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Supporting information for article:

**Quantifying redox heterogeneity in single-crystalline LiCoO₂
cathode particles**

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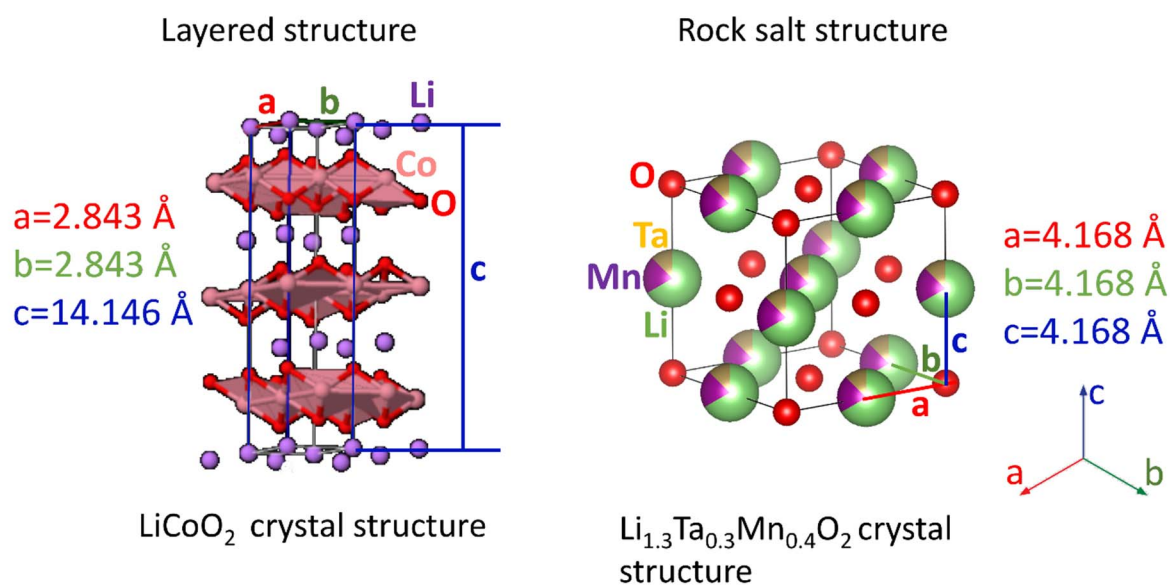


Figure S1 Comparison of the lattice configurations of layered structure (LiCoO₂ as an example) and rock salt structure (Li_{1.3}Ta_{0.3}Mn_{0.4}O₂ as an example). The layered structure is highly anisotropic with its c-axis lattice constant significantly larger than that of the a-axis and b-axis. The rock-salt structure, on the other hand, is rather isotropic with the lattice constant $a=b=c$.

