Supporting Information

Electrolyte Strategies to Minimize Surface Reactivity for Improved Reversibility of H2 – H3 Phase Transition

J. Brandon Adamo and Arumugam Manthiram

Materials Science and Engineering Program and Texas Materials Institute, The University of Texas at Austin, Austin, Texas 78712, United States

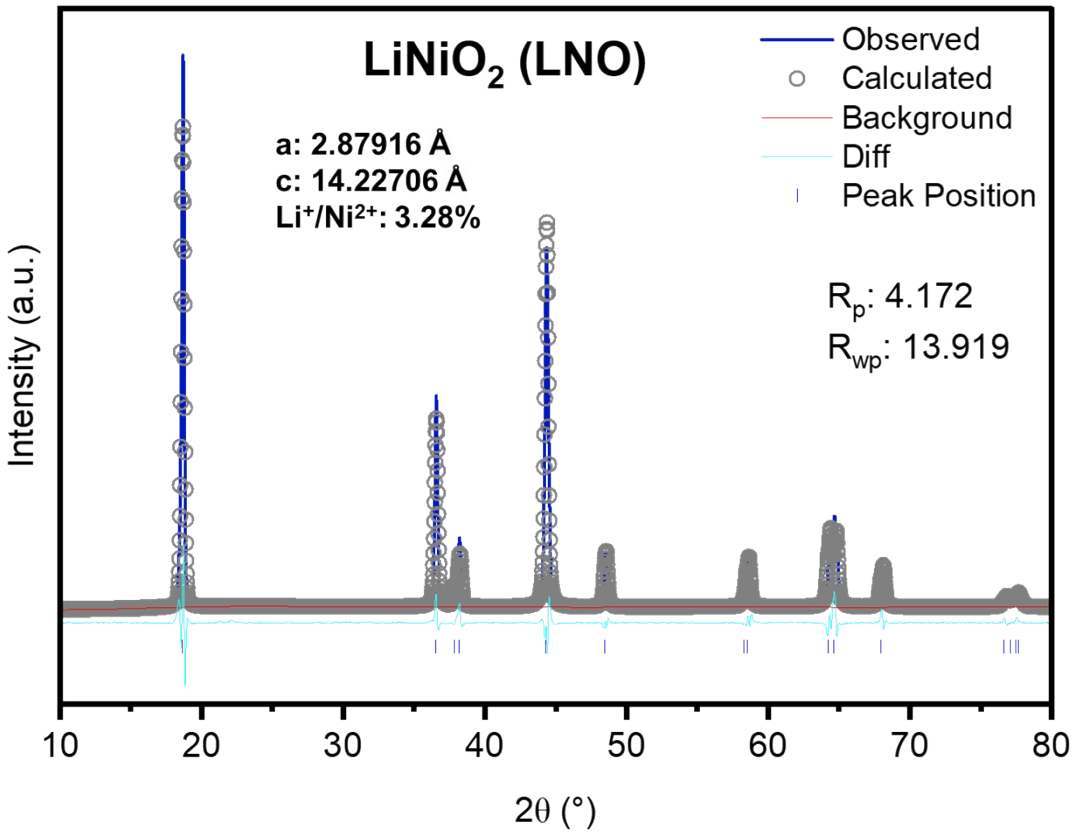

Figure S1 Rietveld refinement results showing both observed and measured XRD patterns of $LiNiO_2$.

