Supporting Information

A succinonitrile infiltrated silica aerogel synergistically-reinforced hybrid solid electrolyte for durable solid-state lithium metal batteries

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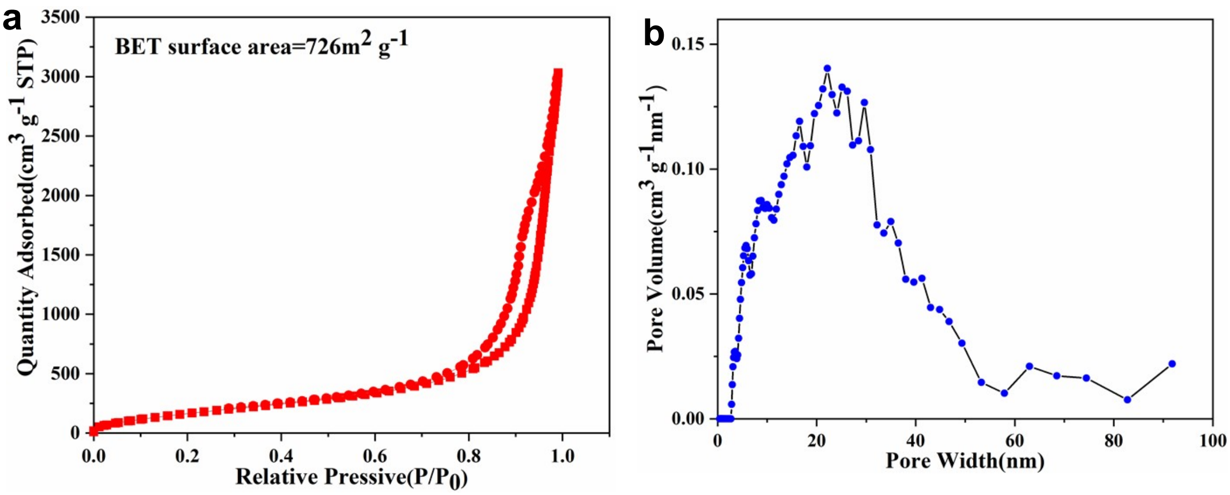

Fig. S1 BET surface area (a) and pore size distribution (b)

