

# Insights into Battery Degradation: Bringing Measurement into Focus

28<sup>th</sup> September 2023 | 12:00 – 13:30 (BST)

**FREE EVENT – Click here to register**



## Chair: Dr. Sofia Marchesini (CEng)

*National Physical Laboratory, Teddington, U.K*

Battery degradation involves a complex set of chemical processes that lead to a loss of performance over time, reducing the battery's ability to store charge and supply power. In this webinar we will present and discuss how to use different measurement techniques to better understand battery degradation, which is critical for the design of improved battery materials.



## Operando HAXPES probing solid electrolyte interphase growth

**Joshua S. Gibson**

*School of Chemistry, University of Edinburgh / Department of Materials, University of Oxford, U.K.*

Metallic lithium electrodes hold promise for increasing the energy density of Li-ion batteries. Evaporation of an ultra-thin (20-50 nm), X-ray transparent lithium electrode allows access to the chemistry of the buried solid electrolyte – lithium metal interface. We discuss detection of different chemical species formed during the first lithium metal stripping and plating cycles.



## Solution NMR Characterisation of Metal Dissolution in Batteries

**Dr. Jennifer Allen**

*University of Cambridge, U.K. / Morrow Batteries, Norway*

Lithium-ion battery cathodes are prone to dissolution, releasing paramagnetic transition metals into the electrolyte. Paramagnetic species have unique effects in NMR spectroscopy, causing peak broadening (rapid nuclear relaxation) and peak shifting (bulk magnetic susceptibility effects). This talk addresses how NMR can be used to determine the concentration, oxidation state, and solvation sphere of dissolved transition metals.



## Surface Analysis of Lithium-Ion Battery Electrodes: Addressing the Measurement Challenges

**Dr. Benjamin P. Reed**

*National Physical Laboratory, Teddington, U.K.*

Surface analysis techniques (e.g. XPS, SEM, SIMS, Raman spectroscopy, etc) are commonly employed to characterize the chemistry and structure of Li-ion batteries, most notably to understand their degradation mechanisms. However, these material systems are complex and present several measurement challenges to inexperienced analysts. This is compounded by a lack of standard measurement protocols and guidelines for data interpretation. This talk discusses measurement challenges that affect several key surface analysis techniques being used for the analysis of Li-ion battery electrodes and provides some recommendations to improve reproducibility and reduce uncertainty.