-

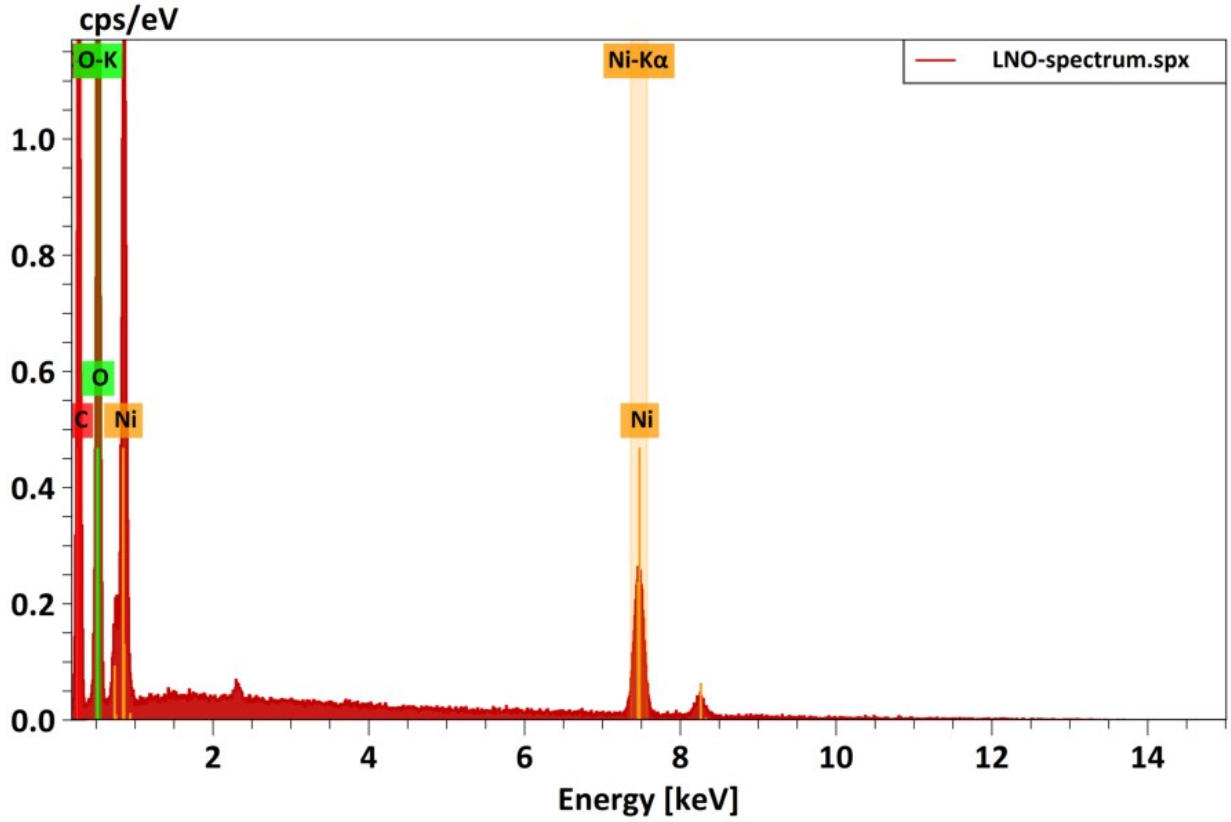

Figure S2 Observed EDX spectrum of LNO.

