Supplementary Materials

Outstanding Electrochemical Performance of Ni-Rich Concentration-Gradient Cathode Material $LiNi_{0.9}Co_{0.083}Mn_{0.017}O_2$ for Lithium-Ion Batteries

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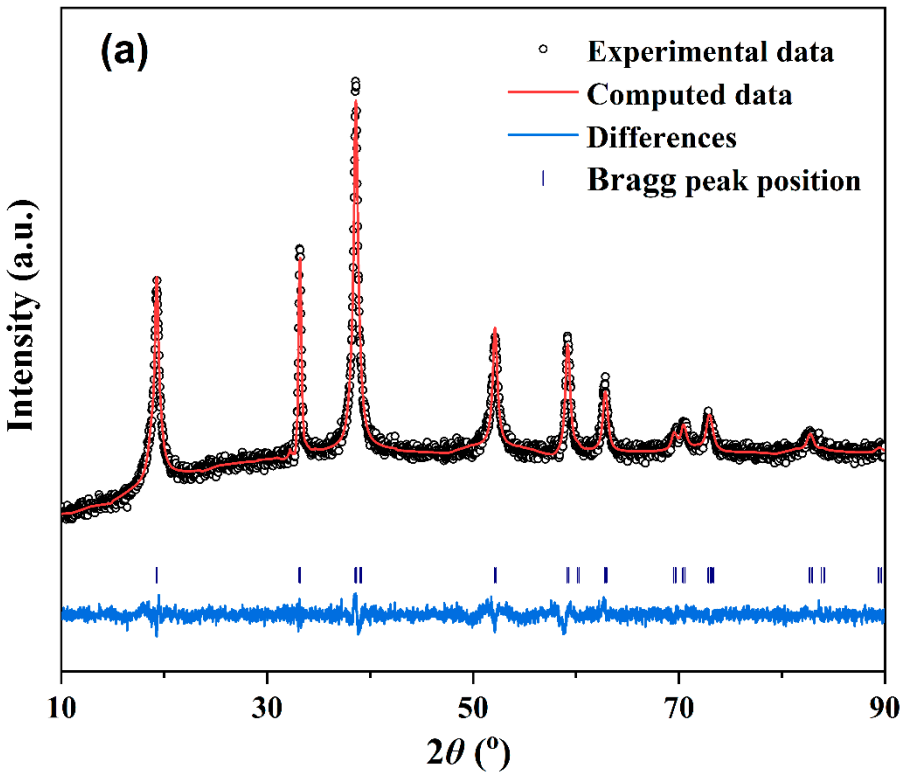
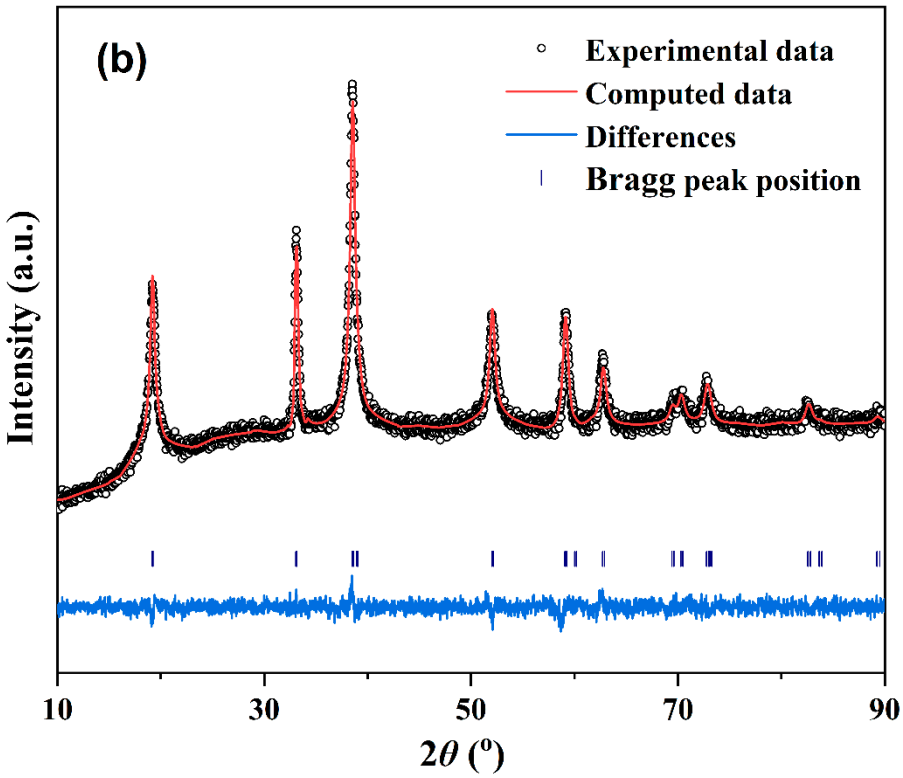

