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Supporting information for article:

Methods for operando coherent X-ray diffraction of battery materials at the Advanced Photon Source

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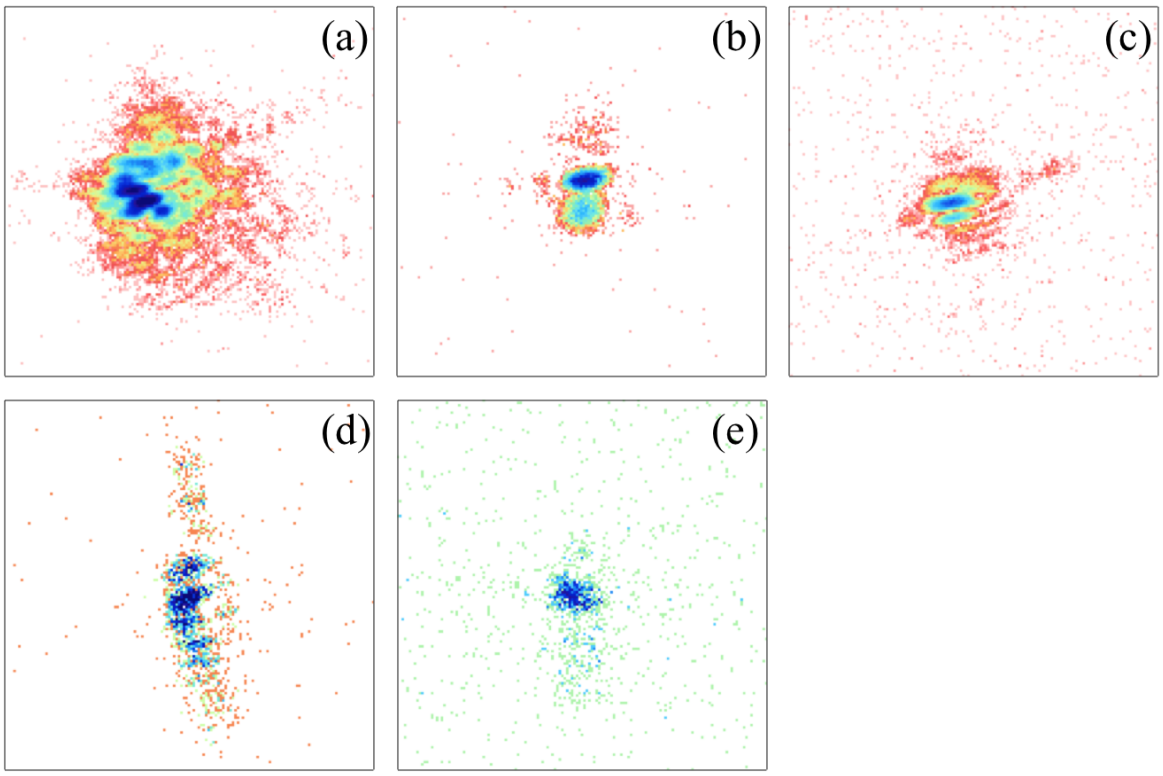

Figure S1 (a) a complicated diffraction pattern; (b) a diffraction pattern with two central bright intensity. This may indicate twinning or two crystals are located close to each other with similar orientation; (c) a diffraction pattern with bright center and clear fringes. (d) an example of diffraction pattern from a collection of multi-crystalline. These crystals or crystallite should be avoided for BCDI measurements. This might be introduced by the synthesis process. (e) a diffraction patter with round central intensity without fringes. The crystal surface is not shape enough to generate fringes. In crystal screening process, (c) is the best of all choices for BCDI measurements. However, diffraction patterns may vary from sample to sample.

