

Electronic Supplementary Information (ESI)

Enhanced Cycling Performance of B-doped $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$ Cathode Prepared by Solid-state Method

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Supplementary figures

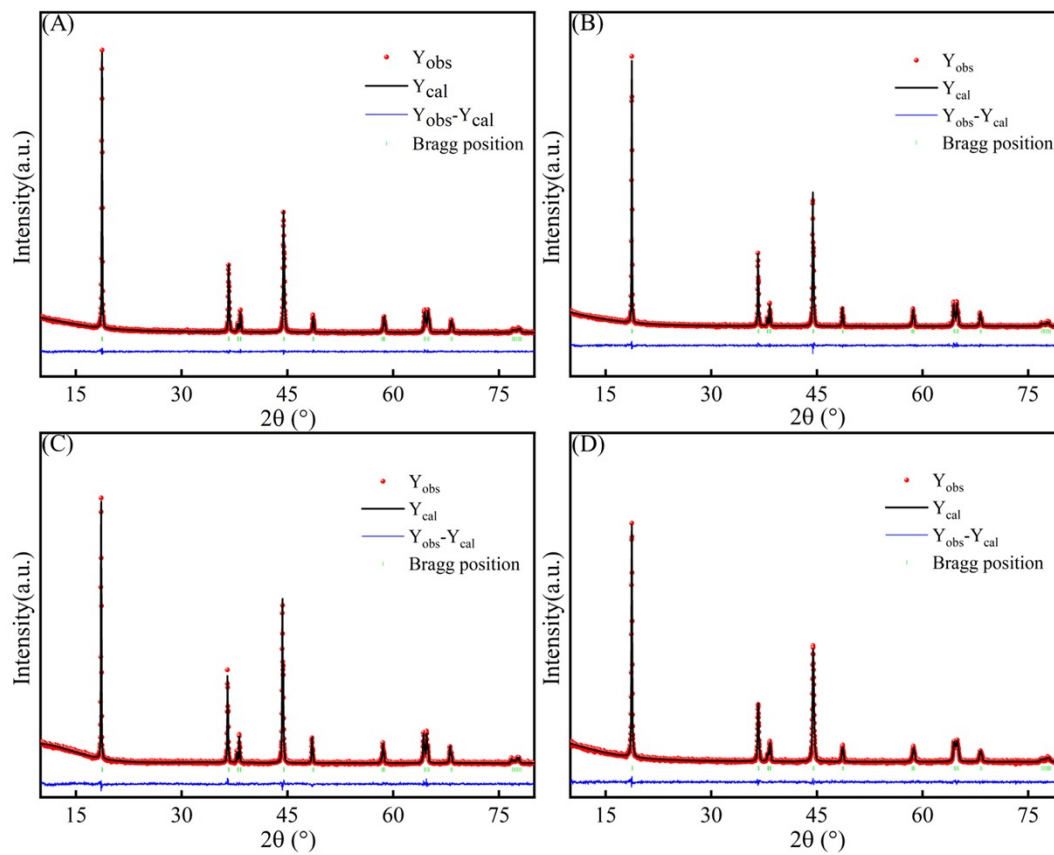


Fig. S1 Rietveld refinement of (A) S0, (B) S1, (C) S2, and (D) S3.

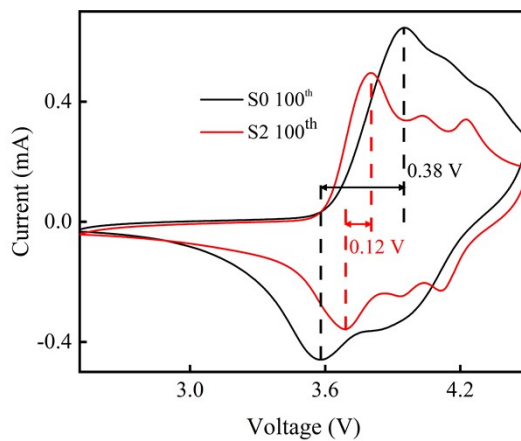


Fig. S2 CV curves of S0 and S2 after 100 cycles.

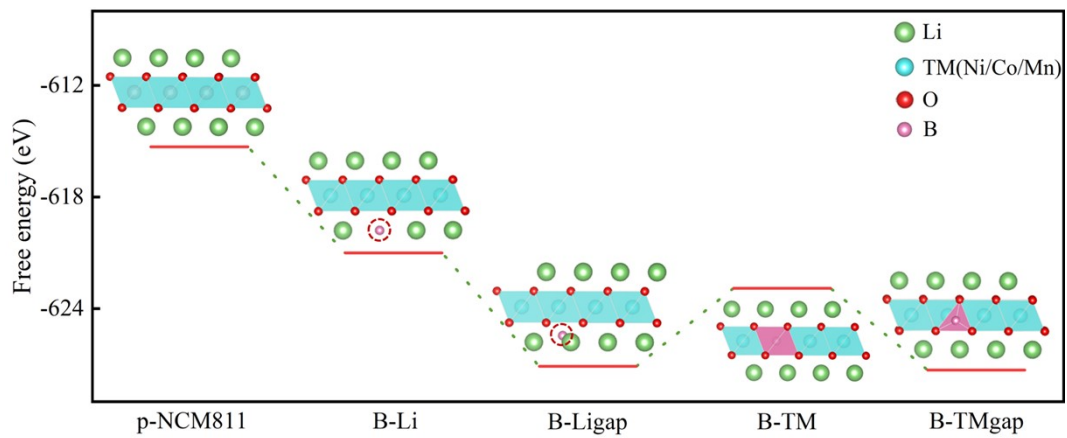


Fig. S3 Free energy of B-doping varies at different positions.

