Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Self-Assembled N-Graphene Nanohollows Enabling Ultrahigh Energy Density Cathode for Li-S Batteries

Hanting Tang, Jinlong Yang, Guangxing Zhang, Chaokun Liu, Han Wang, Qinghe Zhao, Jiangtao Hu, Yandong Duan and Feng Pan*

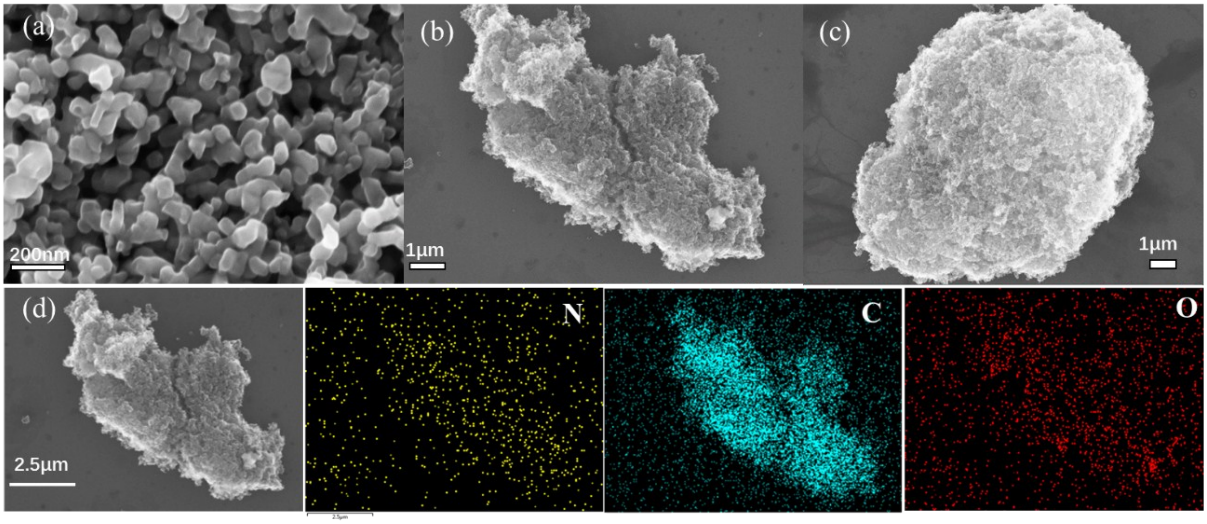

Figure S1. SEM images of (a) PB, (b) PSSN and (c) PSSN/S. (d) EDX mapping of C, N, O elements collected from a selected area of PSSN.

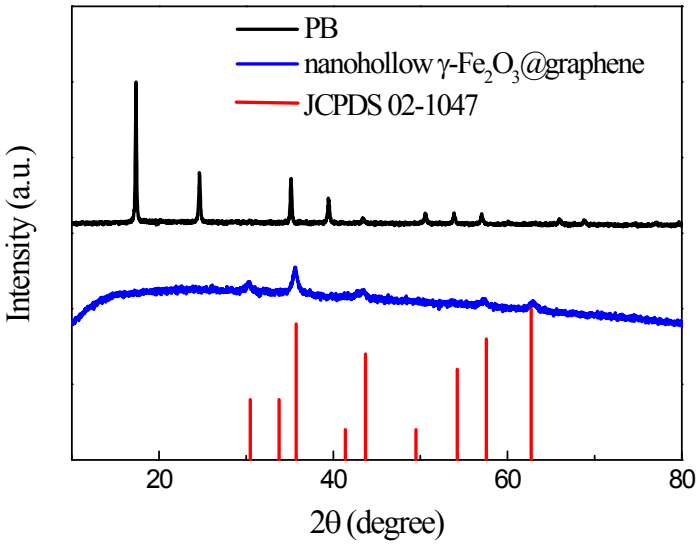

Figure S2. XRD patterns of PB and nanohollows γ-Fe_2O_3@graphene.

