Supporting Information

for

Facile and scalable dry surface doping technique to enhance the electrochemical performance of LiNi$_{0.64}$Mn$_{0.2}$Co$_{0.16}$O$_2$ cathode materials

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**Fig. S1** shows the cross-section TEM EDS mapping of the 0.6% Nd-doped NMC cathode and Nd is distributed on the surface.

**Fig. S1** Cross-section TEM-EDS mapping of the 0.6% Nd-doped NMC cathode.

**Fig. S2** shows the Rietveld refinement of the XRD patterns.

**Fig. S2** Rietveld refinement of the XRD patterns of (a) pristine, (b) annealed and (c) Nd-doped NMC cathodes.
**Fig. S3** displays the cycling performance of NMC cathodes doped with different amount of Nd, and 0.6% Nd-doped NMC shows the best cycling performance.

**Fig. S3** Specific discharge capacities of NMC doped with different amount of Nd at C/2 in coin cells.

**Fig. S4** displays the measurement positions in EELS linescan.

**Fig. S4** Measurement positions of EELS spectra in (a) fresh NMC, (b) fresh Nd-doped NMC, (c) cycled NMC and (d) cycled Nd-doped NMC cathodes.
**Fig. S5** displays similar EELS spectra of fresh NMC and Nd-doped NMC samples. (a-b) O K-edge, (c-d) Ni L-edge, (e-f) Co L-edge, and (g-h) Mn L-edge.