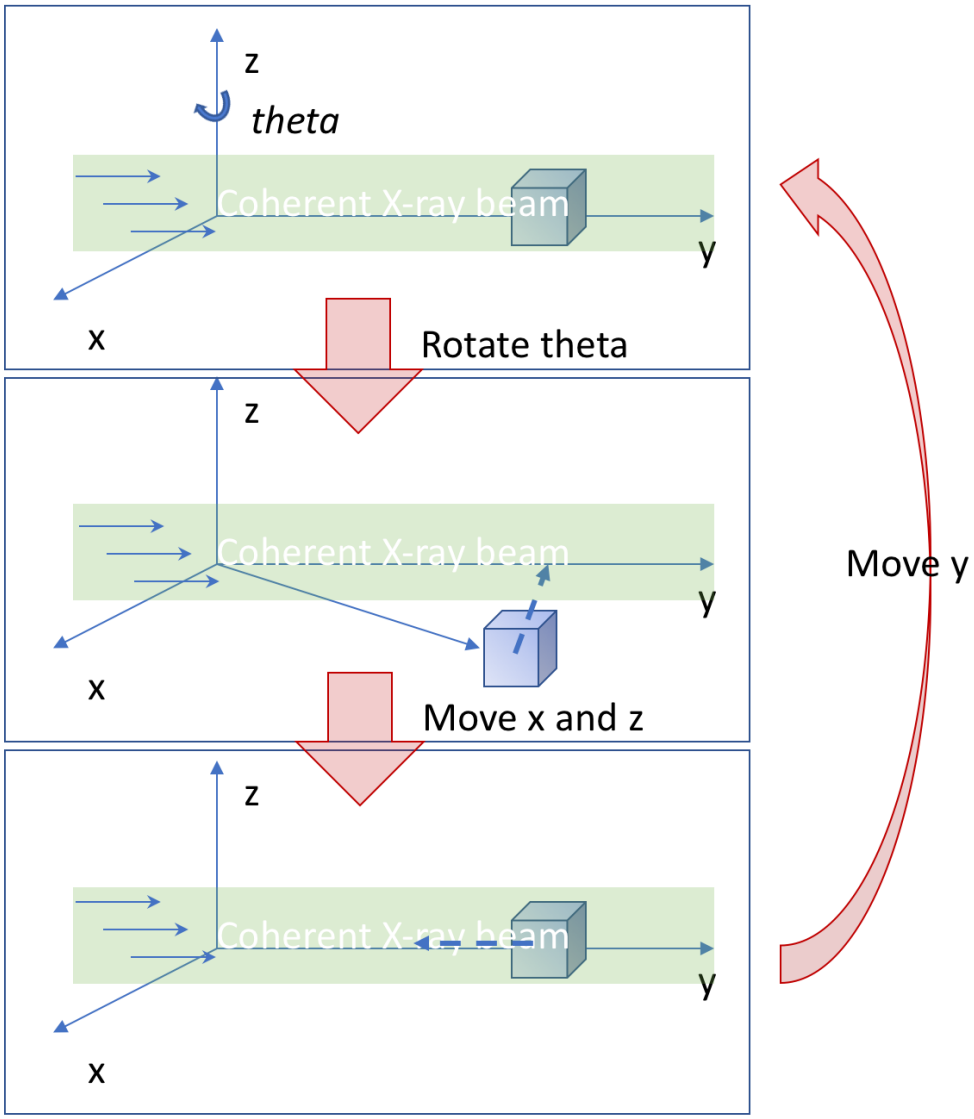

Figure S2 Schematic of the crystal geometry for aligning the crystal to the centre of rotation. If the crystal is not at the center of rotation along y-axis (or along the x-ray propagation direction), when rotating the crystal by a fraction of a degree, the crystal will move out of the beam. Adjust the sample x and z to move the crystal back into the x-ray beam. This process indicates where is the relative position of the crystal regarding the center of rotation along y-axis. Move the crystal along the beam closer to the center of rotation. Repeat the process until the crystal rocking curve shows a smooth Gaussian shape without sudden intensity decrease.

Movie 1: An example of CMCD measurements of the diffraction patterns from $NaNi_{1/3}Fe_{1/3}Mn_{1/3}O_2$ cathode material in operando conditions. The half cell is cycled against constant current with C/4 rate. The movie shows the evolution of the sample diffraction patterns in a full (dis)charge cycle. During the charge process, the average diffraction ring moves to a lower diffraction angle, while individual crystals experience phase transition at their own pace.