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Electronic Supplementary Information

Porous Nitrogen-Doped Carbon Nanofibers Assembled with Nickel nanoparticles for Lithium-Sulfur Battery

Qi Li[a], Jiangna Guo[a], Jun Zhao[b], Cancan Wang[a] and Feng Yan[a,*]

[a] Jiangsu Key Laboratory of Advanced Functional Polymer Design and Application, Department of Polymer Science and Engineering, College of Chemistry, Chemical Engineering and Materials Science, Soochow University, Suzhou, 215123, China.

[b] Sichuan College of Architectural Technology, Deyang 618000, China.

E-mail: fyan@suda.edu.cn

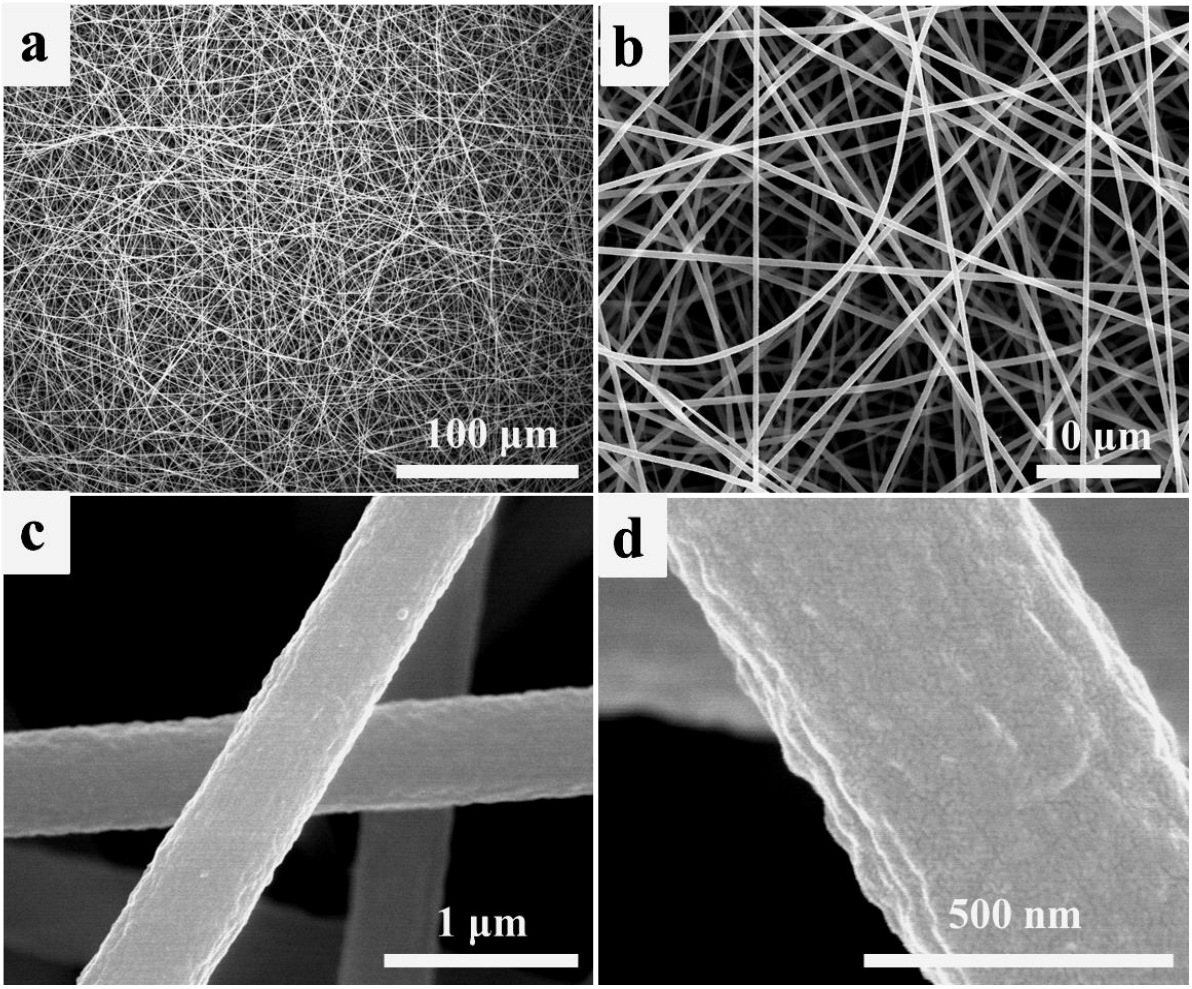

Figure S1. SEM images of Ni-precursor film with different scales.