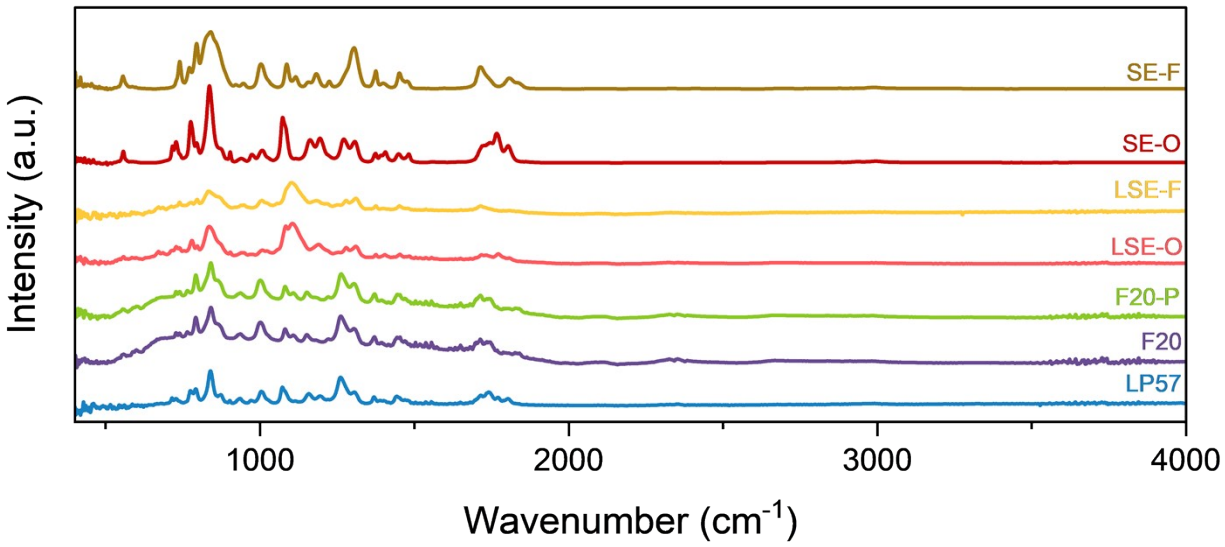

Figure S3 Full FTIR spectra collected for each electrolyte tested.

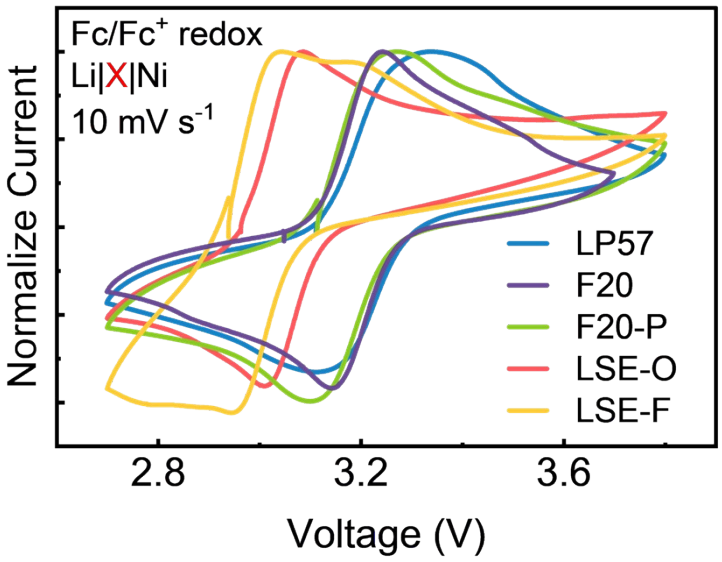

Figure S4 CV curves showing the Fc containing electrolytes used to measure the voltage upshift in Li/Li^+.

