Lithium-ion batteries banjul

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Lithium-based batteries are a class of electrochemical energy storage devices where the potentiality of electrochemical impedance spectroscopy (EIS) for understanding the battery charge storage mechanisms is still to be fully exploited. Generally considered as an ancillary technique, the application of EIS should be promoted focusing on improved experimental design of experiments and advanced data analysis using physics-based models.

By contrast, if the scientific research community wishes to exploit the potential of this powerful technique fully, considerable efforts are needed in terms of measurements optimisation and data interpretation. In continuation, we present several examples of advanced approaches to EIS measurements of LiB systems and state-of-the-art modelling tools for in-depth interpretation of measured data.

a Schematics showing the movement of electrons and mobile ions in a typical Li-ion insertion positive electrode. b Theoretical impedance response for an ideal case where each individual step shown in a can be seen as a separate feature. c Example of a practical EIS measurement where many of the predicted features are not seen due to overlap of time constants, very small values of impedance values for certain steps or other measurement artefacts. Most of the missing features can be retrieved using dedicated electrochemical experiments, as explained in the main text.

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