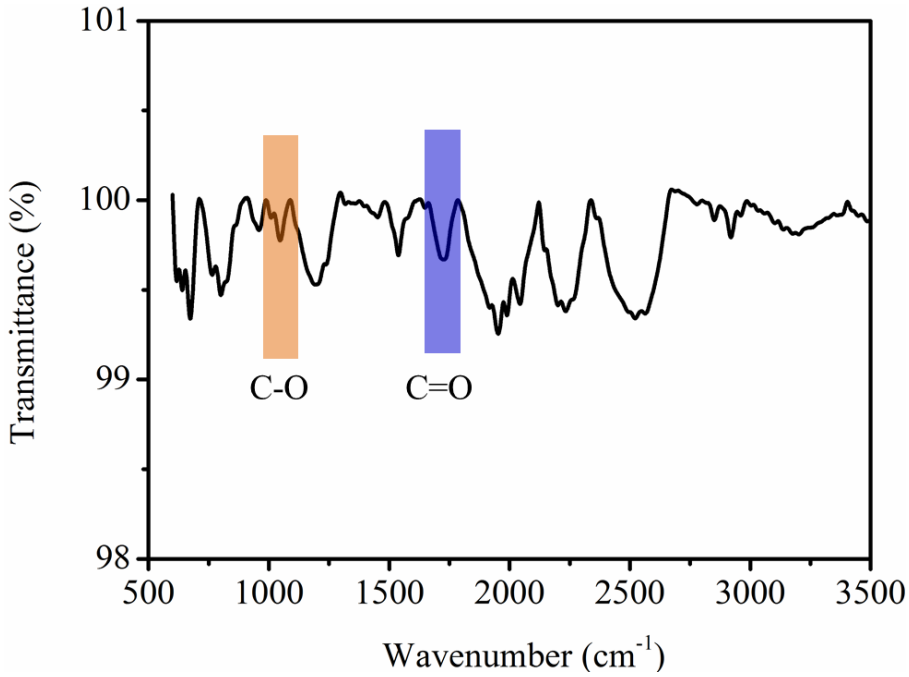

Figure S2. FTIR spectrum of Ni/PCNFO.

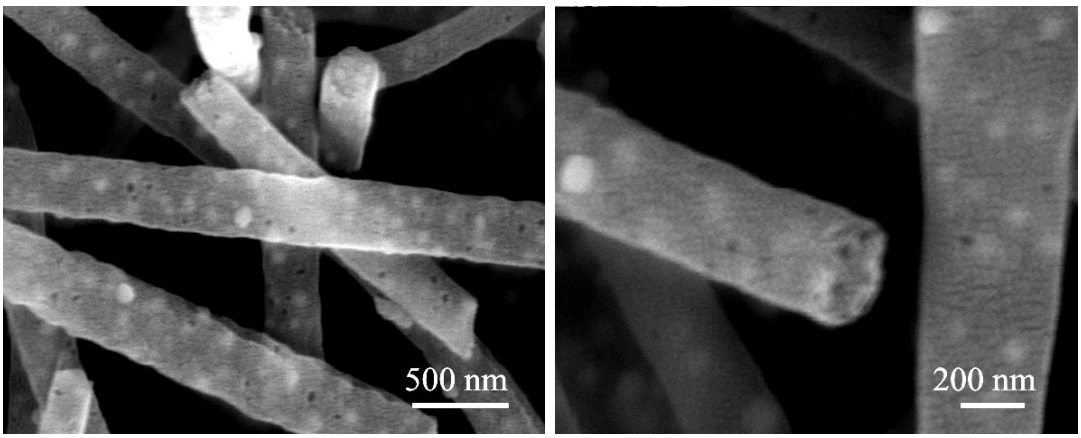

Figure S3. Higher magnification SEM images of Ni/PCNFO.

