Supporting Information

Quasi-Solid-State Lithium Metal Batteries Using the $LiNi_{0.8}Co_{0.1}Mn_{0.1}O_2$−$Li_{1+x}Al_xTi_{2-x}(PO_4)_3$ Composite Positive Electrode

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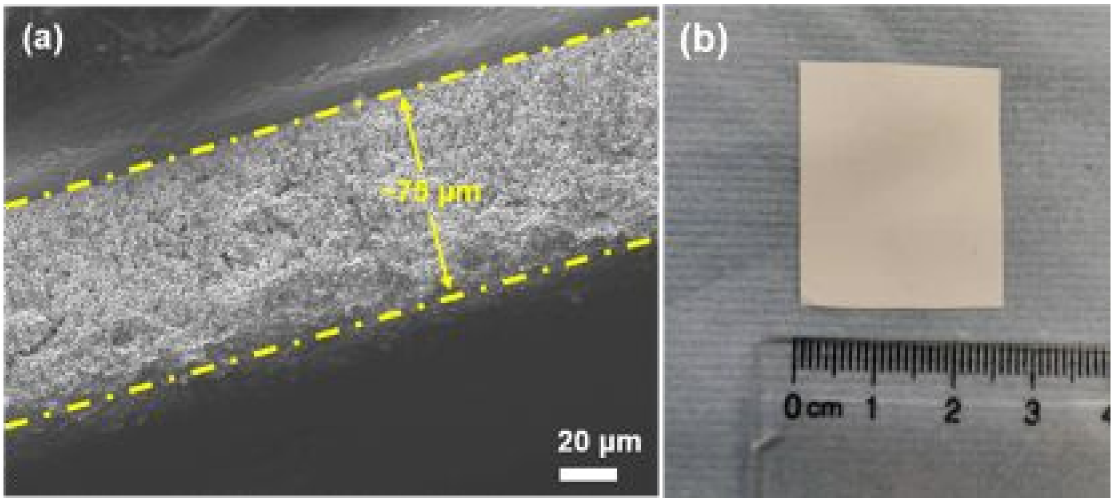

Figure S1. (a) The cross-sectional view and (b) a digital photo of a piece of LATP/PVDF-TrFE/ILE hybrid electrolyte.