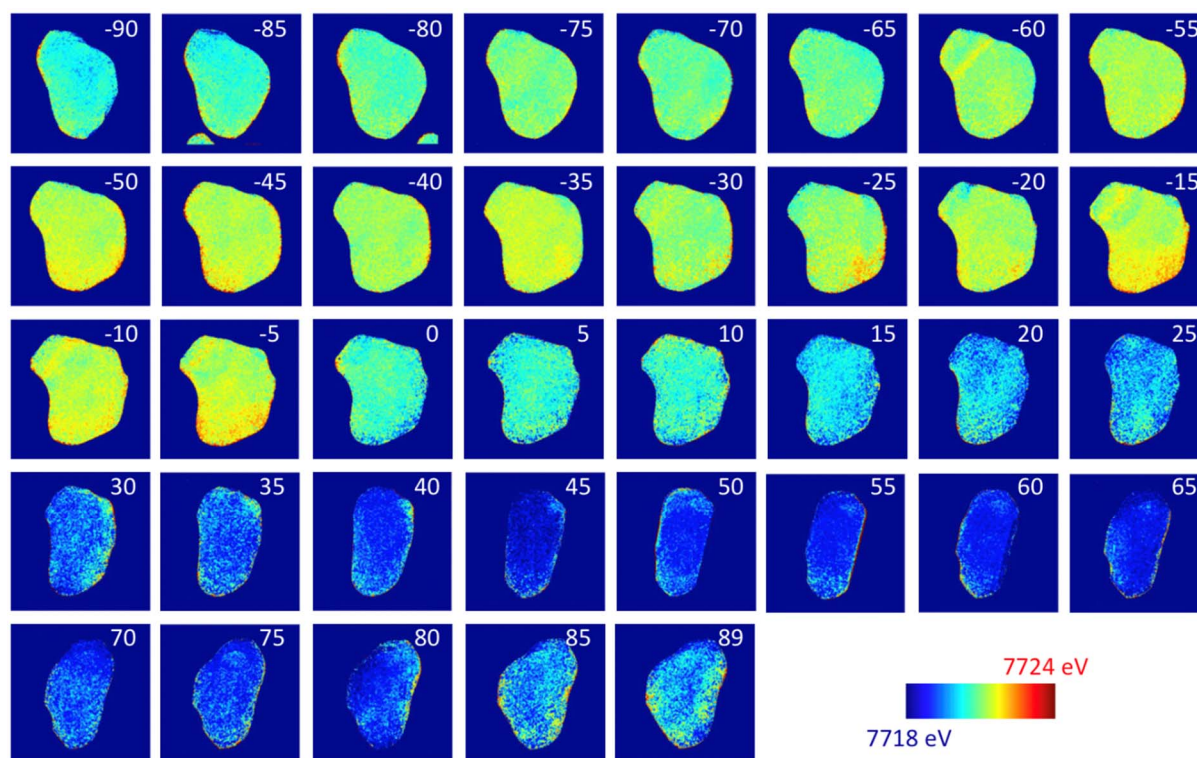


Figure S2 Edge energy maps of a pristine LiCoO_2 crystal in different viewing angles. The particle is not exposed to any reaction active conditions. The differences in the edge energy maps are attributed to the polarization effect.

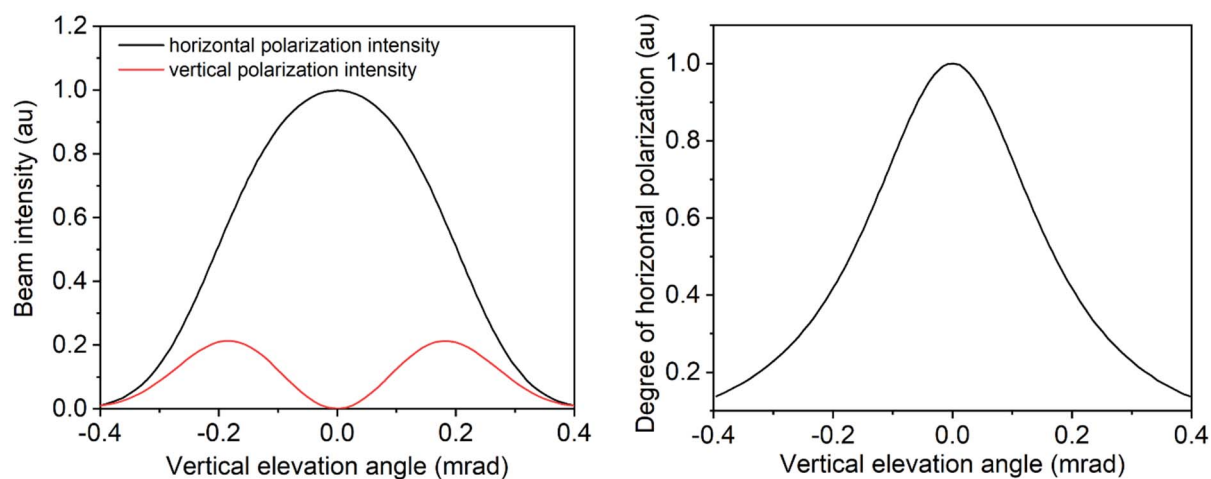


Figure S3 The left panel shows the SSRL's relative intensity profiles of the horizontal and vertical polarization components as a function of the vertical elevation angle. The right panel shows the effective degree of linear polarization in the vertical direction as a function of the vertical elevation angle. Majority of the experiments at SSRL take place at near zero vertical elevation angle. Therefore, majority of the experimental stations see linearly polarized x-rays in the horizontal direction.

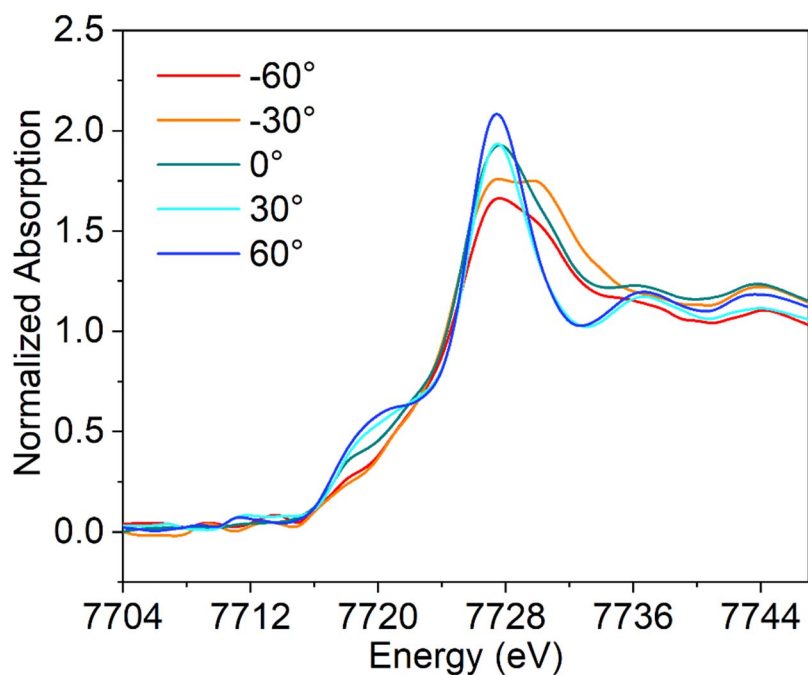


Figure S4 Five selected angles of the XANES spectra averaged over the entire particle in the pristine LiCoO₂ to show the angle independence property of the peak energy.