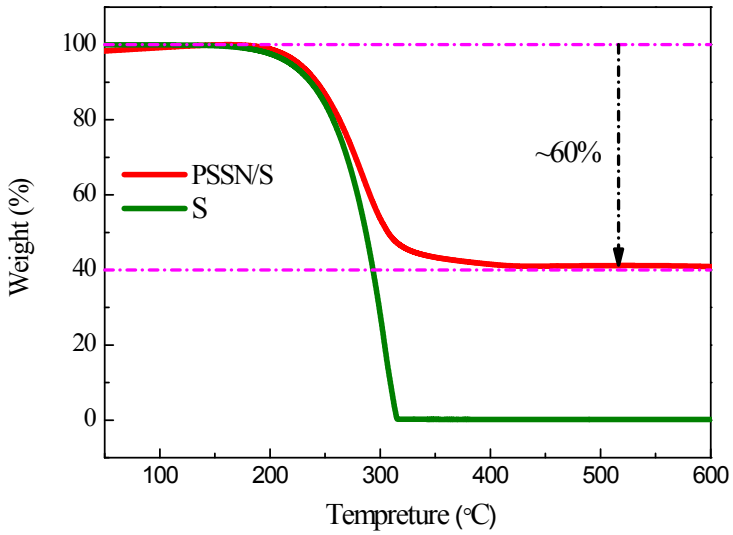

Figure S3. TGA curves of elemental S and PSSN/S measured in N_2 atmosphere.

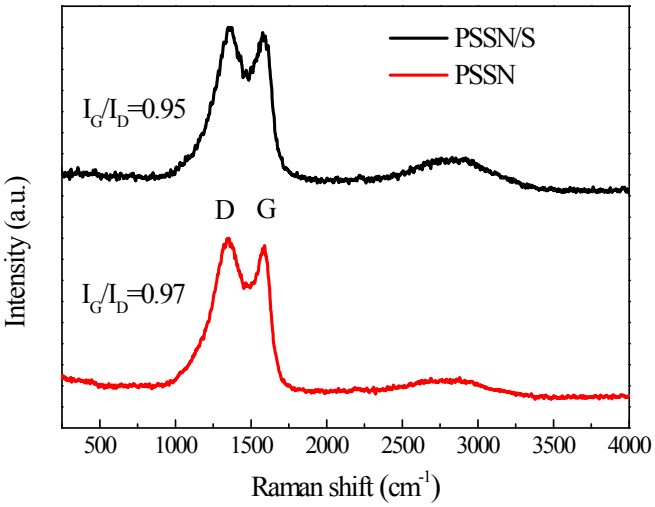

Figure S4. Raman spectra of PSSN and PSSN/S.