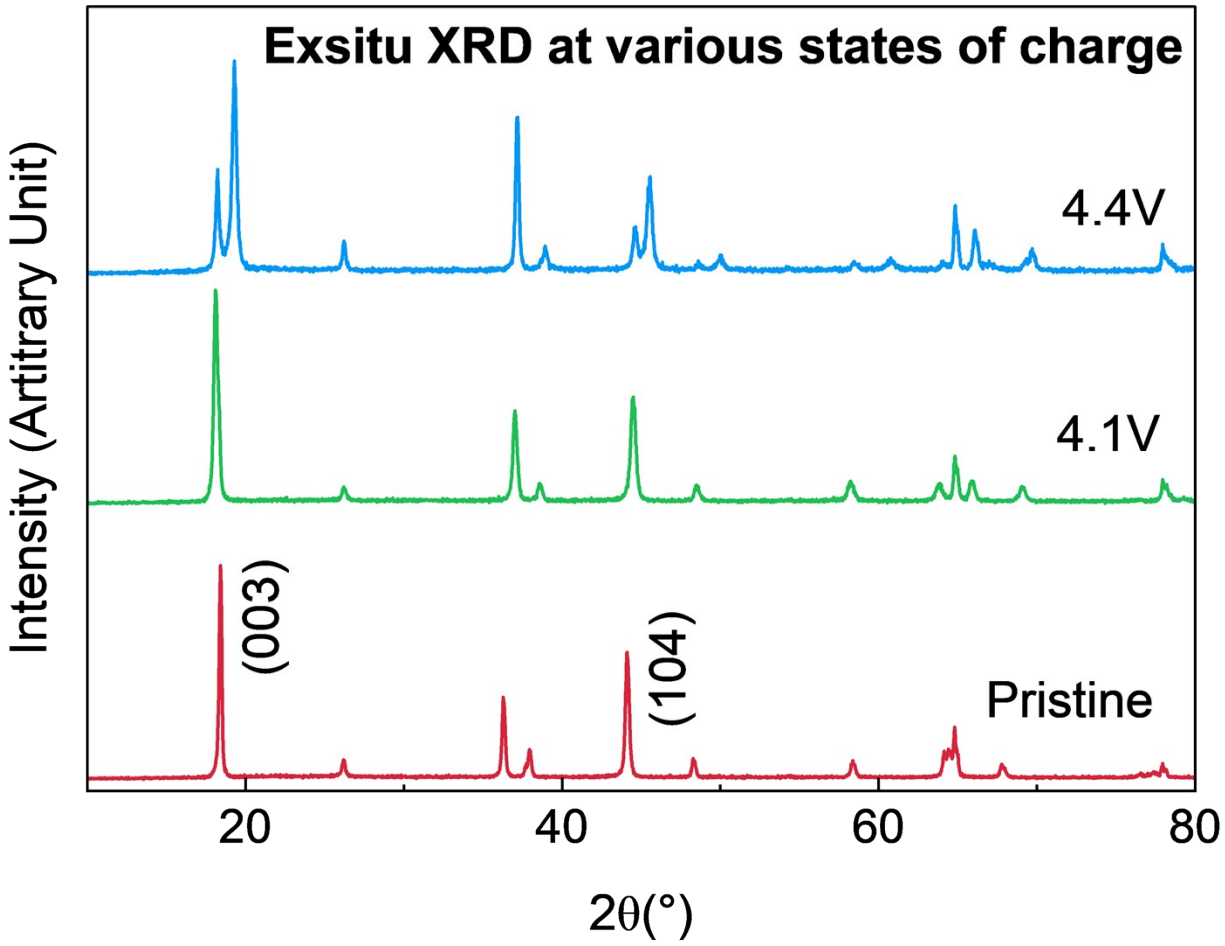

Figure S5 Ex situ XRD patterns of LNO electrodes taken at various states of charge.

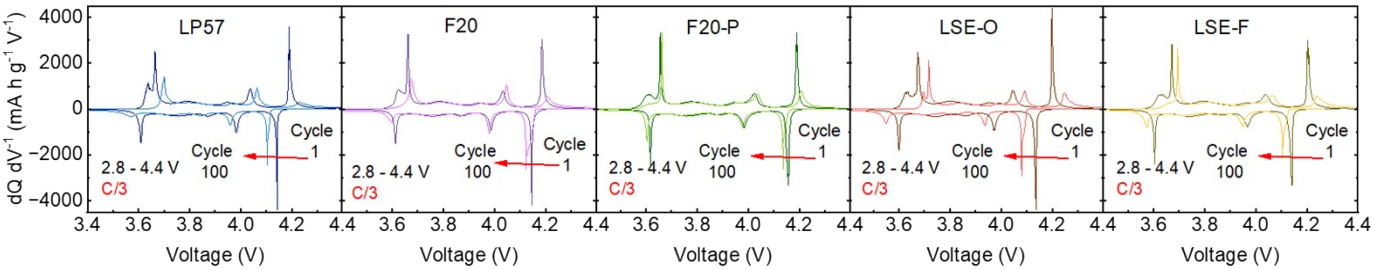

Figure S6 Full first and 100th cycle dQ dV^{-1} plots of each of the five electrolytes tested.