(a)
Experimental data
Computed data
Differences
Bragg peak position
Intensity (a.u.)
10
30
50
70
90
2θ (°)


(b)
Experimental data
Computed data
Differences
Bragg peak position
Intensity (a.u.)
10
30
50
70
90
2θ (°)

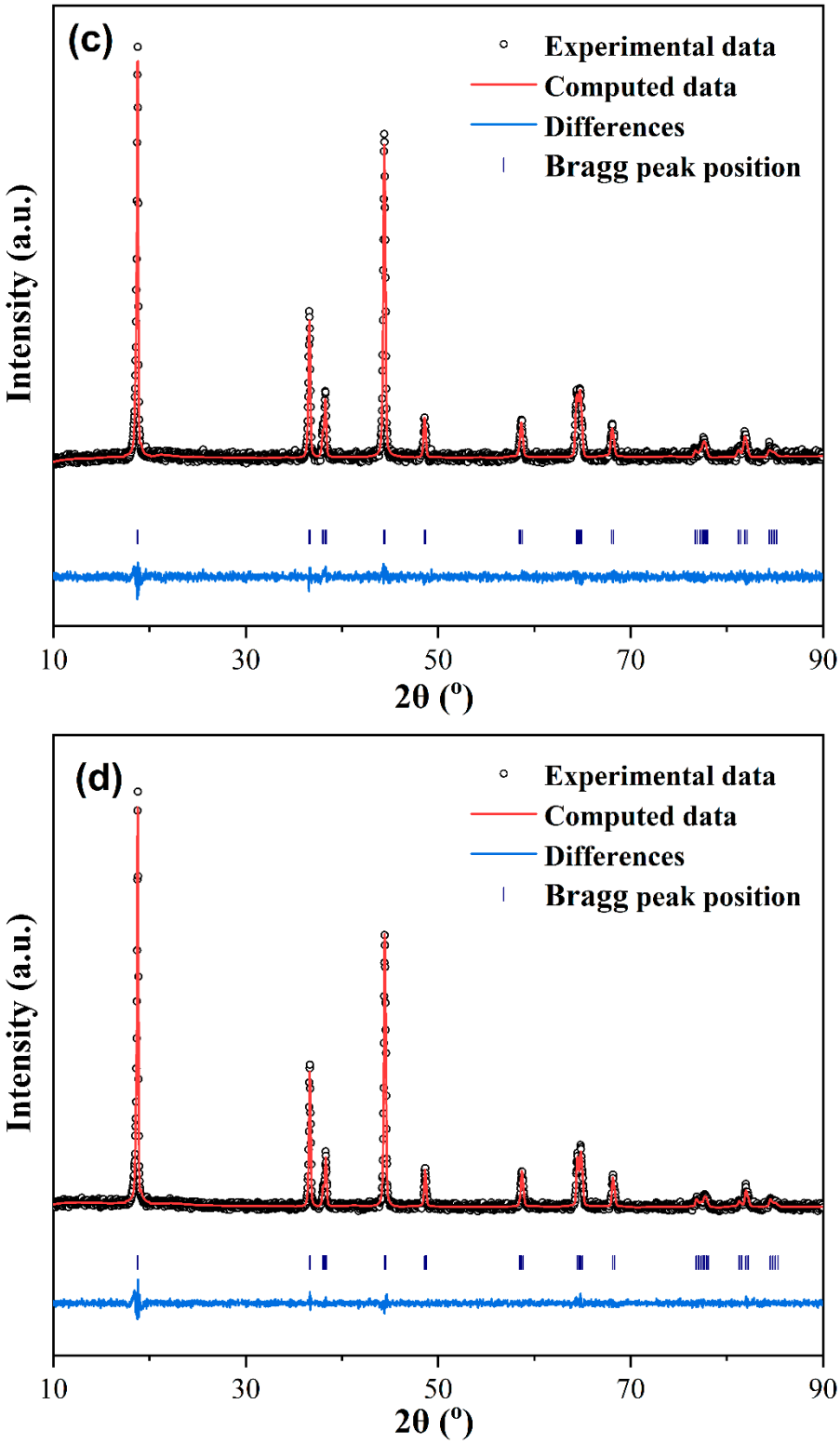
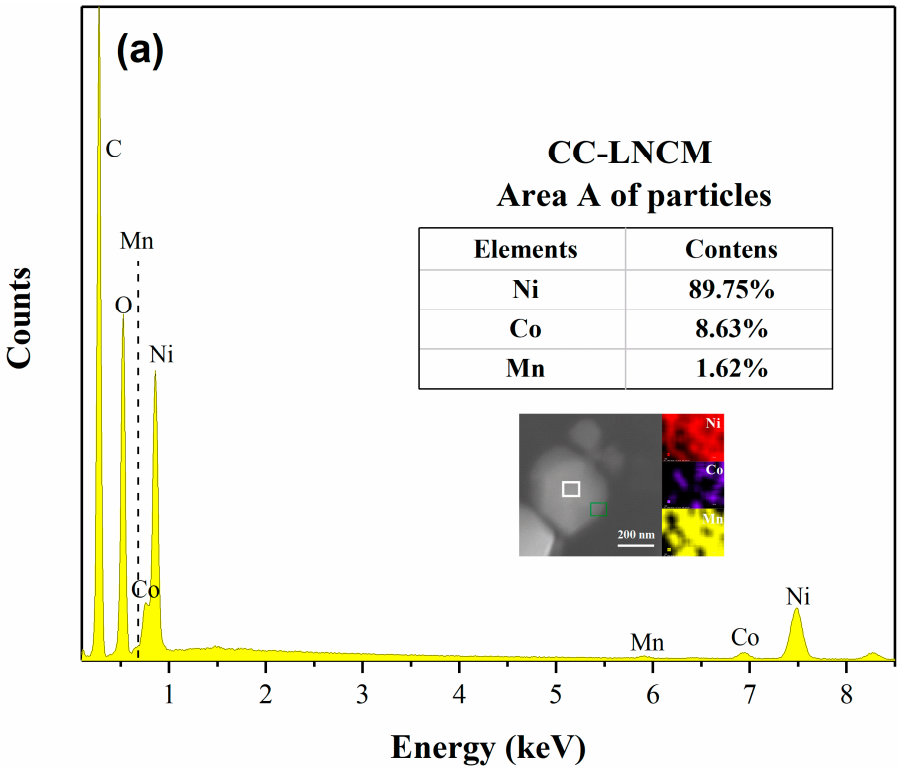
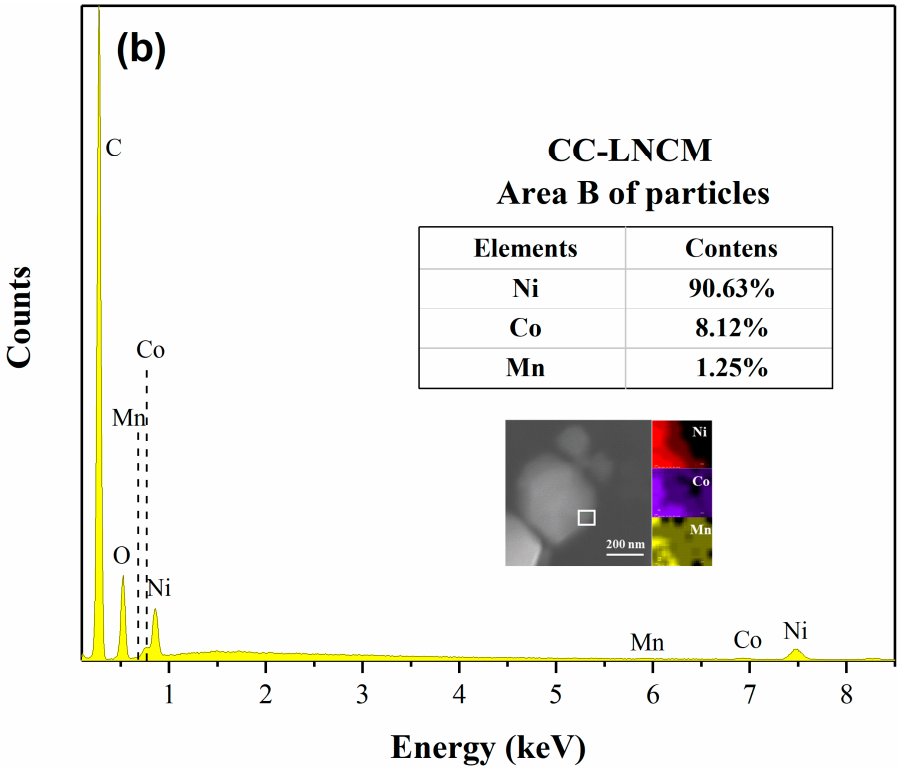


