Effect of the cathode on the of the lithium/electrolyte interface.

R. Bouchet, L. Santinacci

Université de Provence-CNRS, Laboratoire MADIREL, UMR 6221,
Centre de Saint Jérôme, 13397 Marseille Cedex 20, France.

During past decades a great deal of interest has been devoted to the study and improvement of rechargeable lithium metal battery. Due to the crucial role of the lithium/electrolyte interface in the performances of the battery, numerous reports have been published, see e.g. ref [1]. Symmetric cells lithium (Li)/electrolyte (El)/lithium (Li) are very useful to study lithium/electrolyte interface which is the negative pole of the lithium metal battery.

We present the comparison of electrochemical impedance spectroscopy (EIS) results obtained on symmetric cells Li/El/Li [2] and Li/El/cathode/El/Li, where the electrolyte is PEO-LiTFSI polymer. In the last configuration, the cathode, which is a mixed ionic-electronic conductor composed by a PEO-LiTFSI matrix mixed with electroactive oxide and carbon black, is taken as an ionic conductor by lithium ions (i. e. as an electrolyte). We observe by this procedure the chemical pollution of the Li/El interface by the cathode. An equivalent electrical circuit including the bulk electrolyte and the Li/El interface (passive layer and electronic transfer), is proposed. The aging at 90°C is investigated and the variations of the electrical properties (electrolyte and Li/El interface) as a function of temperature in the range [120, -40°C] are also shown. We note strong modifications of the lithium interface demonstrating that the cathode is not fully transparent to the cell performance. Furthermore, a soft plastification of the electrolyte is also observed.

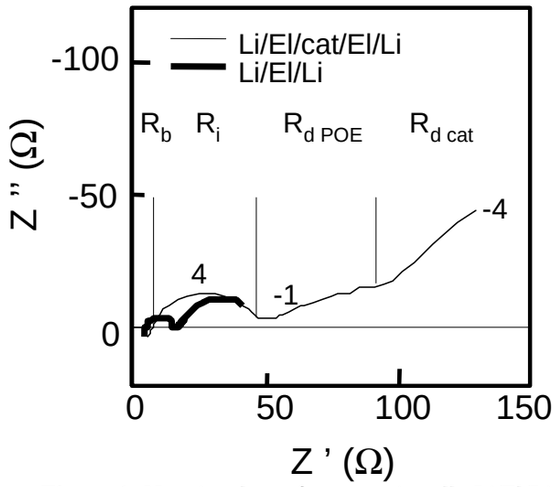

Figure 1: Nyquist plots of symmetric cells Li/El/Li and Li/El/Cat/El/Li. The different contributions are indicated on the plot. The markers on the curve correspond to the power of AC frequency.

References:

[1] N. Munichandraiah, L. G. Scanlon, R. A. Marsh, J. Power Sources, **72**, 203 (1998).

[2] R. Bouchet, S. Lascaud, M. Rosso, accepted in J. Electrochem. Soc.