

Supporting Information

A new synthesis strategy towards enhancing the structure and cycle stabilities of $\text{LiNi}_{0.8}\text{Co}_{0.15}\text{Al}_{0.05}\text{O}_2$ cathode material

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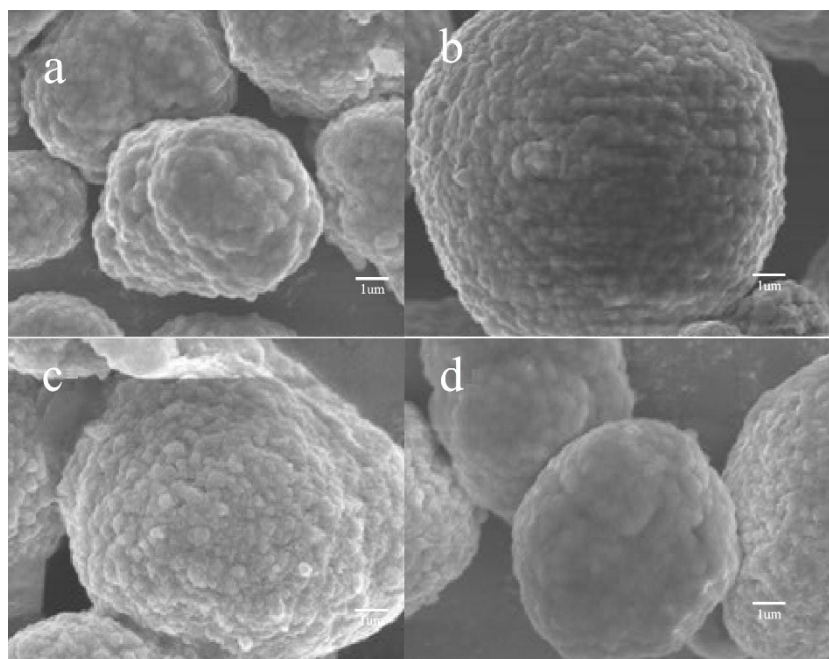


Fig. S1 SEM images of LNCA powders. a, b, c and d are LNCA50, LNCA32, LNCA23 and LNCA05 respectively.

Table S1. The compositions of LNCA materials, determined by inductively coupled plasma test.

Samples	Designed values	Measured values
LNCA50	LiNi _{0.80} Co _{0.15} Al _{0.05}	Li _{0.999} Ni _{0.802} Co _{0.152} Al _{0.045}
LNCA32	LiNi _{0.80} Co _{0.15} Al _{0.05}	Li _{0.990} Ni _{0.803} Co _{0.149} Al _{0.047}
LNCA23	LiNi _{0.80} Co _{0.15} Al _{0.05}	Li _{0.985} Ni _{0.801} Co _{0.153} Al _{0.047}
LNCA05	LiNi _{0.80} Co _{0.15} Al _{0.05}	Li _{0.988} Ni _{0.804} Co _{0.149} Al _{0.047}

Table S2. The atom parameters of LNCA32 samples synthesized at various temperatures. sg = space group, occ = site occupancy. The figures in parenthesis are the error value.

sg: R $\bar{3}$ m	LNCA32_650				LNCA32_750				LNCA32_850			
	x	y	z	occ	x	y	z	occ	x	y	z	occ
Li (3a)	0	0	0	0.978(2)	0	0	0	0.989(2)	0	0	0	0.975(4)
Li (3b)	0	0	0.5	0.022(2)	0	0	0.5	0.011(2)	0	0	0.5	0.025(4)
Ni (3a)	0	0	0	0.022(2)	0	0	0	0.011(2)	0	0	0	0.025(4)
Ni (3b)	0	0	0.5	0.778(2)	0	0	0.5	0.789(2)	0	0	0.5	0.775(4)
Co (3b)	0	0	0.5	0.1500	0	0	0.5	0.1500	0	0	0.5	0.1500
Al (3b)	0	0	0.5	0.0500	0	0	0.5	0.0500	0	0	0.5	0.0500
O (6c)	0	0	0.24327(21)	1	0	0	0.24337(23)	1	0	0	0.24328(23)	1

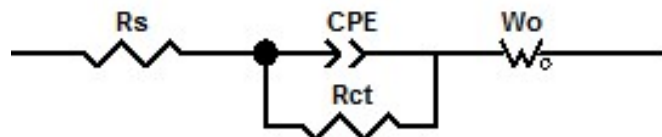


Fig. S2 Equivalent circuits used to fit the experimental data. R_s is solution resistance, R_{ct} is interfacial charge-transfer resistance, CPE is a constant phase element, W_o is assigned to the semi-infinite Warburg diffusion impedance in the bulk.

Table S3. The simulated results from electrochemical impedance spectra of the LNCA electrodes.

Sample	R_s (Ω)	R_{ct} (Ω)
LNCA_50	1.82	154.8
LNCA_32	1.93	99.5
LNCA_23	2.59	130.1
LNCA_05	2.80	102.9