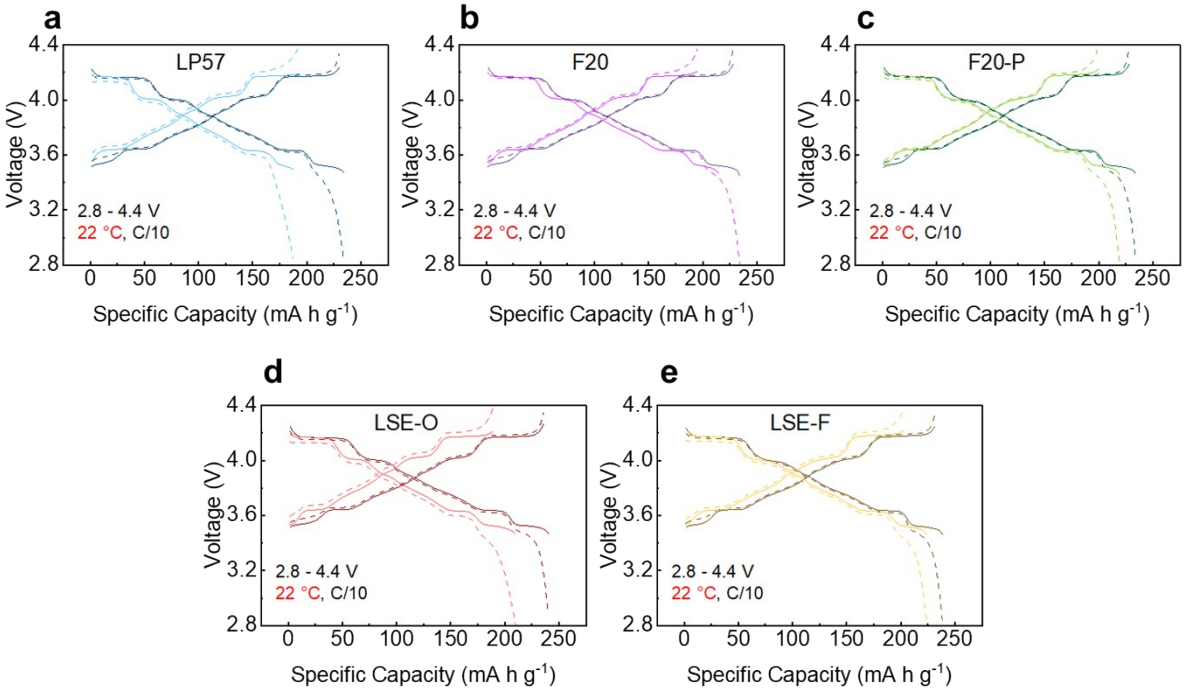

Figure S7 Thermodynamic (solid lines) and kinetic (dashed lines) curves extracted from post formation and post cycling GITT measurements of **(a)** LP57, **(b)** F20, **(c)** F20-P, **(d)** LSE-O, and **(e)** LSE-F.

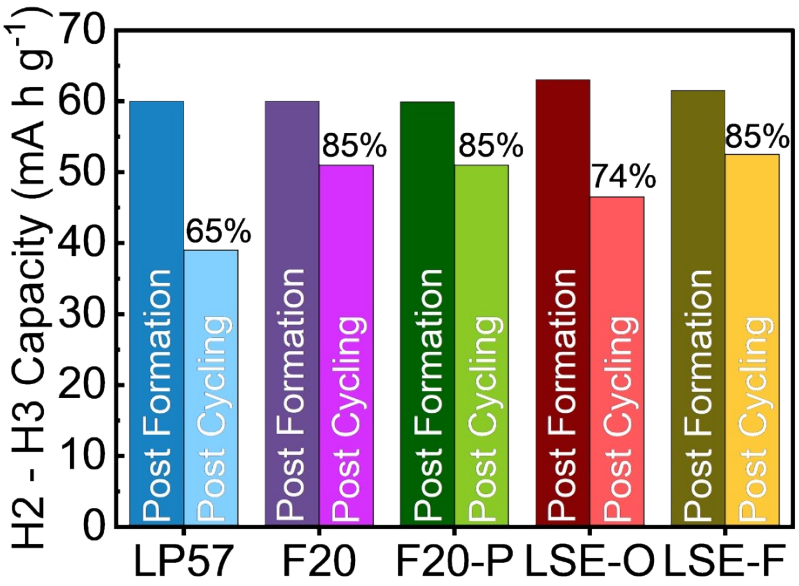

Figure S8 Estimated thermodynamic capacity of the H2 – H3 region, extracted with SDA from post formation and post cycling thermodynamic voltage curves. Percent of the post formation capacity retained in the post cycling capacity is indicated by the percentage above the post cycling bars.

