Supporting Information

Bi-functional Surface Coating of LiNbO$_3$ on High-Ni Layered Cathode Materials for Lithium Ion Batteries

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Figure S1. Field-emission scanning electron microscopy (FESEM) images of (a) bare NCM811 particles, (b) A-LNO-NCM811 particles, and (c) C-LNO-NCM811 particles at a low magnification.

Figure S2. Transmission electron microscopy (TEM) and energy dispersive X-ray spectroscopy (EDS) elemental mapping results of (a) A-LNO-NCM811 and (b) C-LNO-NCM811 for Ni (green), Co (yellow), Mn (pink) and Nb (red).
Figure S3. Focused ion beam-scanning electron microscopy (FIB-SEM) energy dispersive X-ray spectroscopy (EDS) elemental mapping results from surface to bulk of (a) A-LNO-NCM811 and (b) C-LNO-NCM811 particles.
Figure S4. Inductively coupled plasma mass spectroscopy (ICP-MS) results of bare NCM811, A-LNO-NCM811, and C-LNO-NCM811; Li (purple), Ni (green), Co (blue), Mn (orange), Nb (red).
Figure S5. Comparison of X-ray diffraction (XRD) patterns of (a) bare NCM811, (b) A-LNO-NCM811 and (c) C-LNO-NCM811 and (d) summary of lattice parameters after Rietveld refinements.
Figure S6. (a) XPS Ni 2p spectra and (b) areal ratios of Ni$^{2+}$/Ni$^{3+}$ for bare NCM811, A-LNO-NCM811, and C-LNO-NCM811.
Figure S7. Galvanostatic charge and discharge profiles of (a) bare NCM811, (b) A-LNO-NCM811, and (c) C-LNO-NCM811 with different currents of 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, and 10.0 C (1 C = 200 mA g⁻¹) in a voltage range from 3.0 to 4.25 V vs. Li/Li⁺.
Figure S8. Differential scanning calorimetry (DSC) curves of bare NCM811, A-LNO-NCM811, and C-LNO-NCM811 cathodes measured at a scan rate of 5 °C min\(^{-1}\) at elevated temperatures, together with onset temperatures and heat flows.