4.6 Dual Composite Polymer Electrolytes for Lithium Rechargeable Batteries

H H Sumathipala[a] S. Panero, B. Scrosati[*]
[a]Department of Physics, University of Kelaniya
*Department of Chemistry, University of Rome, La Sapienza, Aldo Moro 5, 00185, Rome, Italy

ABSTRACT

Lithium–ion batteries have been drawn great attention due to their potential for use in high-performance electric vehicles. However, some drawbacks still remain to be solved for the optimization of some critical operational features such as safety, design flexibility etc. Replacing of the conventional liquid electrolytes currently being used by a polymer electrolyte is the most effective approach for reaching the goal. In this scenario, PEO-LiX (X= CF_3SO_3, ClO_4, BF_4, LiBOB), electrolytes have been widely studied for practical applications.

Among the other drawbacks, low lithium ion transference number of PEO-LiX electrolytes, is more significant as it lowers the power capability of the battery. Focusing on this drawback, recently we have introduced new approach to improve the lithium ion transference number of PEO-based polymer electrolytes, still maintaining the overall high level of ionic conductivity.

A composite polymer electrolyte, formed by dispersing dual additives, super acid zirconia (S-ZrO_2) acting as a conductivity promoter and calix(6)pyrrol acting as an anion trapper, into a PEO- $LiCF_3SO_3$ has been tested as a separator in a new type of rechargeable lithium battery using lithium ion phosphate as the cathode. Promising results in terms of capacity delivery, rate capability and cycle life, have been obtained, demonstrating the effective practical relevance of the composite electrolyte membrane.

Author wishes to acknowledge the Renewable energy Fellowship offered by the International centre for Theoretical physics (ICTP), Trieste