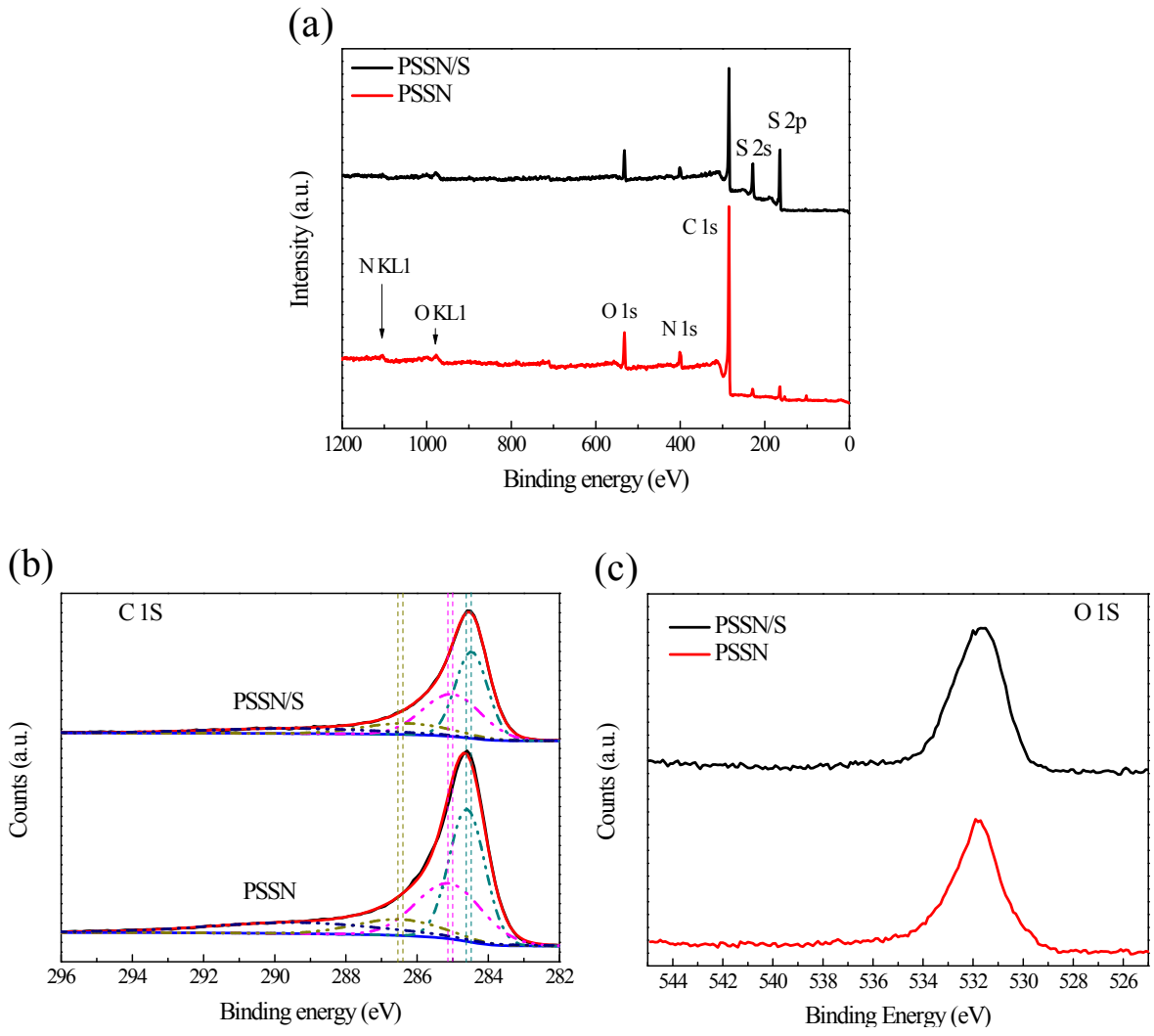

Figure S5. (a)full spectra, (b) C 1S and (c) O 1s XPS of PSSN and PSSN/S.

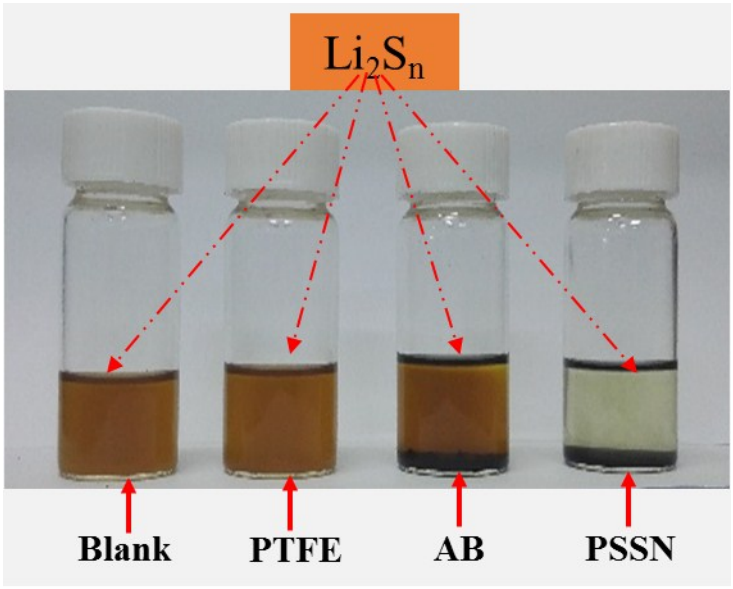

Figure S6. Polysulfides adsorption experiments of different materials in PSSN/S electrode.

Table S1. Surface element contents in PSSN and PSSN/S samples analyzed by XPS.