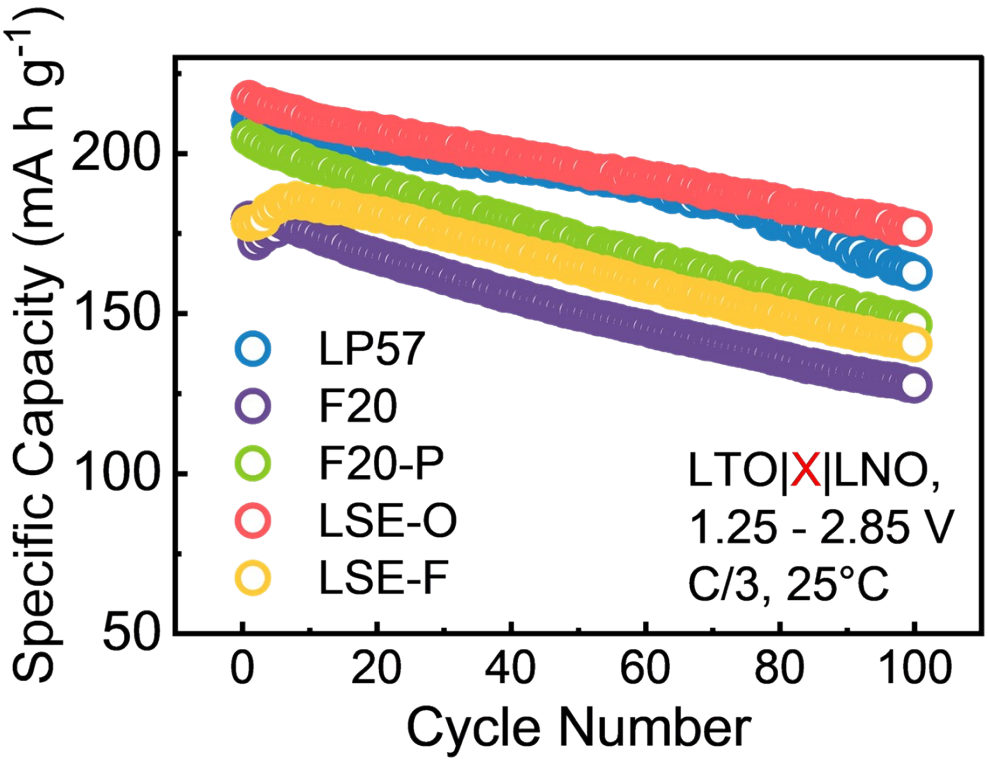

Figure S9 Cycling at C/3 rate of LTO || LNO cells. The cells were cycled from 1.25 to 2.85 V vs. LTO and with a constant voltage hold at the top of charge at 2.85 V to a cutoff current of C/50.

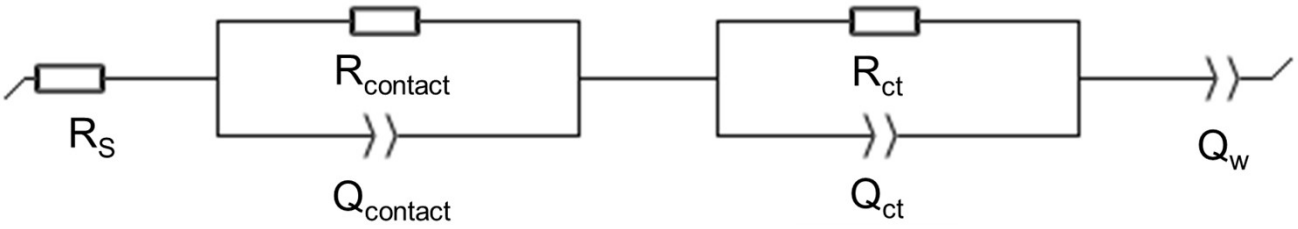

Figure S10 Equivalent circuit used to fit the GEIS data.