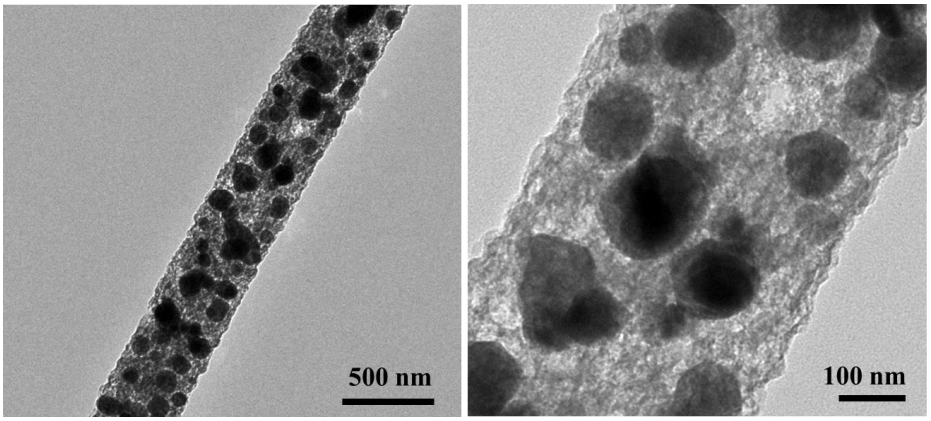

Figure S4. TEM images of Ni/PCNF with different scales.

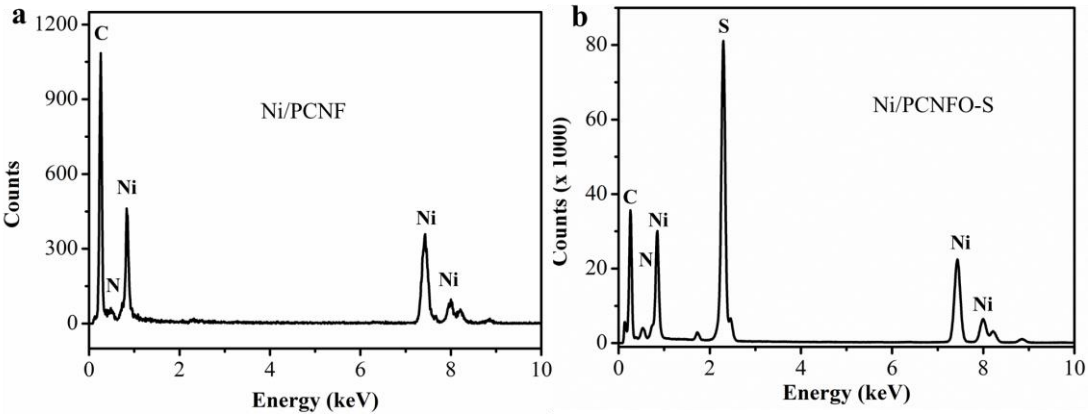

Figure S5. The EDS pattern of (a) Ni/PCNF and (b) Ni/PCNFO-S composite.

