

Supplementary Data

The Effect of the Conductive Additive Morphology and Crystallinity on the Electrochemical Performance of Ni-rich Cathodes for Sulfide All-Solid-State Lithium-ion Batteries

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Figure S1.

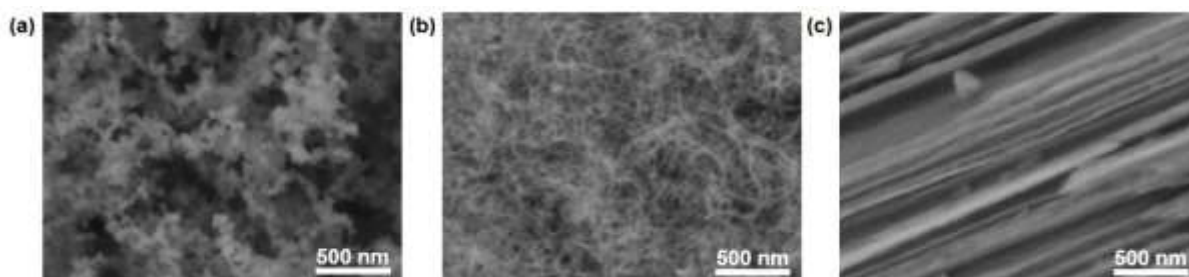


Figure S1 - High magnification scanning electron microscopy (SEM) imaging of the carbon surface of a) Super C, b) CNTs, and c) CNF

Table S1.

Table S1 – Comparison between this work and related publications applying sulfide solid electrolyte and $\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$ in all-solid-state lithium-ion battery systems

Reference	Cathode Active Material (AM)	Solid Electrolyte (SE)	Conductive Additive (CA)	Mass Ratio (AM:SE:CA:BM)	Discharge Capacity (mAh g^{-1})	ICE	C-Rate	Volt. Range (vs. Li/Li^+)	Retention	C-Rate	Temperature
S1 [1]	NCM811	$\text{Li}_{10}\text{SnP}_2\text{S}_{12}$	AB	50:48:2:0	165	67.9%	0.1C	2.85-4.35V	77.8%@100cyc	0.1C	30°C
S2 [2]	NCM811	$\text{Li}_6\text{PS}_5\text{Cl}$	Super P	70:29:1	175	84.1%	0.1C	2.52-4.22V	--	0.1C	25°C
S3 [3]	NCM811	$\text{Li}_6\text{PS}_5\text{Cl}$	VGCF	70:30:0:0	162.3	76.8%	0.1C	2.62-4.22V	71.8%@270cyc	1C	30°C
S4 [4]	NCM811	$75\text{Li}_2\text{S}-25\text{P}_2\text{S}_5$	Denka black	60:35:5:0	141	61.3%	0.1C	2.52-4.22V	93.75%@40cyc	0.1C	RT
S5 [5]	NCM811	$75\text{Li}_2\text{S}-25\text{P}_2\text{S}_5$	Denka black	70:30:0:0	124	70.5%	0.1C	2.7-4.3V	65.3%@50cyc	0.1C	25°C
S6 [6]	NCM811	$\text{Li}_6\text{PS}_5\text{Cl}$	Super P	70:28:02	157	66.2%	0.1C	2.62-4.42V	63%@30cyc	0.1C	RT
S7 [7]	NCM811	$\text{Li}_{5.6}\text{PS}_{4.6}\text{S}_{1.0}\text{Br}_{0.4}$	$\text{Li}_6\text{PS}_5\text{Cl}$	70:27:3:0	181.2	67%	0.1C	2.62-4.4V	75.3%@50cyc	0.1C	25°C
			carbon		188.4	64%					
			CNF		163.6	85.98%					
This work	NCM811	$\text{Li}_6\text{PS}_5\text{Cl}$	CB	70:30:5:0	111.8	70.45%	0.05	2.5-4.3V	72.6%@50cyc	0.5C	30°C
			CNT		137.8	77.58%					

Figure S2.

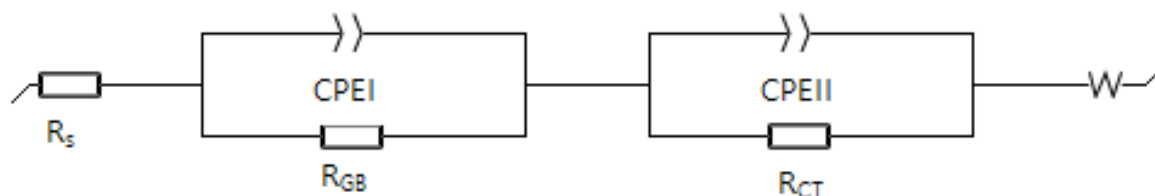


Figure S2. Equivalent circuit diagram associated with the electrochemical impedance spectroscopy (EIS) analysis conducted and provided in Figure 3 of the main manuscript.

Table S2.

Table S2 – The charge/discharge capacity data of the cycles outlined in Figure 5 of the main manuscript

Samples	1 st Cycle		10 th Cycle		20 th Cycle		30 th Cycle		40 th Cycle		50 th Cycle	
	Charge Capacity	Discharge Capacity	Charge Capacity	Discharge Capacity	Charge Capacity	Discharge Capacity	Charge Capacity	Discharge Capacity	Charge Capacity	Discharge Capacity	Charge Capacity	Discharge Capacity
NCM-CNF	188.2	163.6	157.8	157.4	151.8	151.6	146.7	146.4	141.9	141.5	137.5	137.3
NCM-CNTs	173.8	137.7	124.8	123.6	113.4	112.5	105.1	104.4	98.5	98.0	93.4	92.9
NCM-CB	141.1	111.81	100.9	99.6	94.4	92.8	88.9	87.5	85.3	84.2	81.6	81.2

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