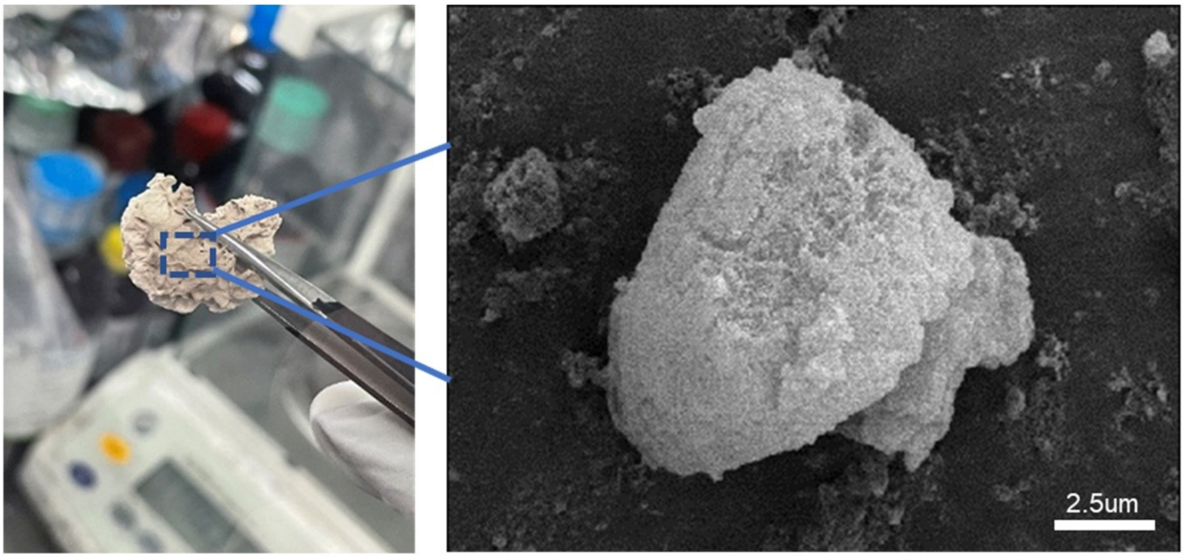

Fig. S2 The digital image (left) and SEM image (right) of SNE@SAG precursor

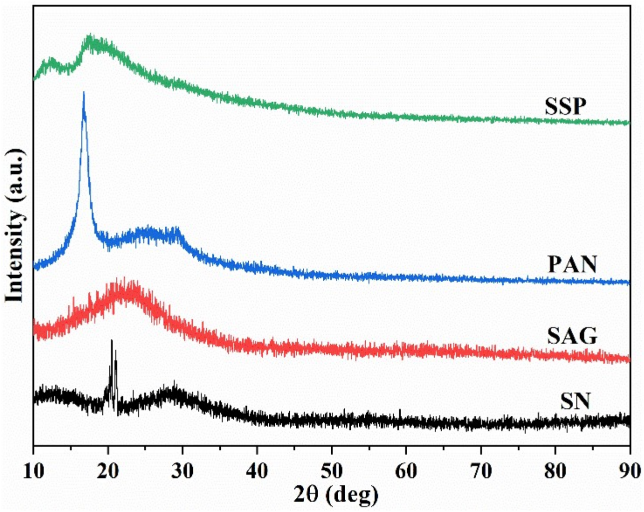

Fig. S3 XRD patterns of SSP, PAN, SAG and SN

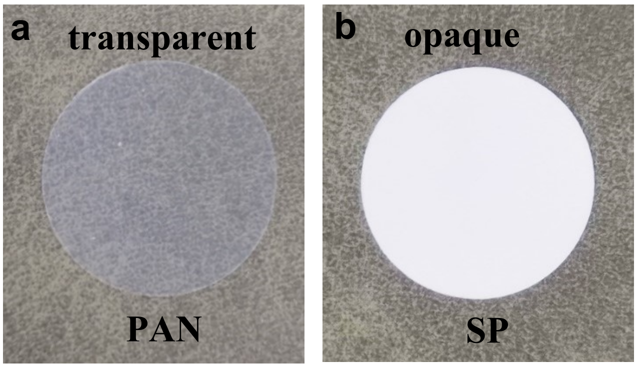

Fig. S4 The images of PAN (a) and SP (b) membranes

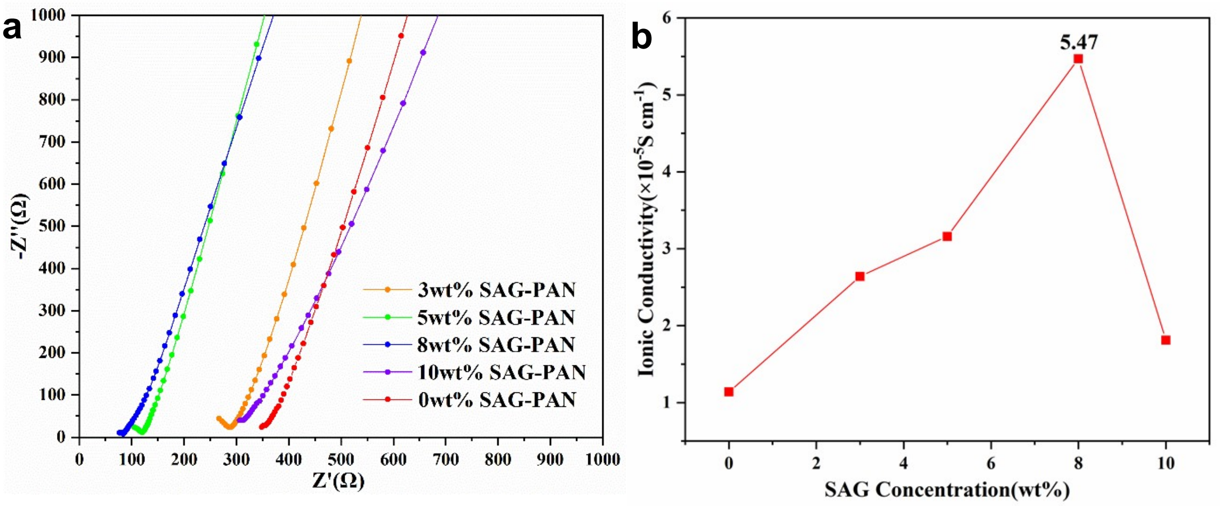

Fig. S5 The EIS curves of SAG-PAN HSEs with different SAG content (a) and the corresponding ionic conductivity (b)