	Element	Content (%)
PSSN	C	85.7
	N	7.4
	O	6.9
PSSN/S	C	69.7
	N	6.2
	O	5.8
	S	18.3

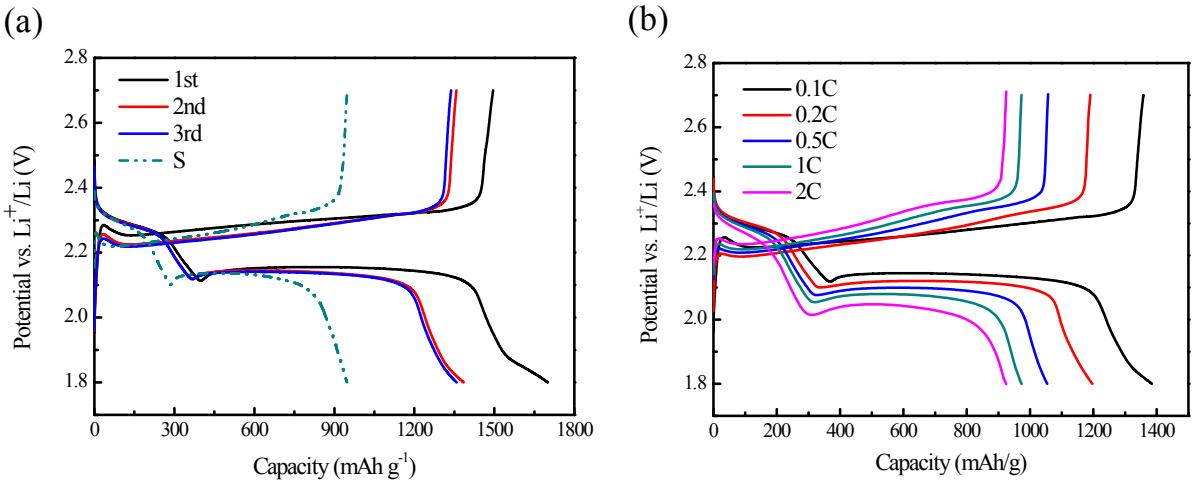

Figure S7. (a) Galvanostatic charge/discharge curves of PSSN/S cathode at 0.1 C in the voltage range of 1.8-2.7 V vs. Li^+/Li and the comparison with S cathode. (b) Galvanostatic charge/discharge curves of PSSN/S cathode at different current densities.

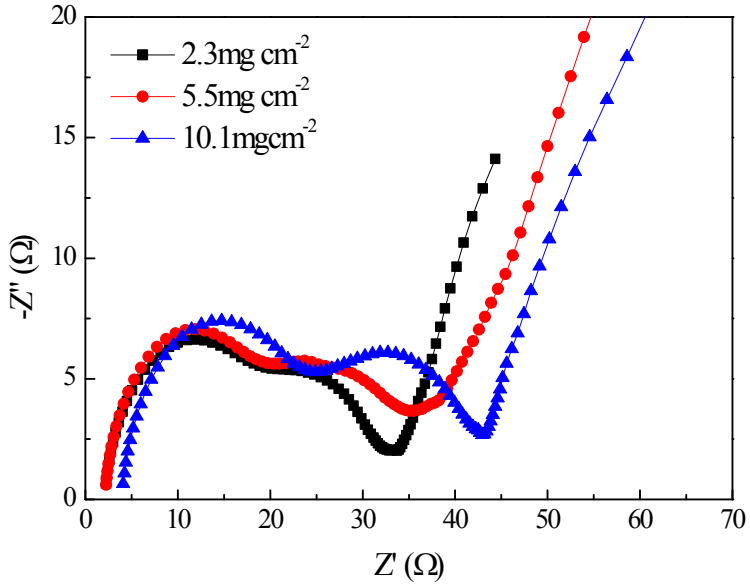

Figure S8. electrochemical impedance spectra of PSSN/S cathodes with 2.3, 5.5 and 10.1 mg cm^{-2} of sulfur loading after 5th cycle.

