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Diffraction computed tomography with X-rays and neutrons

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This contribution discusses the adaptation of the well-established X-ray diffraction computed tomography (XRD-CT) technique for neutron diffraction computed tomography (ND-CT) in the field of materials science. Leveraging the additional structural information provided by the diffraction signal, this method offers distinct advantages over classical tomography approaches. Over the past decade, active development of the method has facilitated the non-destructive exploration of structural gradients, particularly in the distribution of lithium within lithium-ion battery cells, achieving unprecedented sensitivity.

In this study, the inhomogeneity of lithium content was investigated in a commercial lithium-ion battery of 18650-type NNP cell, featuring NCA cathode and graphite anode. We present a methodology for calculating the density of lithiation of the graphite anode and assessing the extent of cathode delithiation based on the detailed structural information obtained through high-resolution and region-of-interest XRD-CT. The study demonstrates the feasibility of ND-CT and highlight its ability to provide non-destructive insights into the internal structures of energy materials, consistent with reference XRD-CT experiments.

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