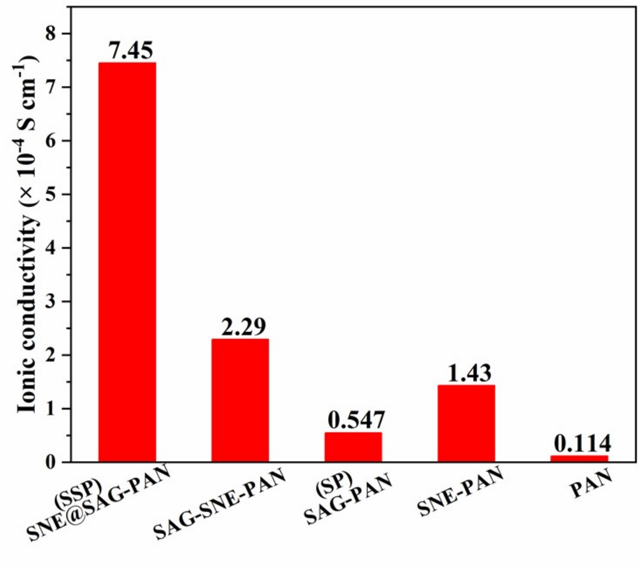

Fig. S6 The comparison of ionic conductivity of different HSEs in this work

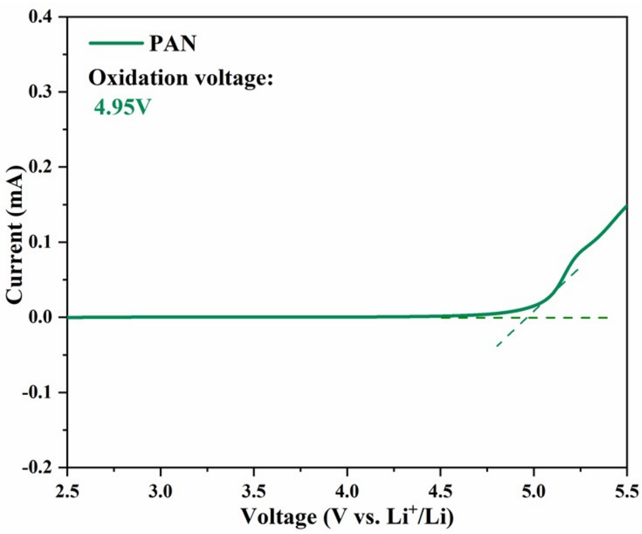

Fig. S7 The linear sweep voltammetry (LSV) tests of PAN

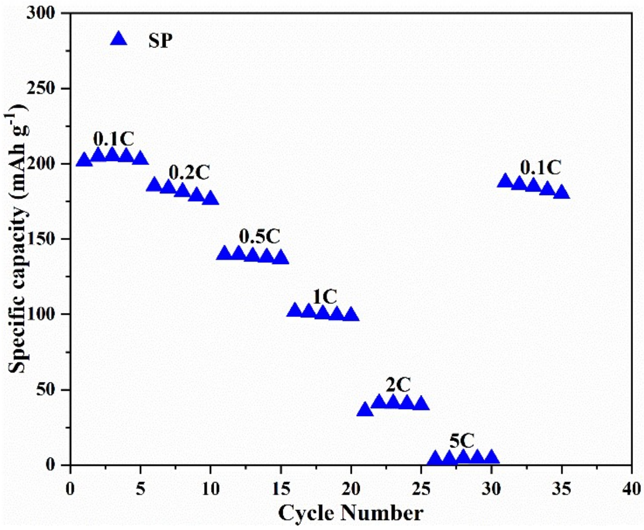

Fig. S8 The rate performance of NCM811/SP/Li cell

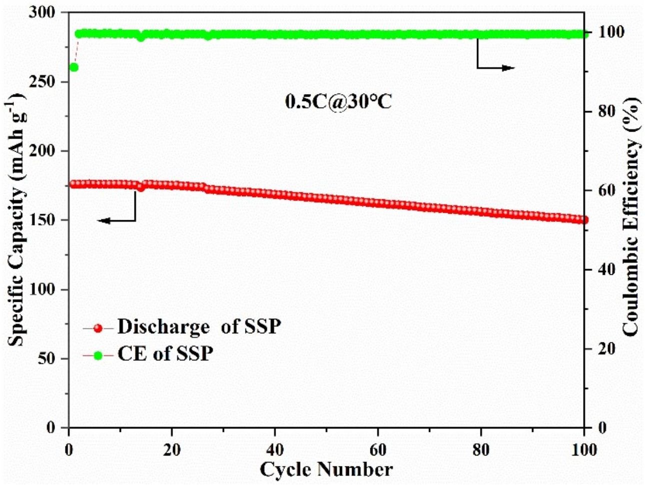

Fig. S9 The cycling performance of NCM811/SSP/Li cell at 0.5C

Table S1 FTIR peak positions and percentage of C≡N peak area for PAN, SP and SSP

Sample	Unbonded C≡N		Bonded C≡N	
	(cm^{-1})	**(%)**	**(cm^{-1})**	**(%)**
PAN	2243	84.4	2254	15.6
SP	2242	61	2251	39
SSP	2243	90	2255	10

Table S2 Battery properties of the recent reports and this work

HSEs	**Cathode**	**1st discharge capacity (0.1C)**	**Cycling performance**	**Ref.**
PTFE-LLZTO-SN	NCM523	158 mAh g^{-1}	90.7% capacity retention after 100 cycles at 0.1C	S1
PTFE-PVDF-HFP-LiTFSI/LiBOB-ADN	NCM811	168 mAh g^{-1}	78.3% capacity retention after 1000 cycles at 2C	S2
PI-PVDF-LLZTO	NCM523	161 mAh g^{-1}	94.9% capacity retention after 80 cycles at 0.1C	S3
PVDF-LLZTO	NCM111	200.3mAh g^{-1} (0.05C)	～62% capacity retention after 100 cycles at 0.2C	S4
PAN-PAN@LAGP-PEGDA	NCM622	180 mAh g^{-1}	81.5% capacity retention after 270 cycles at 0.5C	S5
PVDF-HFP/LLZTO-PEO	NCM111	123 mAh g^{-1}	85.3% capacity retention after 100 cycles at 0.2C	S6
PEO-SAG	LFP	/	85% capacity retention after 200 cycles at 0.5C	S7
SNE@SAG-PAN	**NCM811**	**200.5 mAh g^{-1}**	**capacity retention：86% after 100 cycles at 0.5C，73.2% after 200 cycles at 1C**	**This work**

References

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