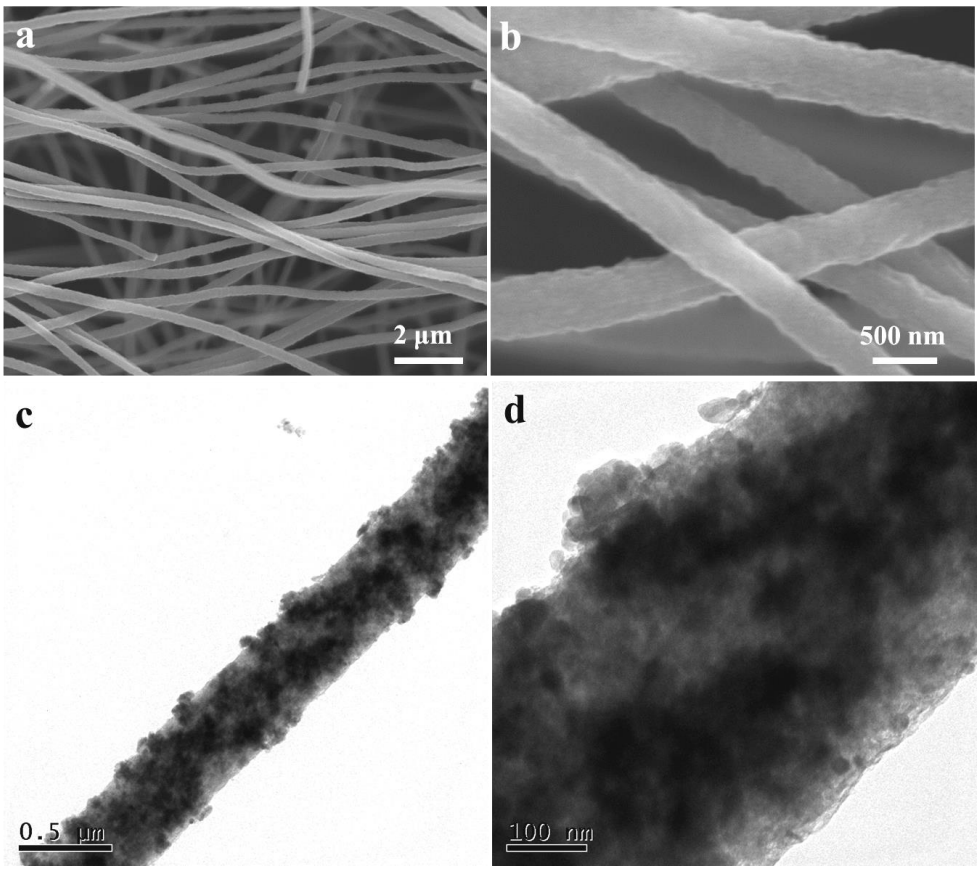

Figure S6. SEM images of Ni/PCNFO-S.

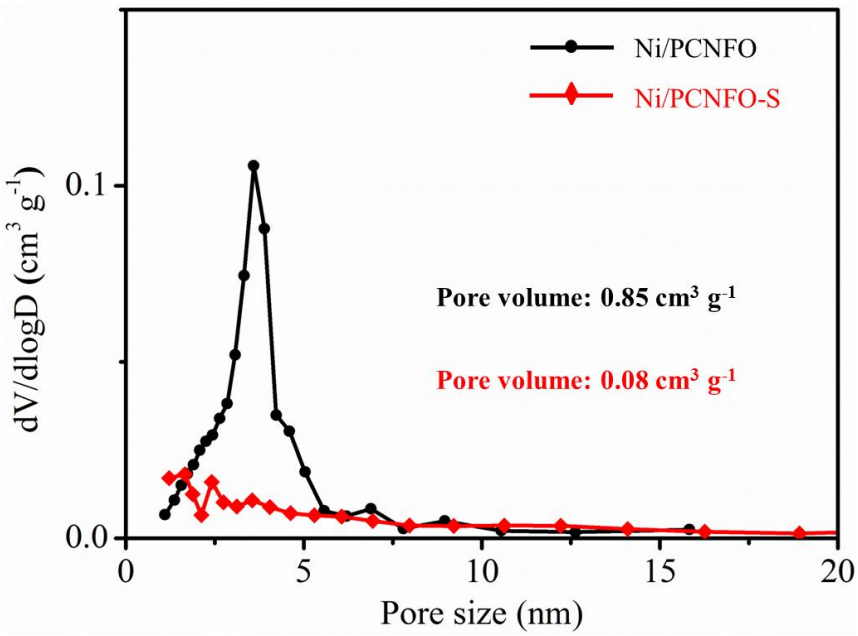

Figure S7. Pore size distribution curves of Ni/PCNFO and Ni/PCNFO-S.