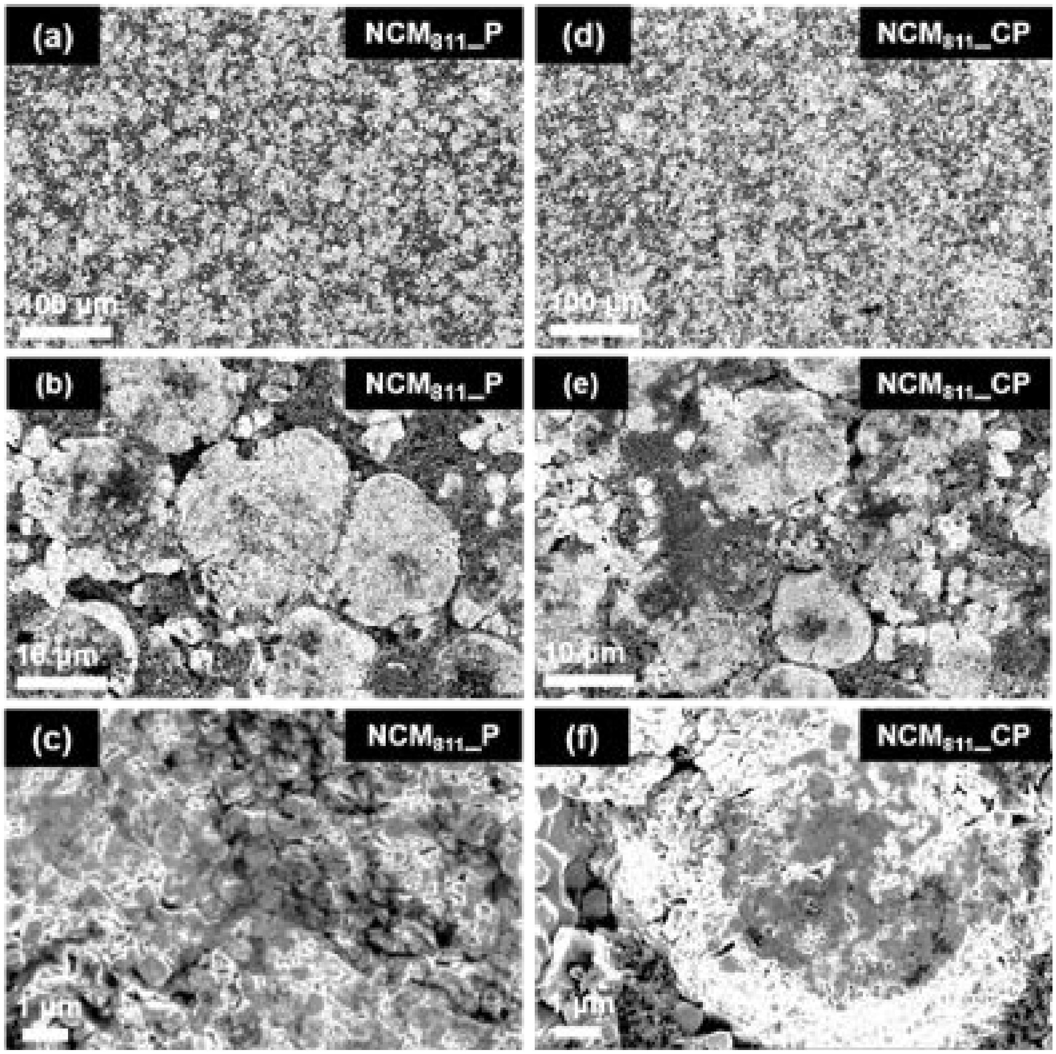

Figure S2. SEM images of pristine (a−c) NCM_{811}_P and (d−f) NCM_{811}_CP electrodes.

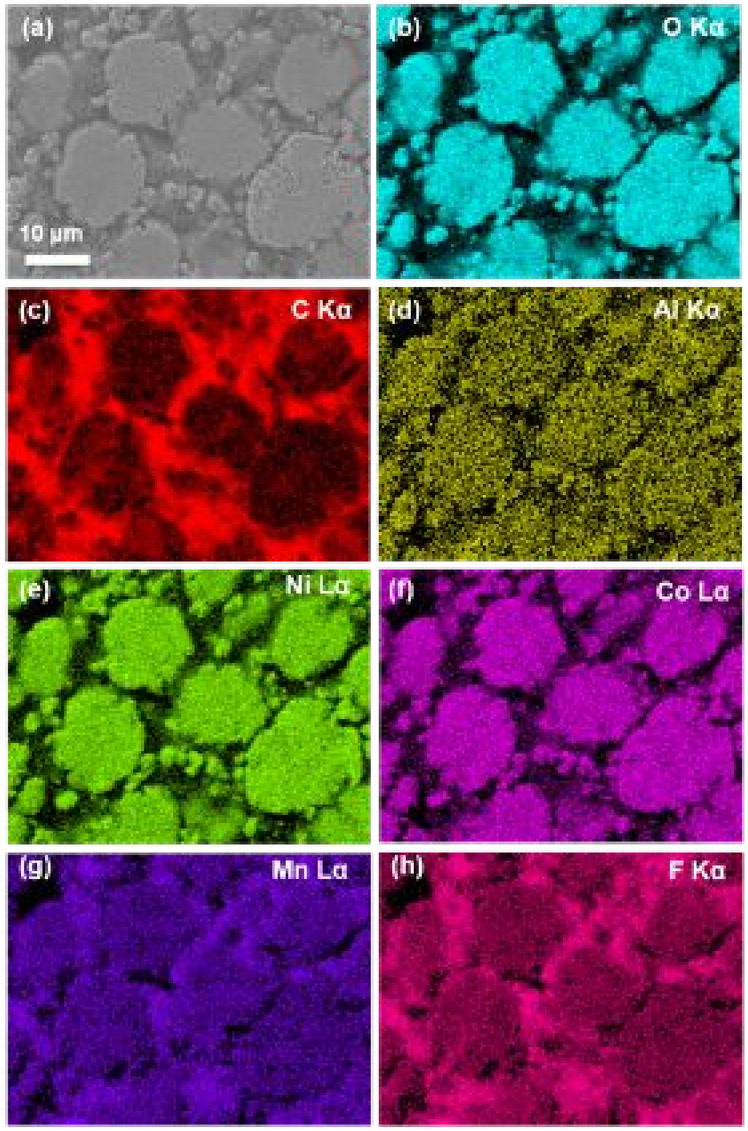

Figure S3. (a) SEM image and corresponding elemental EDS mapping of a pristine NCM_{811}_P electrode: (b) O Kα, (c) C Kα, (d) Al Kα, (e) Ni Lα, (f) Co Lα, (g) Mn Lα and (h) F Kα.