Supplementary tables

Table S1 Rietveld XRD analysis of S0-S3 samples

Sample		S0	S1	S2	S3
Lattice parameters	a(Å)	2.8715	2.8725	2.8727	2.8720
	c(Å)	14.1994	14.2073	14.2091	14.2020
	c/a	4.9449	4.9460	4.9462	4.9450
	I(003)/I(104)	1.78	1.86	2.03	1.92
	Ni/Li(%)	4.67	4.52	3.76	4.59
	R _p (%)	2.72	2.54	2.61	2.70
	R _{wp} (%)	3.44	3.20	3.31	3.51

Table S2 Comparison of performance of LiNi_xCo_yMn(Al)_{1-x-y}O₂ (x ≥ 0.8) cathodes obtained by the solid-state method

Cathode	Strategy	Retention (25°C)	Voltage (V)	Refs.
LiNi _{0.8} Co _{0.1} Mn _{0.1} O ₂	Optimize preparation process	67.8% (0.2 C, 100 th)	2.7-4.3	52
LiNi _{0.8} Co _{0.15} Al _{0.05} O ₂	Y-doped	84.7% (0.5 C, 50 th)	2.8-4.2	53
	Ca-doped	87.7% (0.5 C, 50 th)		
LiNi _{0.88} Co _{0.09} Al _{0.03} O ₂	Mn-doped	88.4% (1 C, 100 th)	2.5-4.3	54
LiNi _{0.9} Co _{0.07} Al _{0.03} O ₂	Zr-doped	84.9% (0.5 C, 100 th)	2.8-4.3	55
LiNi _{0.815} Co _{0.15} Al _{0.035} O ₂	Br-doped	73.7% (0.5 C, 100 th)	2.8-4.3	56
LiNi _{0.8} Co _{0.1} Mn _{0.1} O ₂	La/Al co-doped	75.4% (1 C, 100 th)	2.7-4.3	57
LiNi _{0.85} Co _{0.1} Al _{0.05} O ₂	Na/Nb co-doped	94.3% (0.5 C, 100 th)	2.8-4.5	58
LiNi _{0.8} Co _{0.15} Al _{0.05} O ₂	polyanion/Mn co-doped	85.5% (1 C, 100 th)	2.7-4.3	59
LiNi_{0.8}Co_{0.1}Mn_{0.1}O₂	B-doped	90.7% (1 C, 100th)	2.7-4.3	This work

Table S3 Comparison of performance of LiNi_xCo_yMn(Al)_{1-x-y}O₂ (x ≥ 0.8) cathodes prepared by various doping methods and elements

Cathode	Strategy	Retention (25°C)	Voltage (V)	Refs.
LiNi _{0.815} Co _{0.15} Al _{0.035} O ₂	Zn-doped	92% (1 C, 100 th)	2.7-4.3	60
	co-precipitation			
LiNi _{0.8} Co _{0.1} Mn _{0.1} O ₂	Ta-doped	90% (1/3 C, 100 th)	2.7-4.3	61
	co-precipitation			
LiNi _{0.84} Co _{0.1} Mn _{0.06} O ₂	V-doped	88.1% (0.5 C, 80 th)	2.7-4.3	62
	co-precipitation			
LiNi _{0.83} Co _{0.11} Mn _{0.06} O ₂	La-Nd-Sm-Eu-Gd-Zr-doped	90% (1 C, 100 th)	2.7-4.3	63
	co-precipitation			
LiNi _{0.8} Co _{0.1} Mn _{0.1} O ₂	Nb-doped sol-gel method	94.6% (1 C, 100 th)	2.7-4.3	23

$\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$	Nb-doped sol-gel method	95.4% (0.5 C, 100 th)	2.7-4.3	64
$\text{LiNi}_{0.88}\text{Co}_{0.1}\text{Al}_{0.02}\text{O}_2$	B-doped co-precipitation	90.4% (1 C, 100 th)	2.7-4.3	35
$\text{LiNi}_{0.9}\text{Co}_{0.05}\text{Mn}_{0.05}\text{O}_2$	B-doped co-precipitation	91.5% (0.5 C, 100 th)	2.38-3.68	33
$\text{LiNi}_{0.885}\text{Co}_{0.1}\text{Al}_{0.015}\text{O}_2$	B-doped co-precipitation	93.5% (0.5 C, 100 th)	2.7-4.3	65
$\text{LiNi}_{0.85}\text{Co}_{0.1}\text{Mn}_{0.05}\text{O}_2$	B-doped co-precipitation	94.2%(1 C, 100 th)	3.0-4.3	31
$\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$	B-doped solid-state method	90.7% (1 C, 100th)	2.7-4.3	This work

Table S4 EIS fitting data and calculation results of D_{Li^+}

Sample	S0			S2		
	$R_{\text{sf}}(\Omega)$	$R_{\text{ct}}(\Omega)$	$\text{D}_{\text{Li}^+}(\text{cm}^2/\text{s})$	$R_{\text{sf}}(\Omega)$	$R_{\text{ct}}(\Omega)$	$\text{D}_{\text{Li}^+}(\text{cm}^2/\text{s})$
1 st	58.7	278.4	3.8×10^{-13}	79.4	134.6	6.4×10^{-13}
100 th	281.7	584.4	2.0×10^{-13}	262.7	382.8	3.1×10^{-13}