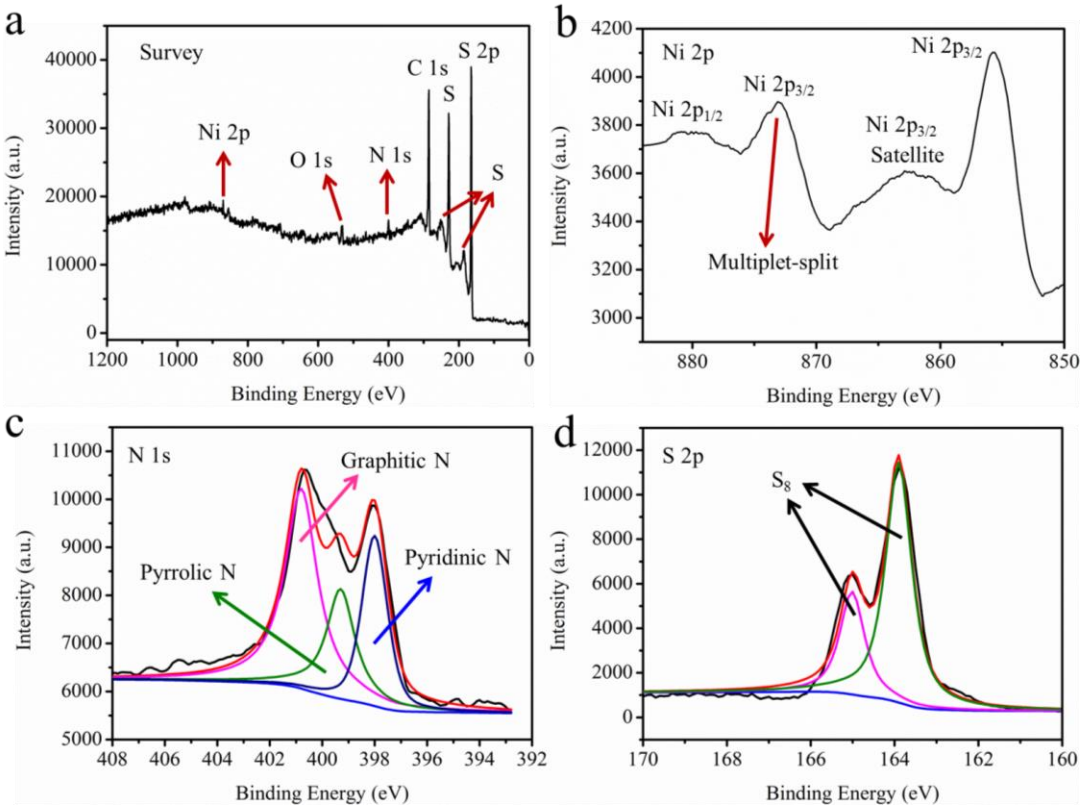

Figure S8. (a) Survey XPS spectrum of Ni/PCNFO-S. High-resolution XPS spectrum at Ni 2p, (c) N 1s, and (d) S 2p region of Ni/PCNFO-S.

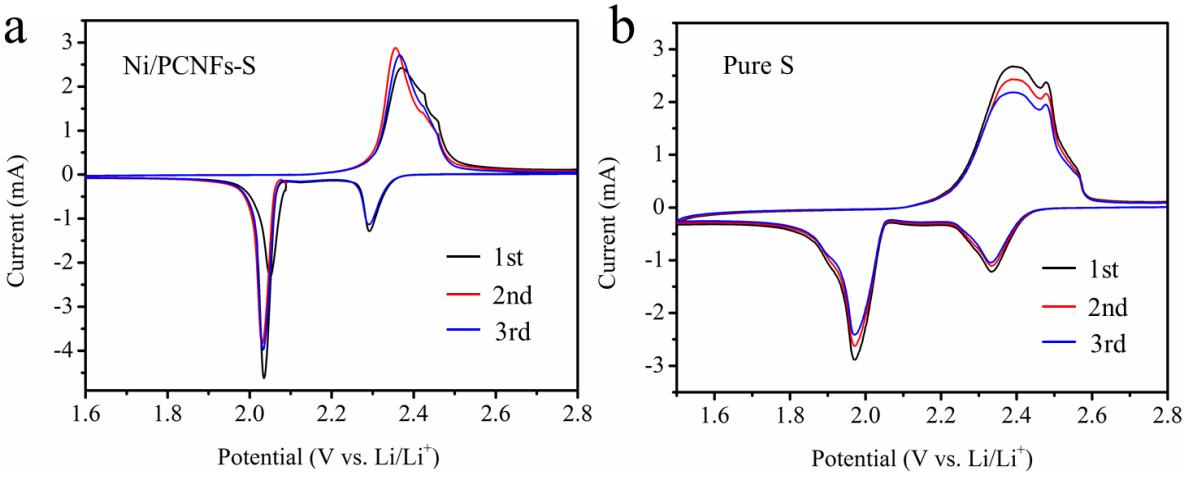

Figure S9. CV curves of (a) PCNF-S and (b) pure S cathodes at a scan rate of 0.1 mV s^{-1} at the 1st, 2nd, and 3rd cycles between 1.6 and 2.8 V with a sulfur loading of 2.4 mg cm^{-2}.