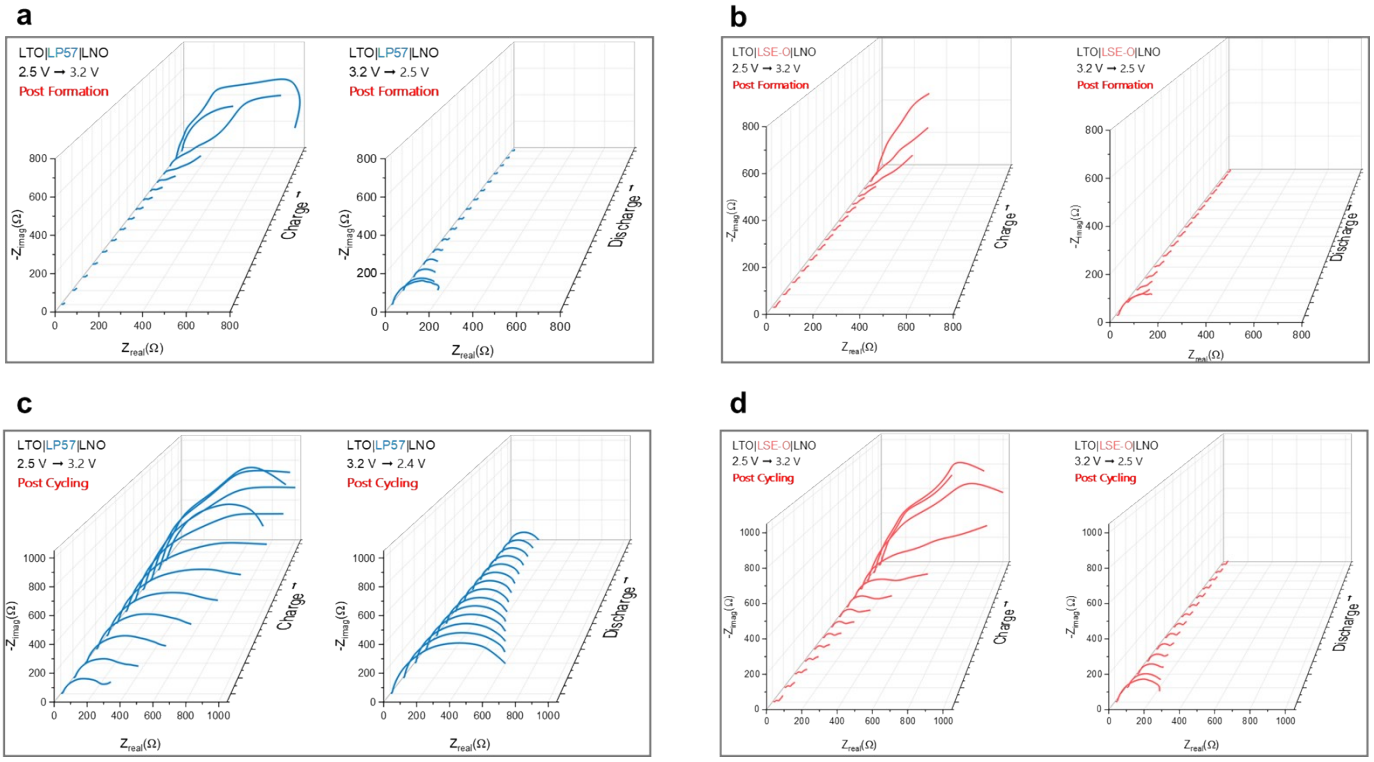

Figure S11 Charge and discharge GEIS data with **(a)** LP57 post formation, **(b)** LSE-O post formation, **(c)** LP57 post cycling, and **(d)** LSE-O post cycling.