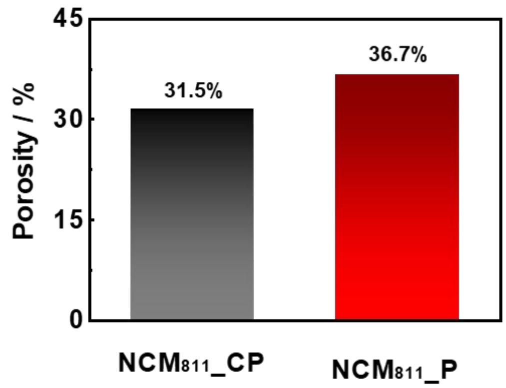

Figure S4. Comparison of electrode porosity of pristine NCM_{811}_CP and NCM_{811}_P electrodes.

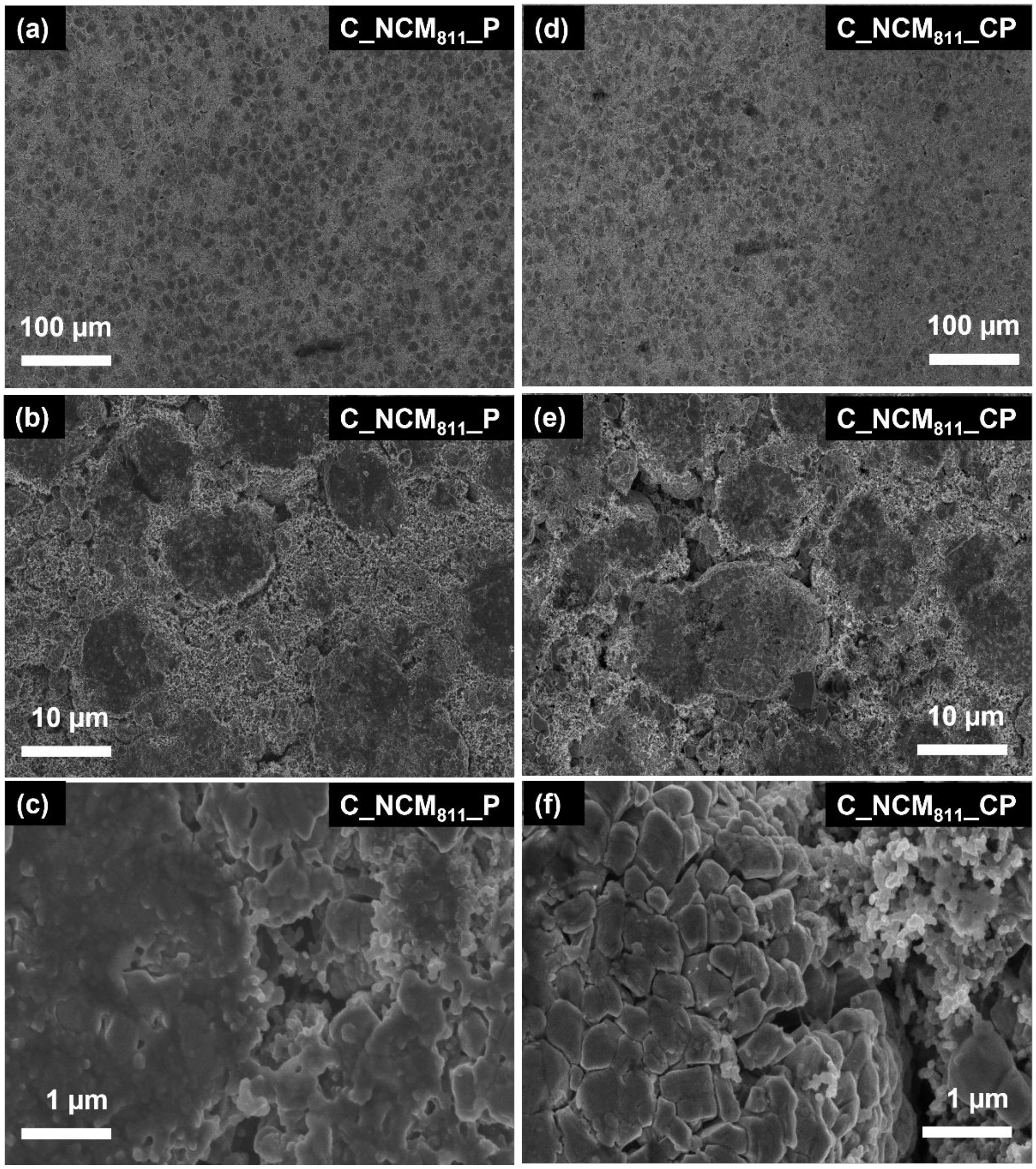

Figure S5. Ex situ electrode morphology investigation of (a−c) cycled NCM_{811}_P (denoted as C_NCM_{811}_P) and (d−f) cycled NCM_{811}_CP (denoted as C_NCM_{811}_CP) electrodes recovered from PTNB@Li||NCM_{811}_P and PTNB@Li||NCM_{811}_CP cells after 200 cycles at 0.5C, respectively.

