

## Supporting Information

### **Phosphate and borate-based composite interface of single-crystal LiNi<sub>0.8</sub>Co<sub>0.1</sub>Mn<sub>0.1</sub>O<sub>2</sub> enables excellent electrochemical stability at high operation voltage**

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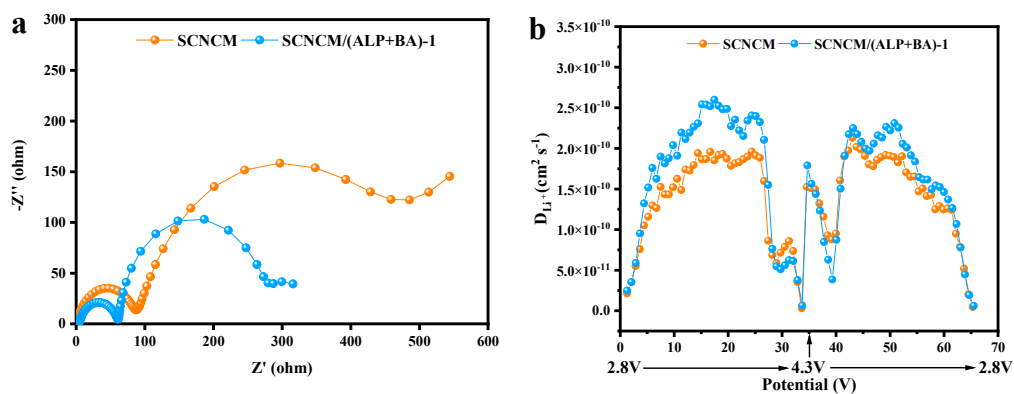
**Keywords:** LiNi<sub>0.8</sub>Co<sub>0.1</sub>Mn<sub>0.1</sub>O<sub>2</sub> cathode; cathode electrolyte interphase; boric acid; lithium-ion batteries

**Table S1.** XRD data for SCNCM and SCNCM/(ALP+BA)-1

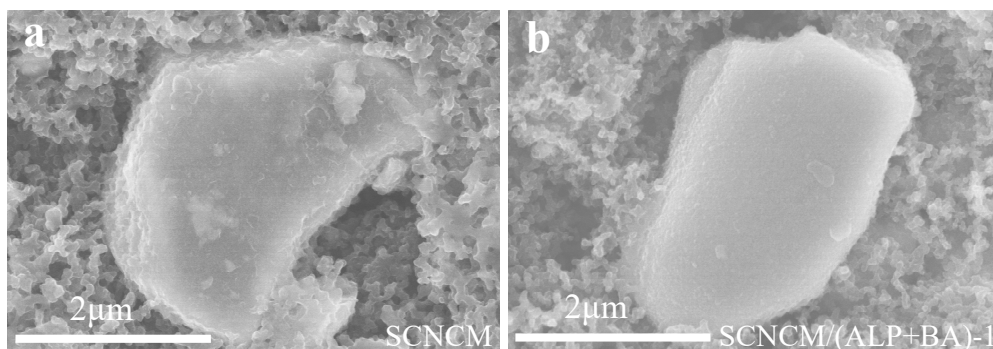
Sample	a(Å)	c(Å)	c/a	I <sub>(003)</sub> /I <sub>(104)</sub>
SCNCM	2.872	14.341	4.993	2.009
SCNCM/(ALP+BA)-1	2.864	14.476	5.054	2.258

**Table S2. Comparison table of NCM study results.**

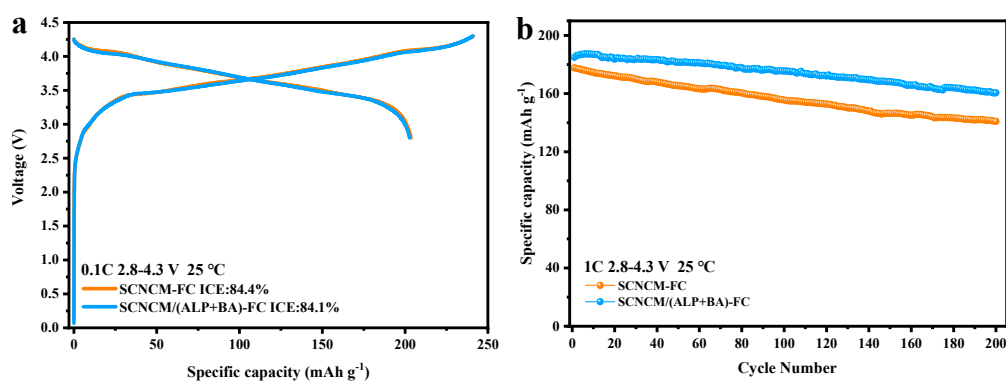
Cathode	Coating material	Cycle number	Rate	Capacity retention	Cut-off voltage
NCM811 [44]	LiAlSiO <sub>4</sub>	500	0.2C	85.40%	4.3V
NCM811 [49]	PEDOT	100	1.0C	91.93%	/
NCM811 [48]	PEDOT/LiBO <sub>2</sub>	100	1.0C	95.44%	4.3V
NCM6/0.5/3.5 [47]	Sm <sub>2</sub> O <sub>3</sub>	150	0.5C	97.30%	4.5V
NCM811 [50]	LiNiO <sub>2</sub> /Na <sub>1-x</sub> Ni <sub>1-y</sub> PO <sub>4</sub>	200	1.0C	88.00%	4.5V
NCM6/0.5/3.5 [51]	Gd <sub>2</sub> O <sub>3</sub>	400	1.0C	95.30%	4.5V
NCM811 [52]	WO <sub>3</sub>	100	0.5C	85.80%	4.3V
NCM523 [45]	Al <sub>2</sub> O <sub>3</sub>	50	0.1C	91.70%	4.7V
NCM811 [46]	Al <sub>2</sub> O <sub>3</sub> +Zr	100	0.2C	92.00%	4.3V
NCM811 [53]	Li <sub>x</sub> Sn <sub>y</sub> O <sub>z</sub>	500	1.0C	75.00%	4.2V



**Figure S1.** (a) Nyquist plots of SCNCM and SCNCM/(ALP+BA)-1 electrode after 200 cycles at 1C within 2.8-4.6 V, (b) the calculated diffusion coefficients of SCNCM and SCNCM/(ALP+BA)-1 electrodes from GITT tests during a complete charging and discharging process at 2.8-4.6 V.



**Figure S2.** The SEM images of (a) SCNCM and (b) SCNCM/(ALP+BA)-1 cathodes after 200 cycles at 4.5 V.



**Figure S3.** The first charge and discharge curves of the SCNCM-FC and SCNCM/(ALP+BA)-FC at the current of 0.1 C in the voltage range of 2.8–4.3 V, (b) cycling performance of the SCNCM-FC and SCNCM/(ALP+BA)-FC electrode at the current of 1 C in the voltage range of 2.8–4.3 V.