

## **Structural integrity: key factor to suppress voltage fade of Li-rich layered cathode materials**

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Lithium-ion batteries are common in home and portable electronics due to their high energy density and slow self-discharge properties. The development of high capacity Li-ion materials is, therefore, vital for industry. Typically, the desired high energy capacity is accompanied by complex phase transitions, structural rearrangement and volume changes, which induce strain and morphological changes within the battery that affect the electrochemical behavior of the electrode material. By combining x-ray spectroscopy, diffraction and microscopy measurements, promising cathode material's,  $\text{Li}_2\text{Ru}_{0.5}\text{Mn}_{0.5}\text{O}_3$ , evolution during repeated cycling is studied to provide a comprehensive understanding of voltage fade through 2D and 3D visualization of the morphology reconstruction and heterogeneity evolution at fine scale lengths.