSI doped ionic liquid electrolytes (left) and charge/discharge curves recorded at 0.2C rates for LMO-cells at 60ºC (1C= 148 mA g$^{-1}$) (right).

Acknowledgements

Financial support from Ministerio de Economía y Competitividad (ILCOBATT Project, Ref: MAT2014-54994-R) is gratefully acknowledged.

References