Figure S1. Refine XRD patterns of **(a)** CC-NCMOH, **(b)** CG-NCMOH, **(c)** CC-LNCM and **(d)** CG-LNCM.


(a)
C
Mn
O
Ni
Co
Mn
Co
Ni
CC-LNCM
Area A of particles
Elements
Contens
Ni
89.75%
Co
8.63%
Mn
1.62%
Ni
Co
Mn
200 nm
Counts
Energy (keV)
1
2
3
4
5
6
7
8


(b)
C
Co
Mn
O
Ni
Mn
Co
Ni
CC-LNCM
Area B of particles
Elements
Contens
Ni
90.63%
Co
8.12%
Mn
1.25%
Ni
Co
Mn
200 nm
Counts
Energy (keV)
1
2
3
4
5
6
7
8

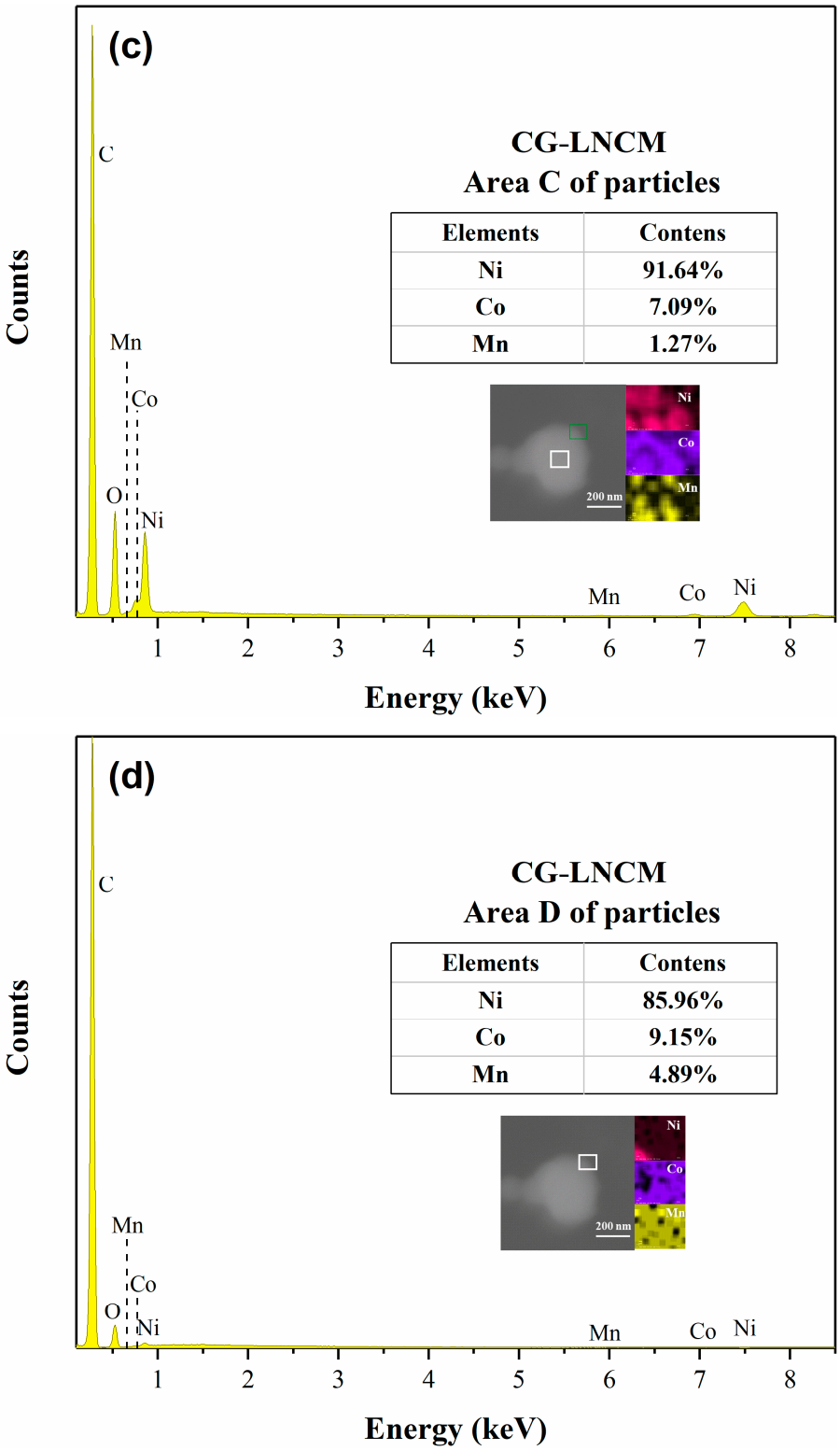


Figure S2. The EDX graph of **(a)** area A and **(b)** area B of CC-LNCM, **(c)** area C and **(d)** area D of CG-LNCM.

