

## Supporting Information

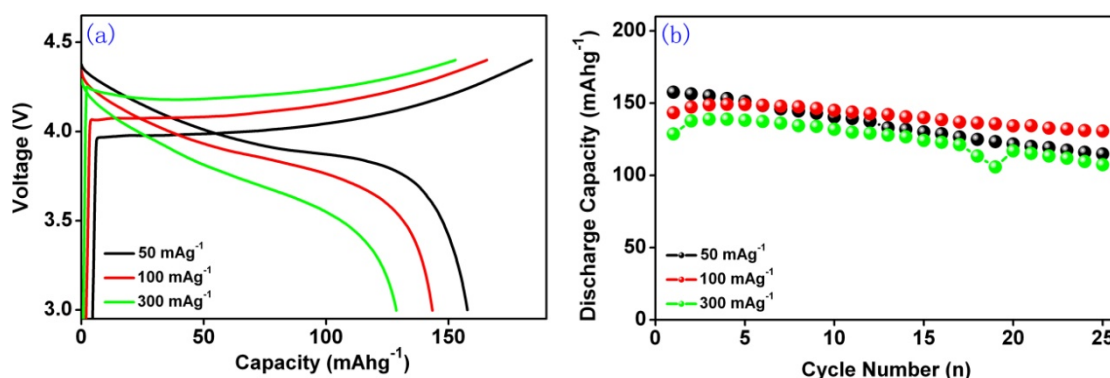
### 1. The detailed refined crystal structure

**Table S1** Refined structure data of sample for  $\text{LiCo}_{0.95}\text{Mn}_{0.05}\text{O}_2$  (space group R-3m)

Atom (ox.)	Wyck position	occupancy	x	y	z	Uiso
Li(+1)	3b	0.996(8)	0	0	0	0.012
Na(+1)	3b	0.004(8)	0	0	0	0.025
Co(+3)	3a	0.97(2)	0	0	0.5	0.025
Mn(+4)	3a	0.03(2)	0	0	0.5	0.084
O(-2)	6c	1	0	0	0.2382	0.016

$a=2.8228(1)$  Å,  $c=14.1305(6)$  Å,  $c/a=5.0058$ , and  $V=97.512(6)$  Å<sup>3</sup>;  $R_p=6.04$  %,  $R_{wp}=7.67$  %,  $R_p(-B_{\text{knd}})=6.15$  %,  $\chi^2=1.484$ .

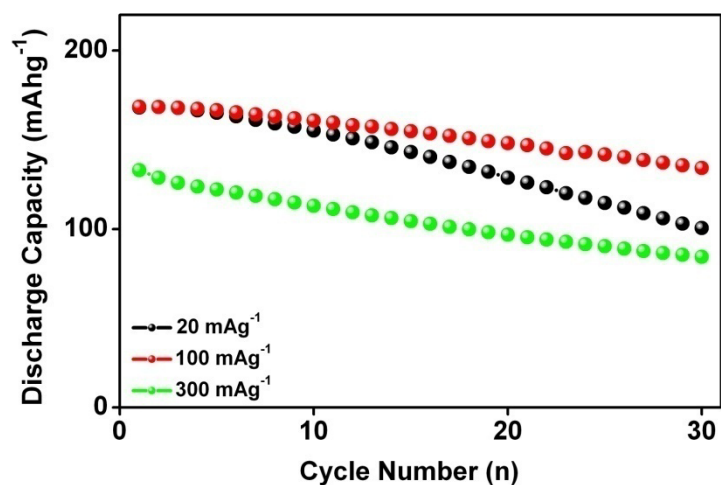
### 2. Room-temperature electrochemical performances of commercial $\text{LiCoO}_2$



**Figure S1** Electrochemical performances for commercial  $\text{LiCoO}_2$  measured at room-temperature: (a) initial charge-discharge profiles and (b) discharge capacity vs. cycle number plots.

Figure S1 shows the room-temperature electrochemical performances of commercial  $\text{LiCoO}_2$  electrode tested at different current densities of 50, 100, and 300  $\text{mA g}^{-1}$  between 3.0 and 4.4 V. As shown in Figure S1, the initial discharge capacities are 158, 143, and 129  $\text{mAh g}^{-1}$ , respectively, at 50, 100, and 300  $\text{mA g}^{-1}$ . After 25 cycles, the capacity retention ratios are 72.68%, 91.44%, and 83.22%, respectively.

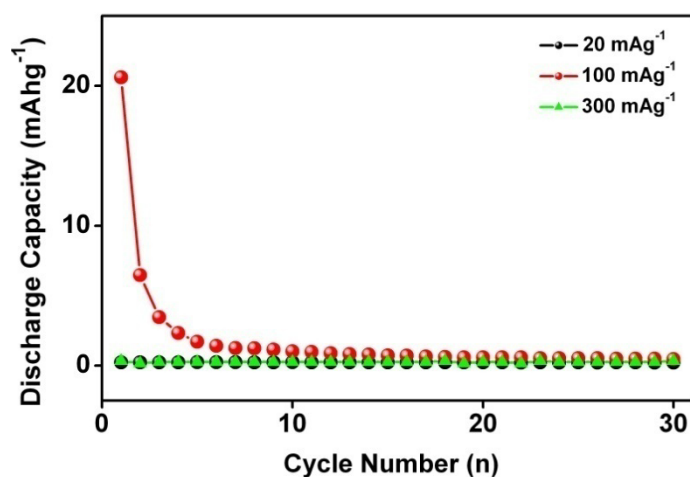
### 3. High-temperature electrochemical performances of commercial LiCoO<sub>2</sub>



**Figure S2** Discharge capacity vs. cycle number plot for commercial LiCoO<sub>2</sub> measured at high-temperature of 45.4 °C.

Figure S2 exhibits the high-temperature cycling performance of commercial LiCoO<sub>2</sub> electrode tested at different current densities of 20, 100, and 300 mA g<sup>-1</sup> between 3.0 and 4.4 V. The initial discharge capacities are 168, 168, and 133 mAh g<sup>-1</sup>, respectively, at 50, 100, and 300 mA g<sup>-1</sup>. After 30 cycles, the capacity retention ratios are 59.85%, 79.92%, and 63.44%, respectively.

### 4. Low-temperature electrochemical performances of commercial LiCoO<sub>2</sub>



**Figure S3** Discharge capacity vs. cycle number plot for commercial LiCoO<sub>2</sub> measured at low-temperature of -10.4 °C.

Figure S3 displays the cycling performance for commercial  $\text{LiCoO}_2$  electrode without any activate treatment tested at low-temperature of  $-10.4\text{ }^\circ\text{C}$  between 3.0 and 4.4 V. The commercial  $\text{LiCoO}_2$  cathode material exhibited poor low-temperature electrochemical performances.