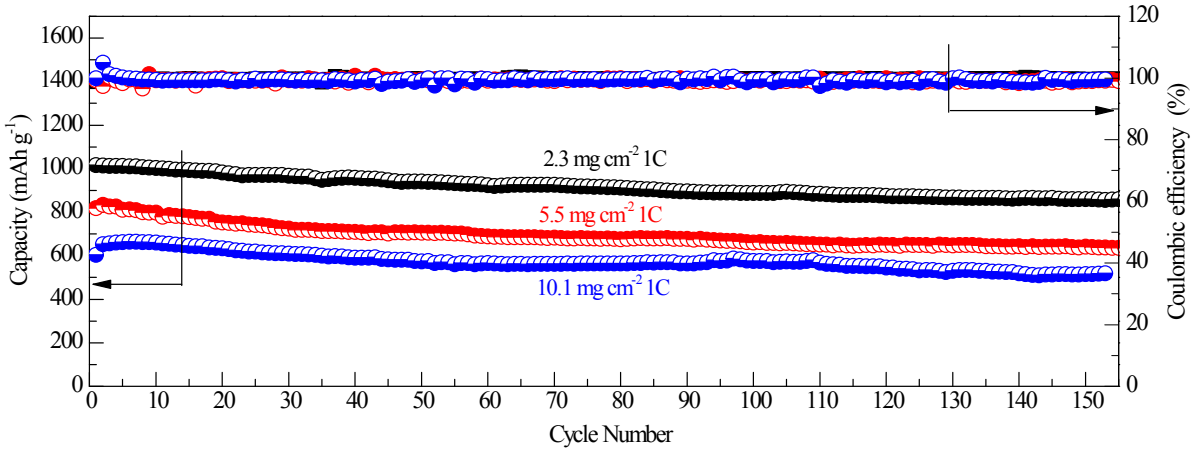

Figure S9. Specific capacities of PSSN/S cathodes with sulfur loading of 2.3, 5.5 and 10.1 mg cm^{-2}.

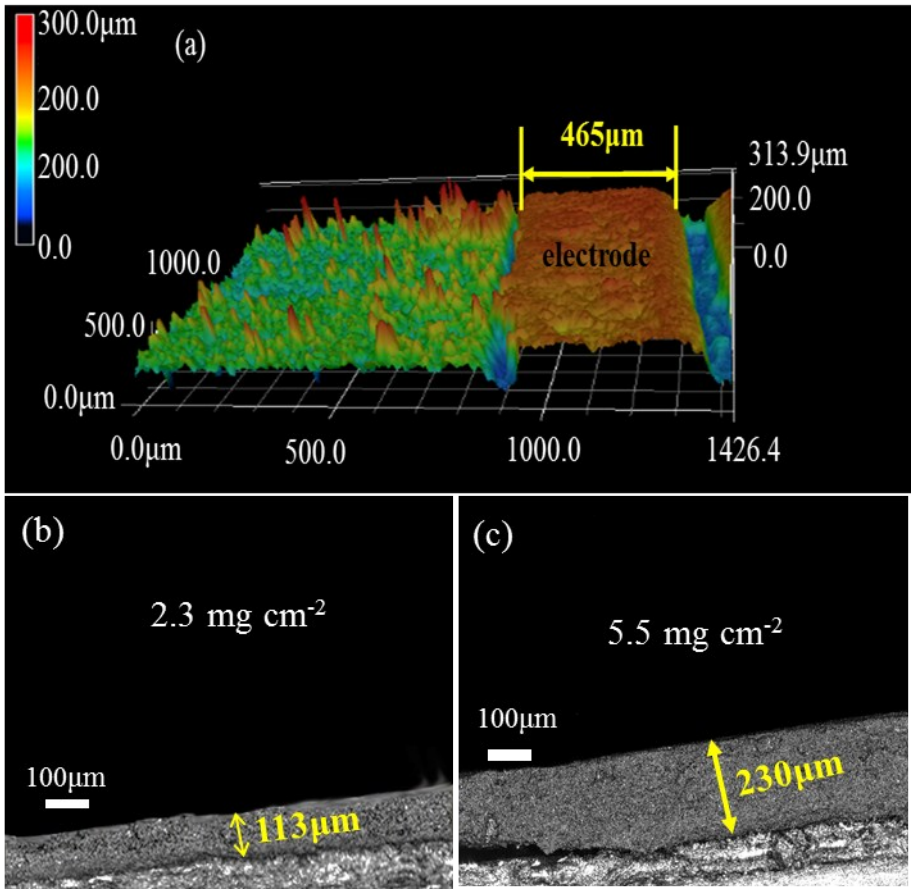

Figure S10. (a) 3D simulated images of PSSN/S cathode with the sulfur loading of 10.1 mg cm^{-2} using 3D confocal microscope. (b-c) 3D confocal microscope images of the PSSN/S cathodes with 2.3 and 5.5 mg cm^{-2} of sulfur loading.

