INTERFACE STUDIES OF ELECTRODES AND POLYMERS ELECTROLYTE BASED ON LI-CONDUCTIVE IMIDAZOLE SALTS

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The electrolyte is one of the most critical components in Li-ion batteries (LIBs) with regard to safety and ageing. Current LIBs are based on liquid electrolytes which derive from lithium salts dissolved in organic carbonates. Despite being the electrolytes of choice in the vast majority of LIBs, these liquid electrolytes show an undesired electrochemical instability along with a serious risk of leakage which is the last thing one would like to have when dealing with organic flammable solvents.

A LIB based on a solid polymer electrolyte (SPE) would overcome the safety and chemical stability problems of batteries based on liquid electrolytes. Moreover, the SPE would remove the necessity of using a separator in the LIB [1].

Despite SPEs offer improved properties, their conductivity at room temperature remains an issue. However, this can be turned into an advantage for high temperature applications since a LIB based in a SPE would provide an enhanced safety compared to batteries based on organic solvents.

One of the key factors to understand LIB battery operation is the solid electrolyte interface (SEI). Widely studied in LIBs based in liquid electrolytes, this layer is originated from the difference in the stability window of the electrolyte and the electrochemical potential of the electrodes. Typically, the SEI is formed during the first discharge cycle of the anode and it is mainly composed by degradation products of the electrolyte salt and species arising from the solvent reduction. The stability and composition of the SEI will seriously influence the rate capability, reversible capacity and safety of the batteries.

The importance of SEI formation in LIBs based on SPE has been recently shown [2]. In this presentation we will report the results of our latest investigations on the SEI composition in both electrodes of a SPE based C/Li cell. In this case we will show the superior performance of our SPE based on lithium conductive imidazole salts, as well as the characteristics of the SEI layers which have been analysed by means of X-ray Photoelectron Spectroscopy (XPS). The main differences of the SEI layer composition in conventional liquid electrolytes and solid polymer electrolytes will be discussed.

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