Figure S6. A digital photo showing the open circuit voltage of a fresh 2-layer bipolar stacked cell.

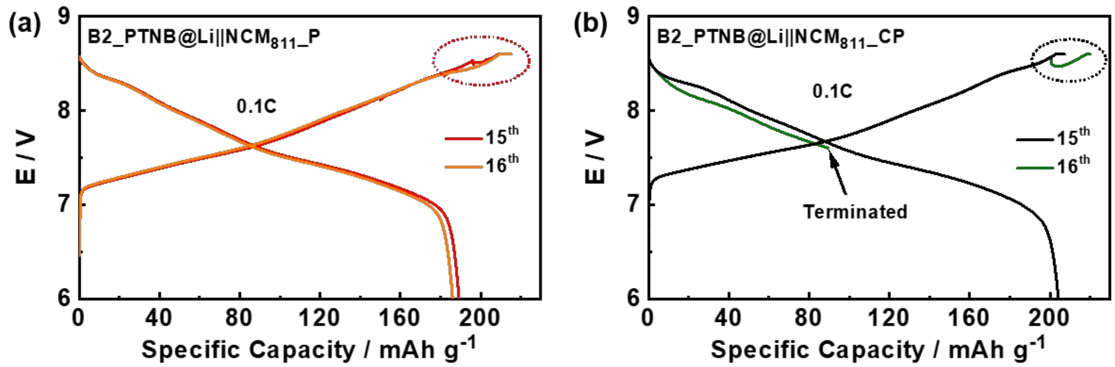

Figure S7. Dis-/charge voltage profiles of 15th and 16th cycles of (a) B2_PTNB@Li||NCM_{811}_P and (b) B2_PTNB@Li||NCM_{811}_CP bipolar cells.

Table S1. The ILE volume percentage within the NCM_{811}_P and NCM_{811}_CP composite electrodes.

Sample	Electrode weight (mg)	Electrode thickness (µm)	Electrode volume[a] (excl. Al, cm^3)	Electrode weight with ILE (mg)	ILE volume[b] (cm^3)	ILE volume (vol.%)
NCM_{811}_P	7.44	24	0.000904	7.81	0.000246	27.2
NCM_{811}_CP	7.71	25	0.001017	8.13	0.000279	27.5

[a] *the thickness of Al current collector is 16 µm;* [b] *the molecular density of ILE is 1.504 g/cm³*

Table S2. Detailed information for the calculation of the NCM_{811}_P electrode porosity.

	Mass fraction (wt.%)	Mass (g)	Theoretical density (g cm^{-3})	Practical volume (cm^3)	Theoretical volume (cm^3)	Porosity (%)
NCM_{811}	92	0.002462	4.70	0.001029	0.000651	36.7
Super C65	4	0.000107	1.60			
PVDF	4	0.000107	1.78			

Table S3. The detailed information for the calculation of the NCM_{811}_CP electrode porosity.

	Mass fraction (wt.%)	Mass (g)	Theoretical density (g cm^{-3})	Practical volume (cm^3)	Theoretical volume (cm^3)	Porosity (%)
NCM_{811}	82	0.002476	4.70	0.001130	0.000774	31.5
Super C65	4	0.000121	1.60			
PVDF	4	0.000121	1.78			
LATP	10	0.000302	2.92			

Table S4. The Z' values collected at 60.9 kHz, 226.2 Hz and 2.7 Hz upon various cycling numbers.

Cycle number	PTNB@Li‖NCM_{811}_P			PTNB@Li‖NCM_{811}_CP		
	Z' (60.9 kHz) / Ω	Z' (226.2 Hz) / Ω	Z' (2.7 Hz) / Ω	Z' (60.9 kHz) / Ω	Z' (226.2 Hz) / Ω	Z' (2.7 Hz) / Ω
20th	14.6	30.7	42.1	14.2	27.2	39.7
40th	14.3	28.8	39.3	14.0	25.1	36.1
60th	14.2	28.0	38.4	14.1	24.4	35.0
80th	14.2	27.5	38.0	13.7	23.6	33.8
100th	14.3	27.4	38.2	14.0	23.4	33.8
120th	14.5	27.5	38.6	14.0	23.1	33.5
140th	14.5	27.6	39.2	14.1	22.9	33.7
160th	14.7	28.1	40.3	14.1	22.8	34.0
180th	14.9	28.5	41.5	14.2	22.8	34.4
200th	15.2	29.2	42.9	14.4	22.8	34.9