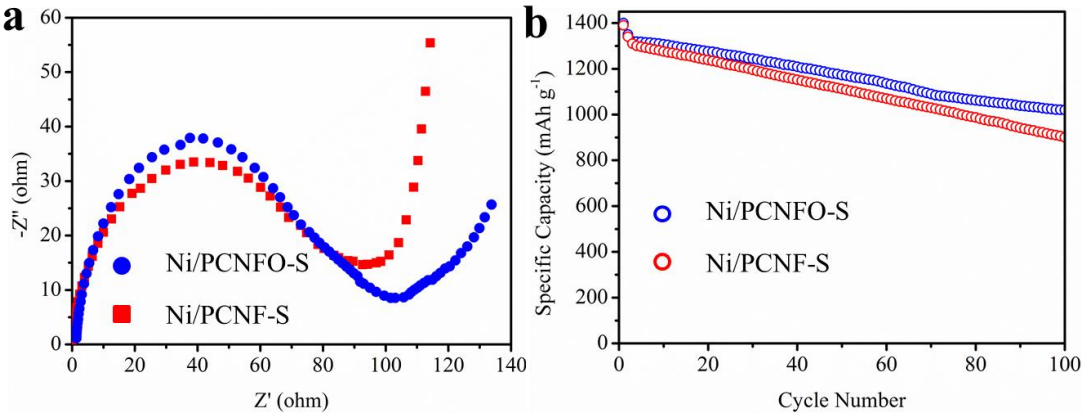

Figure S10. (a) EIS spectra and (b) cycling performance of Ni/PCNFO-S and Ni/PCNF-S cathodes with a sulfur areal loading of 1.8 mg cm^{-2}, respectively.

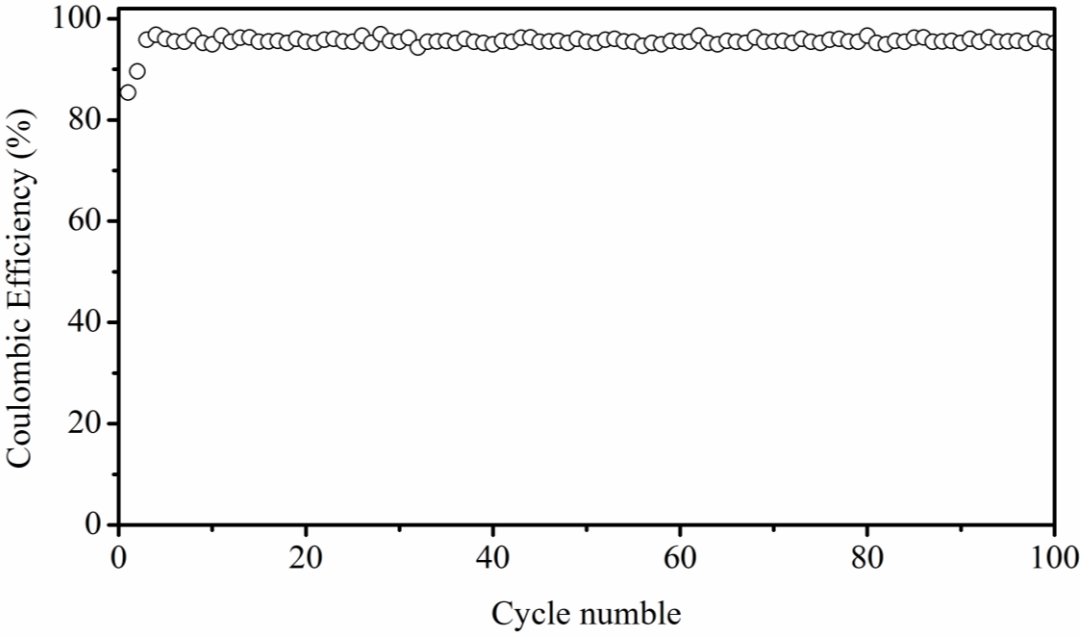

Figure S11. Coulombic efficiency of pure S cathode at 0.2 C with the sulfur loading of 1.8 mg cm^{-2}.