Table S2. Specific capacities comparison of the reported Li-S batteries with high sulfur loading.

sulfur loading ($mg\ cm^{-2}$)	specific capacity (0.1 C) ($mAh\ g^{-1}$)	specific capacity (1 C) ($mAh\ g^{-1}$)	Reference
10.8	1122		8
8.5		710	24
3.2	960	668	33
5	680 (0.02C)		41
4.5		610	42
5	1160	650	44
3.6	1300	700	47
10.8	993		47
9.8	750	570	48
18.1	1000		49
10.2	780(0.05C)		50
9	1014		51
10.1	1180	648	This paper

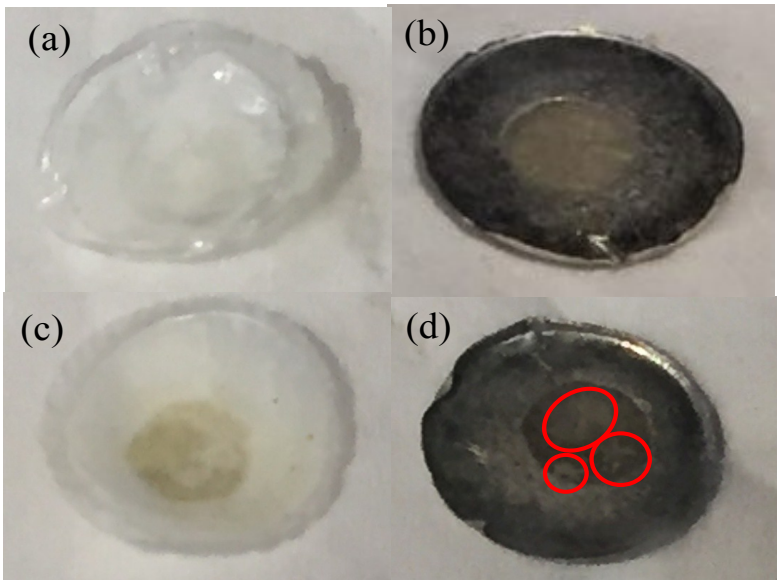

Figure S11. Separators and lithium anodes disassembled from the cells using PSSN/S cathode(up) and S cathode(down) after 50 cycles.

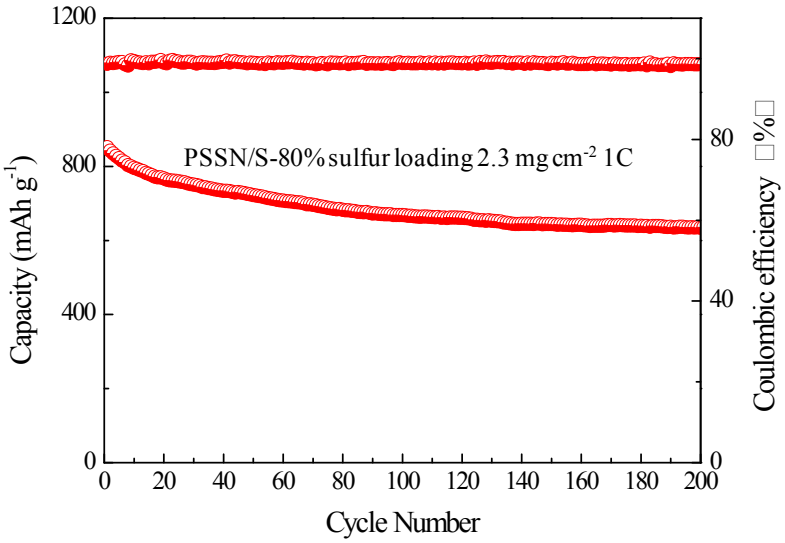

Figure S12. Cycling stability of PSSN/S (80% of sulfur content) with the sulfur loading of 2.3 mg cm^{-2}.