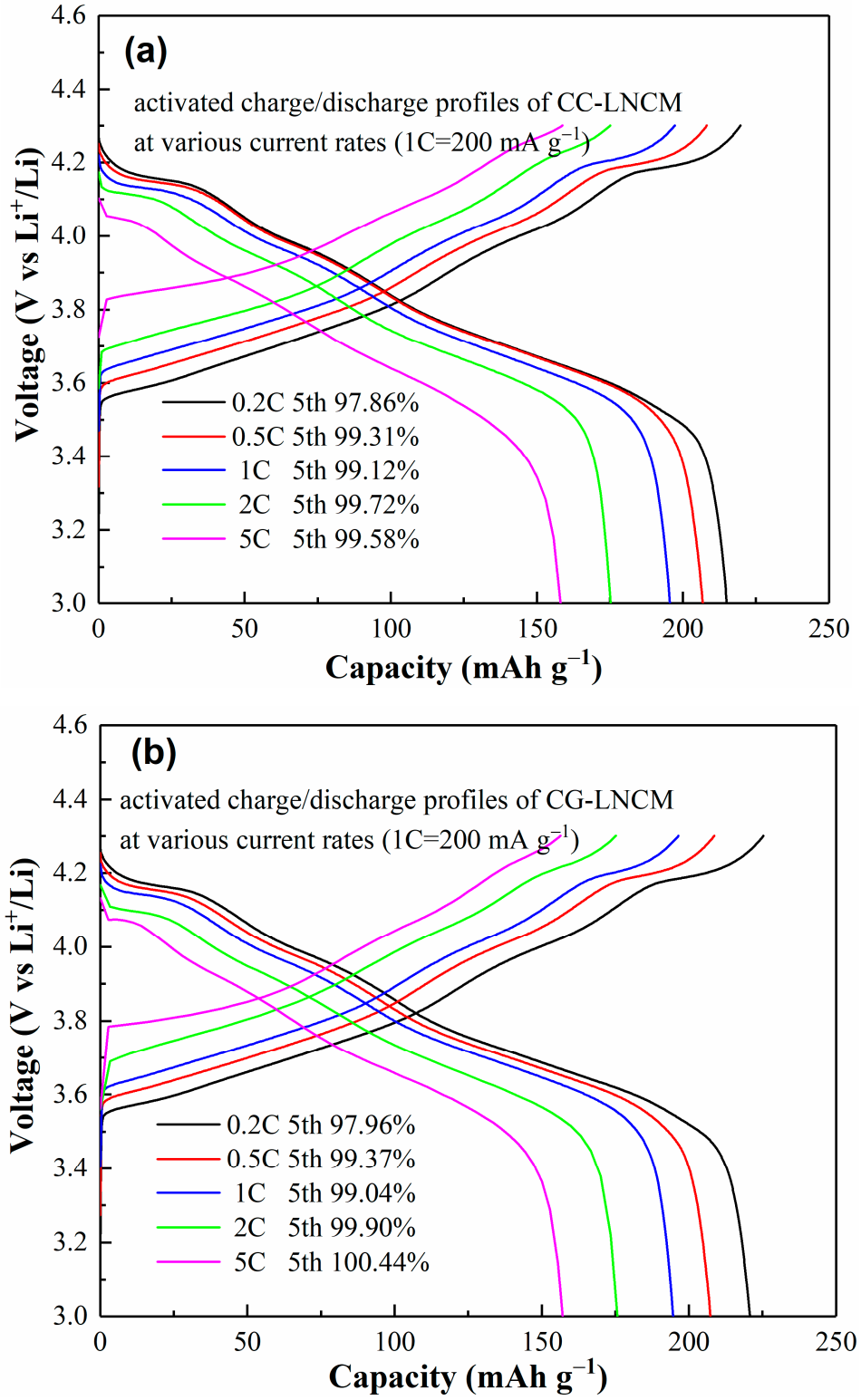


Figure S3. Activated charge/discharge profiles of **(a)** CC-LNCM and **(b)** CG-LNCM at various current rates.

Table S1 Cell parameters of as-prepared samples

sample	*a*/Å	*b*/Å	*c*/Å	*c*/*a*	$I_{(003)}/I_{(104)}$
CC-NCMOH	3.12171	3.12171	4.61164	/	
CG-NCMOH	3.12407	3.12407	4.61924	/	
CC-LNCM	2.8738	2.8738	14.1914	4.94	1.220
CG-LNCM	2.8775	2.8775	14.2059	4.94	1.395

Table S2 Atomic parameters of as-prepared samples

sample	atom	Wyckoff site	x	y	z	occupation
CC-NCMOH	Ni1	1a	0	0	0	0.900
	Co1	1a	0	0	0	0.083
	Mn1	1a	0	0	0	0.017
	O1	2d	0.33333	0.66667	0.23281	1.000
	H1	2d	0.33333	0.66667	0.43211	1.000
CG-NCMOH	Ni1	1a	0	0	0	0.900