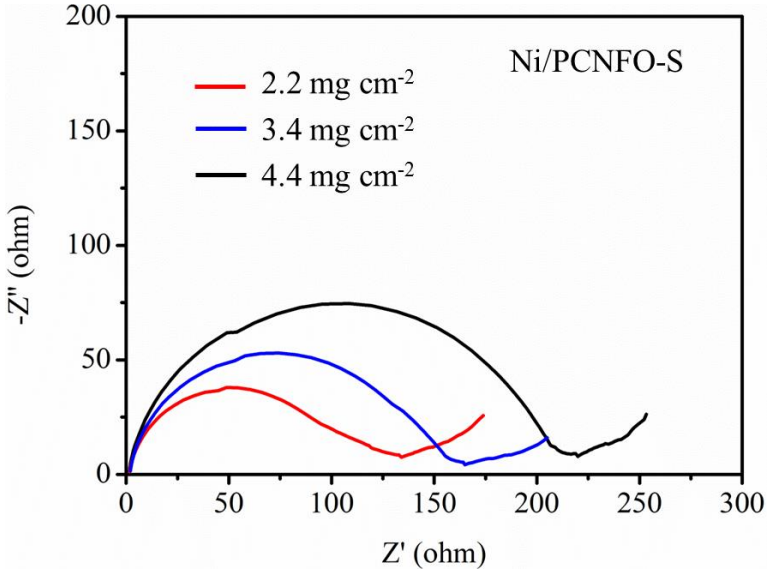

Figure S12. EIS spectra of Ni/PCNFO-S cathodes with different areal sulfur loadings.

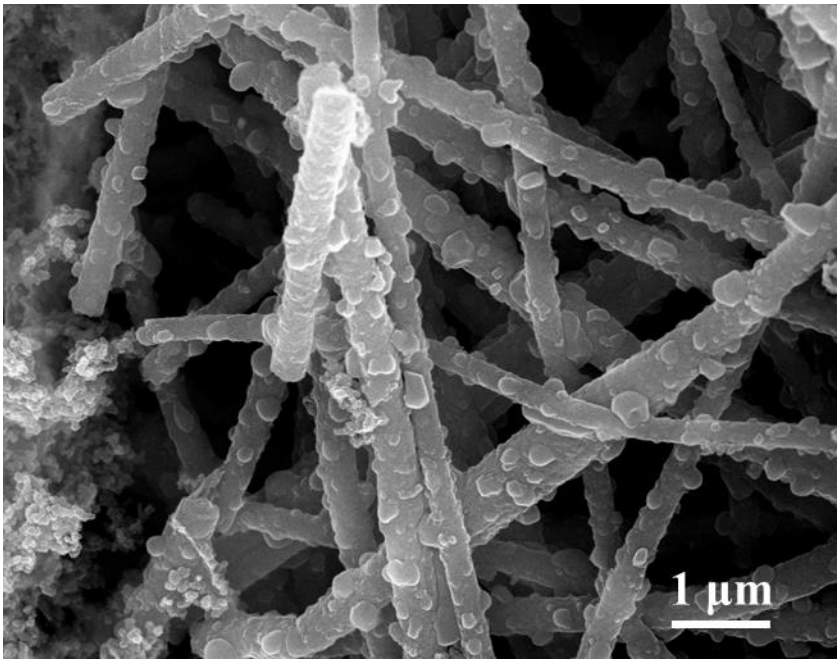

Figure S13. SEM image of Ni/PCNFO-S cathode after 500 discharge-charge cycles.