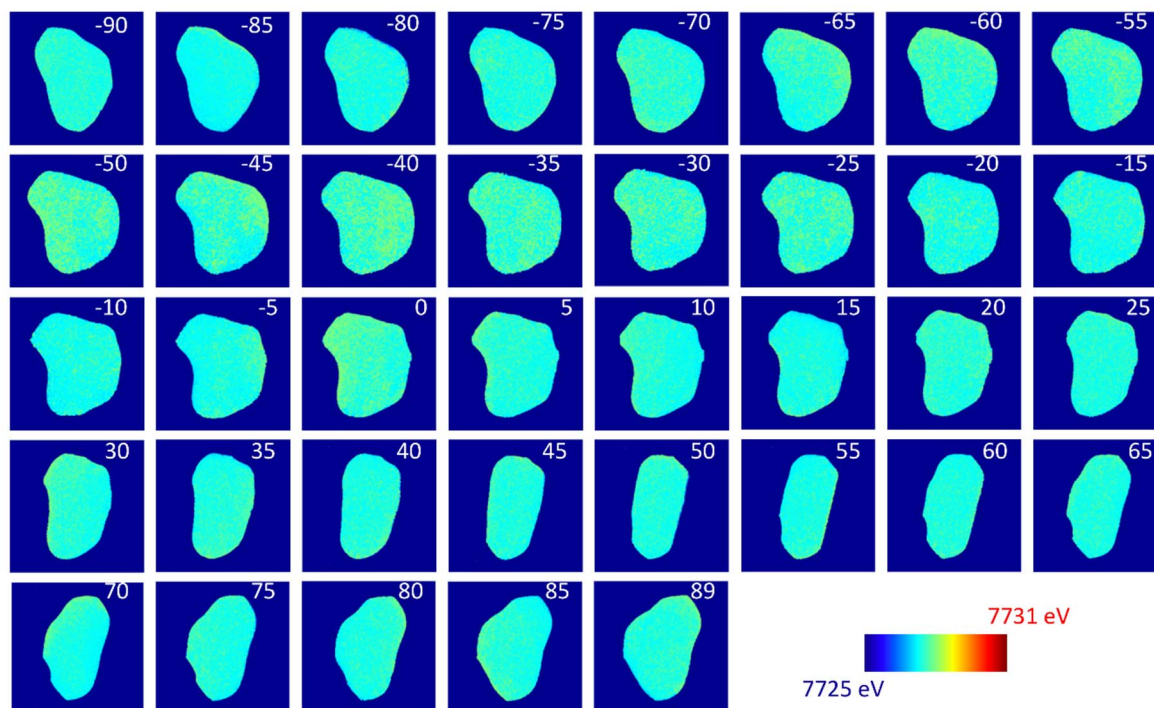


Figure S5 Peak energy maps of the sample pristine LiCoO₂ crystal as Figure S2 in the corresponding viewing angles. It appears that the peak energy is less affected by the polarization effect.

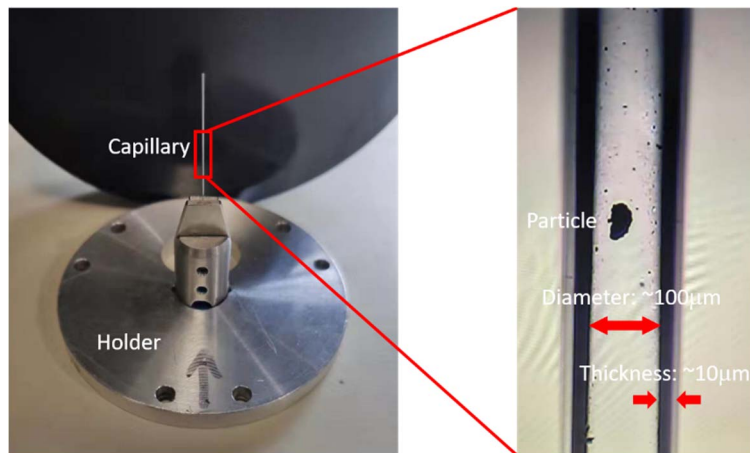


Figure S6 Image of the sample holder and the mounted quartz capillary.