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IMPEDANCE PERSPECTIVES ON LI-AIR BATTERY OVERPOTENTIALS

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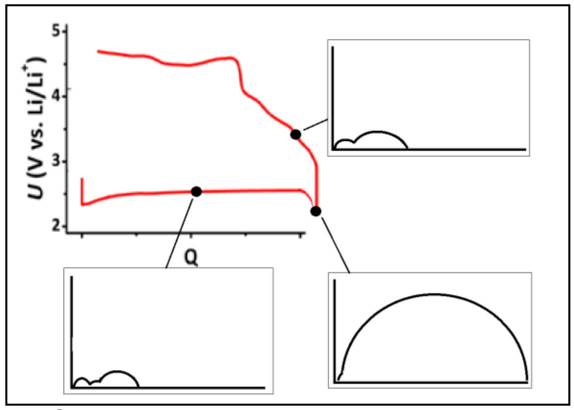

Lithium-air batteries have attracted much attention in recent years because of a potentially high specific energy density and experiments with flat electrodes show that the intrinsic electrochemistry of Lithium-air batteries has a very low overpotential[1]. In real batteries with a porous electrode, the observed overpotentials are, however, significantly larger[2]. The origin of the overpotentials at especially sudden death and during charge has been heavily debated in the literature. Among others, arguments proposed are based on modeling[1], DEMS measurements[2], in-situ TEM[3], and conductivity measurements using a redox-mediator combined with ex-situ characterization methods like FTIR and Raman[4].

In this presentation, a series of electrochemical impedance spectra measured at different states of charge and current densities will be used to analyze three states of the Lithium-air battery electrochemistry; The discharge plateau, sudden death and the initial stage of the charging process.
By combining the measurements with previous results presented by Bryan D. McCloskey and Alan C. Luntz et *al*. (ref. 1, 2 and 5 among others), the internal resistance in the battery is related to the measured overpotential. This relation is essential to understand the reactions inside the battery.

References:
[1] Viswanathan et *al*., *JPCL* **2013**, *4*, 556-560
[2] McCloskey et *al*., *JPCL **2013***, *4*, 2989-2993
[3] Shao-Horn et *al*., *Nano letters* **2013**, *13*, 2209–2214
[4] Bruce et *al*., *Nature chemistry* **2013**, *5*, 489-494
[5] Luntz et *al*., *JPCL* **2013**, *4*, 3494-3499