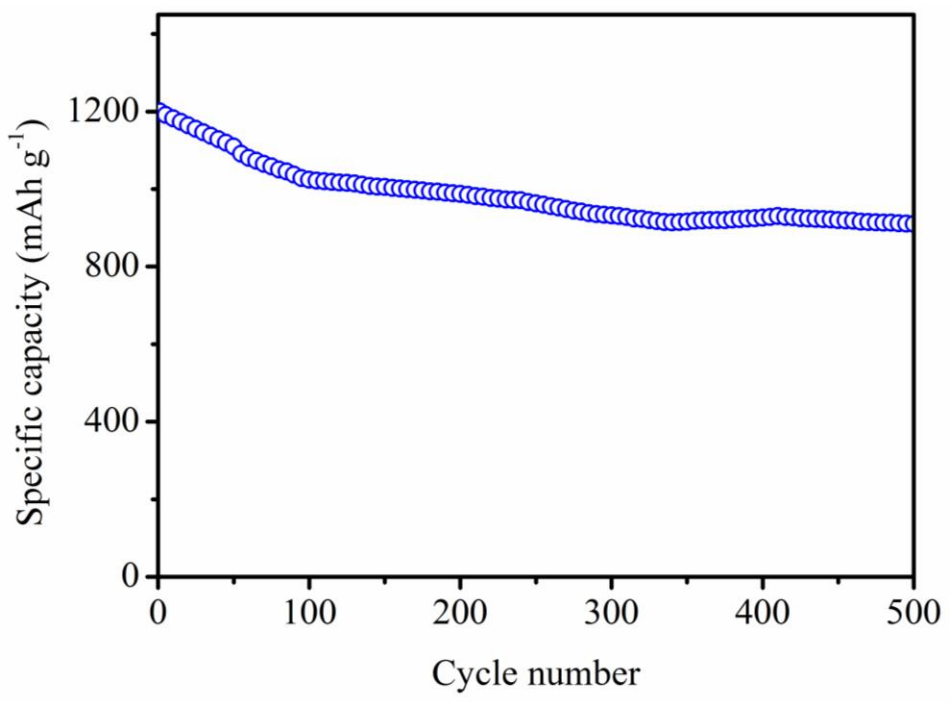

Figure S14. Long-term cycling performances of Ni/PCNFO-S cathode under 0.2 C with the sulfur loading of 2.2 mg cm^{-2}.

Table S1. Electrochemical performances of the representative carbon-based sulfur composite cathodes.

Sulfur hosts structure	Sulfur content (wt. %)	Sulfur loading (mg cm^{-2})	Current rate (C)	Initial capacity (mAh g^{-1})	Cycle number	Capacity Retention (mAh g^{-1})	Rate capacity (mAh g^{-1} /C)
PRC/S	66.4	2.0	0.2	923	500	325	153 /5C
PRC/Ni/S[47]	75.1	2.0	0.2	993	500	813	573 /5C
Highly ordered nitrogen-rich mesoporous carbon[55]	53.3	0.7-1.0	1.0	1209	200	600	595 /3C
Acetylene black[56]	36.0	1.5	0.1	935	50	500	-
Carbon black nanoparticles[57]	84.0	2.0	0.1	1250	100	865	850 /1C
Graphitized porous carbon[58]	90.0	0.8-1.0	0.1	908	100	739	-
Single-wall carbon nanotube network[38]	95.0	4.8	-	1212	140	842	-
Porphyrin-derived graphene-based nanosheets[16]	-	~ 0.1	0.2	1212	300	798	988 /2C
Graphene oxide-carbon nanotube[59]	75.0	2.3	-	-	300	-	-
N,O dual-doped porous carbon microrods[60]	79.0-90.0	-	0.2	1327	160	1071	558 /4C
BCF/S	60.0	-	0.2	1019	200	447	188 /5C
PCGF/Ni/S[61]	68.0		0.2	1198	200	1030	746 /5C

MOFs-derived N-doped porous carbon/graphene[62]	64.0	~ 2.4	0.1	1372	300	608	786 /1C
Carbon nanofiber[63]	65.0	2.6	<0.05	>1600	70	1000	-
Rice husks derived porous carbon[64]	75.0	1.6	0.1	1032	50	742	-
Sulfur-nickel foam cathode [65]	-	-	0.5	1340	500	493	212 /5C
Conventional cathode	60%	-	0.2	750	50	810	-
3D sulfur-nickel foam cathode[66]	60.0	-	0.2	950	50	400	-
This work	81.1	1.8	0.2	1320	100	1070	780 /3C