

# Analyses of Observed Speciation of Cobalt in NMC cathodes Using Laboratory X-ray Absorption Spectroscopy (XAS)

Andreas Bergner<sup>1</sup>, Simon John<sup>1</sup>

<sup>1</sup>Quantum Design GmbH, Pfungstadt, Germany

We report the X-ray Absorption Spectroscopy (XAS) investigation of four samples of NMC electrodes using QuantumLeap™ H2000. Co XANES show three isosbestic points. Principal component analysis (PCA) and Iterative Target Transform Factor Analysis (ITTFA) reconstruction of the experimental X-ray Absorption Near Edge Structure (XANES) show that two of the samples contain two unique species of Co. In the remaining samples, the speciation of Co can be described by the linear combinations of the two distinct species, validating QuantumLeap's synchrotron-like performance.

## Graphic:

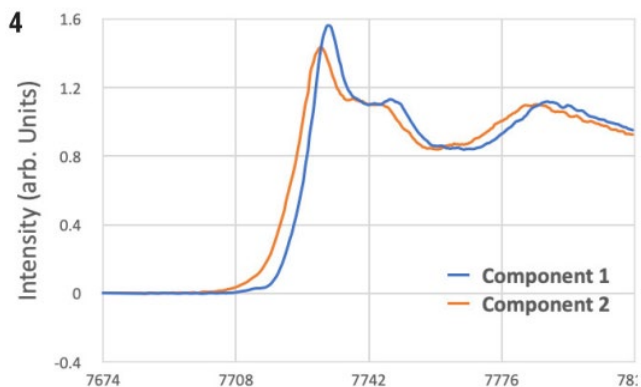


Figure 4: ITTFA reconstructed experimental two principal XANES components (component 1 in blue and component 2 in orange) of cobalt investigated in the series of NMC electrode samples.

## Keywords:

XAS ITTFA XANES battery NMC