	Co1	1a	0	0	0	0.083
	Mn1	1a	0	0	0	0.017
	O1	2d	0.33333	0.66667	0.23417	1.000
	H1	2d	0.33333	0.66667	0.43201	1.000
CC-LNCM	Li1	3b	0	0	0.5	0.939
	Ni2	3b	0	0	0.5	0.061
	Co1	3a	0	0	0	0.083
	Mn1	3a	0	0	0	0.017
	Ni1	3a	0	0	0	0.839
	Li2	3a	0	0	0	0.061
	O1	6c	0	0	0.25610	1.000
CG-LNCM	Li1	3b	0	0	0.5	0.947
	Ni2	3b	0	0	0.5	0.053
	Co1	3a	0	0	0	0.083
	Mn1	3a	0	0	0	0.017
	Ni1	3a	0	0	0	0.847
	Li2	3a	0	0	0	0.053
	O1	6c	0	0	0.25820	1.000

Table S3 The fitting results of fresh electrodes and electrodes after cycled for 100 cycles at 5C.

electrode	R_f (Ω)	R_{ct} (Ω)
fresh CC-LNCM electrode	——	62.9
fresh CG-LNCM electrode	——	48.0
cycled CC-LNCM electrode	109.6	253.0
cycled CG-LNCM electrode	44.2	186.9