-

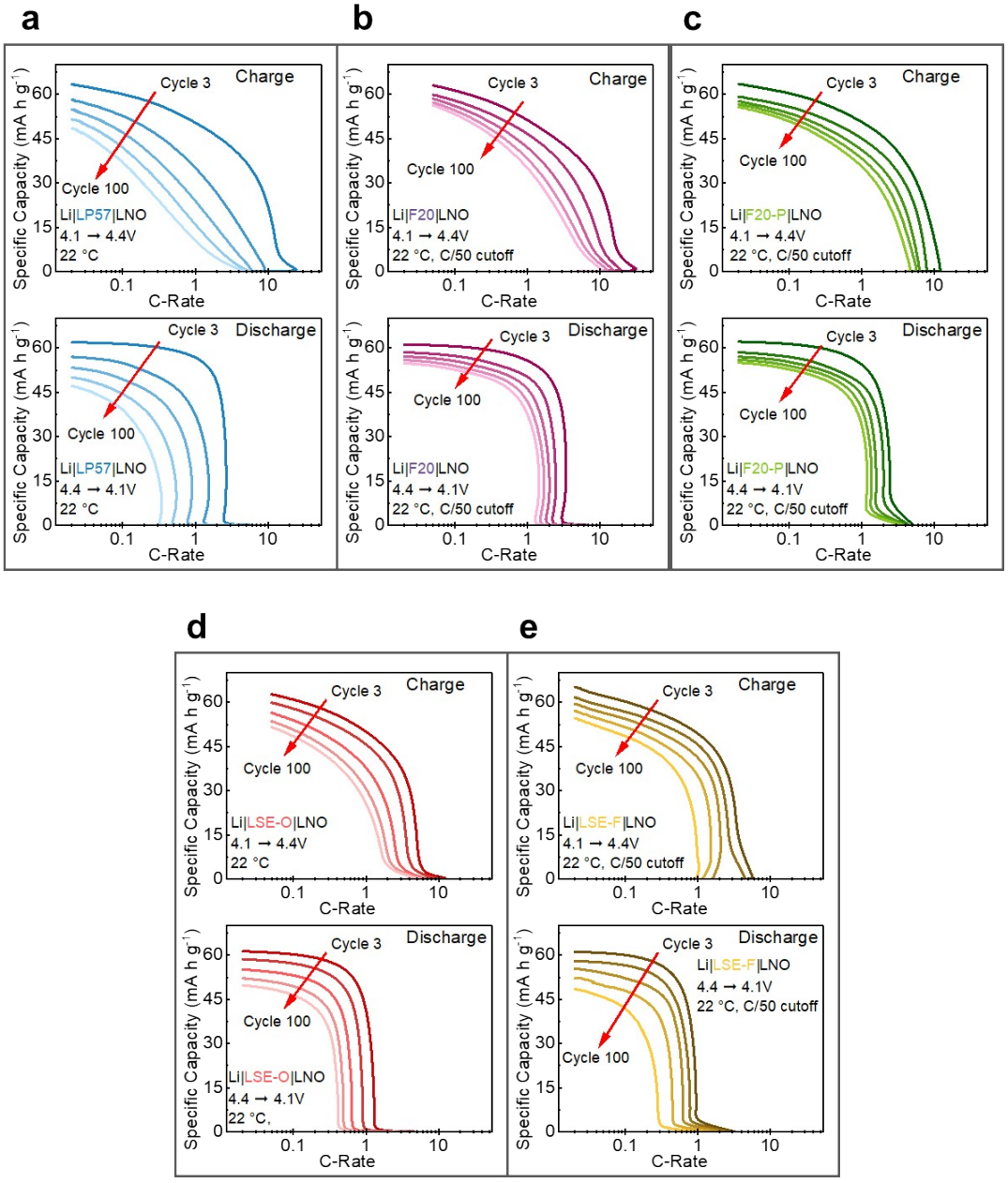

Figure S12 Charge and discharge C rate vs. capacity curves obtained during CSCA of **(a)** LP57, **(b)** F20, **(c)** F20-P, **(d)** LSE-O, and **(e)** LSE-F.