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Højberg, Jonathan

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Analyzing Cell Resistance with Electrochemical Impedance Spectroscopy in Lithium-Air Batteries

J. Højberg*
Haldor Topsøe A/S and Technical University of Denmark
Kgs. Lyngby, Denmark

*jhoj@topsoe.dk

From a theoretical point of view, Lithium-Air batteries are currently the most promising battery system. The technology is however still in a premature state and commercialization is still years ahead. A further development of Lithium-Air batteries are depending on an improved understanding of the actual mechanisms involved during charge and discharge – both the desired and the undesired ones.

The electrochemical characterization of Lithium-Air battery systems are dominated by charge-discharge curves and cyclic voltammetry. Both methods are well suited as screening tools to distinguish different materials, but in complex systems like the Lithium-Air battery both methods are incapable of determining the reaction and degradation mechanisms and need to be complemented by other techniques. One promising supplement is the Electrochemical Impedance Spectroscopy (EIS) and although this technique is used widely within Lithium-Ion batteries, only few research groups have used it to characterize Lithium-Air batteries [1, 2].

This poster will introduce different EIS measurement series adapted to Lithium-Air batteries. The methods may be used to distinguish between different sources of internal resistance in the battery, differentiate cathode and anode reactions from each other and enable a quantitative description of relevant degradation mechanisms. Certain important features in the EIS spectra will be highlighted and examples of measurements, conducted at a Swagelok-setup, will be discussed.

References:

1. M. Mirzaeian and P. J. Hall, *J. Power Sources* 195 (2010) 6817-6824
2. M. Eswaran, N. Munichandraiah and L. G. Scanlon, *Electrochemical and Solid-State Letters*, 13 (2010) A121-A124