Supporting Information

Effect of Lithium Silicate Addition on the Micro-Structure and Crack Formation of LiNi_{0.8}Co_{0.1}Mn_{0.1}O₂ Cathode Particles

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Load on sample (mN)				
n	NCM	1 wt.%-LS-NCM811	2 wt.% LS-NCM-811	
1	7.99	4.06	11.60	
2	8.48	8.49	7.20	
3	8.72	7.69	12.90	
4	6.12	5.69	14.80	
5	10.80	8.57	7.02	
6	8.97	9.55	9.52	
7	7.26	13.00	11.70	
8	13.40	11.20	10.80	
9	8.66	4.89	9.53	
10	10.50	10.30	7.86	
11	6.37	3.33	11.20	
12	7.97	5.66	10.70	
13	7.41	12.00	13.60	
14	8.59	3.11	11.50	
15	7.62	14.40	11.90	
16	7.82	12.10	6.32	
17	5.78	8.94	6.23	
18	8.80	15.00	9.10	
19	8.99	6.74	10.20	
20	8.02	6.17	14.00	
21	8.54	4.62	12.30	
22	5.50	4.90	13.50	
23	6.75	14.20	20.20	
24	8.91	12.50	9.44	
25	7.69	9.03	11.50	
26	7.81	7.62	5.64	
27	6.99	11.80	12.90	
28	7.50	13.10	16.70	
29	6.30	18.70	6.14	
30	6.83	7.93	14.00	

Table S1. Crush loads on 30 samples of NCM811, 1 wt.%-LS-NCM811 and 2 wt.%-LS-NCM811 particles.

Cycle number	Sample	Internal resistance (Ω)	D_{Li^+} (cm ² s ⁻¹)
	NCM811	58.7	$7.9 imes~10^{-13}$
1 st	1 wt.%-LS-NCM811	34.8	$1.0 imes 10^{-12}$
	2 wt.%-LS-NCM811	75.5	$9.1 imes 10^{-13}$
	NCM811	58.6	8.3 × 10 ⁻¹³
2 nd	1 wt.%-LS-NCM811	33.0	$8.7 imes 10^{-13}$
	2 wt.%-LS-NCM811	73.1	$8.4 imes 10^{-13}$
	NCM811	68.2	$4.7 imes 10^{-13}$
5 th	1 wt.%-LS-NCM811	34.2	$7.0 imes 10^{-13}$
	2 wt.%-LS-NCM811	87.0	$6.1 imes 10^{-13}$

Table S2. The internal resistances* and calculated values of D_{Li^+} of NCM811, 1 wt.%-LS-NCM811 and 2 wt.%-LS-NCM811 measured at 3.8 V after 1st, 2nd and 5th cycle at 0.1 C.

*The internal resistance is a sum of the electrolyte resistance + (contact + film) resistance and the charge transfer resistance.



Figure S1. XRD patterns of (a) NCM811, 1 wt.% LS-NCM811 and 2 wt.% LS-NCM811 (the magnified one of Fig. 1(a)) and (b) the lithium silicate (without NCM particles) prepared by various Li / Si ratio after heat-treated at at 780°C for 12 h in O_2 .



Figure S2. (a) BF image of 1 wt.% LS-NCM811 and (b) Cross-sectional TEM-EDX elemental map for Ni (red) and Si (green) of 1 wt.% LS-NCM811.



Figure S3. SEM images of (a) $Ni_{0.8}Co_{0.1}Mn_{0.1}(OH)_2$ precursor particles and (b) $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$ particles calcined at 780°C for 12 h in O₂.



Figure S4. N₂ adsorption isotherms of NCM811 and 2 wt.% LS-NCM811.



Figure S5. Cross-sectional SEM images of NCM811 charged to 4.3 V in the 1st cycle.



Figure S6. Cross-sectional SEM images of 2 wt.%-LS-NCM811 discharged to 3.0 V in the 100th

cycle.



Figure S7. The relationships between cumulative number of breaking particles and load on sample.