

## Supplementary Information

### **Graphene oxide-wrapped bipyramidal sulfur@ polyaniline core-shell structure as cathode for Li-S battery with enhanced electrochemical performance**

**Kailong Zhang,<sup>a</sup> Yanhua Xu,<sup>a</sup> Yue Lu,<sup>a</sup> Yongchun Zhu,<sup>\*a</sup> Yuying Qian,<sup>a</sup> Danfeng Wang,<sup>a</sup> Jianbin Zhou,<sup>a</sup> Ning Lin,<sup>a</sup> and Yitai Qian<sup>\*a,b</sup>**

<sup>a</sup> Department of Chemistry and Hefei National Laboratory for Physical Science at Microscale, University of Science and Technology of China, Hefei, 230026, P.R. China. Tel: +86-551-63601589; E-mail: ychzhu@ustc.edu.cn

\*Corresponding author. Tel.: 86-551-6360-1589; Fax: +86-551-360-7402.  
E-mail address: ychuzhu@ustc.edu.cn (Y. C. Zhu), ytqian@ustc.edu.cn. (Y. Qian)

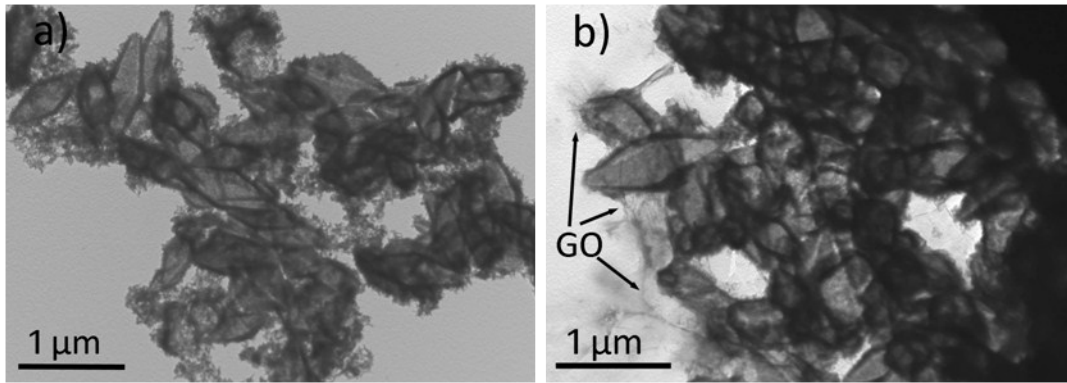


Figure S1 TEM of (a)S@PANI and (b) S@PANI/GO after dealing with acetone.

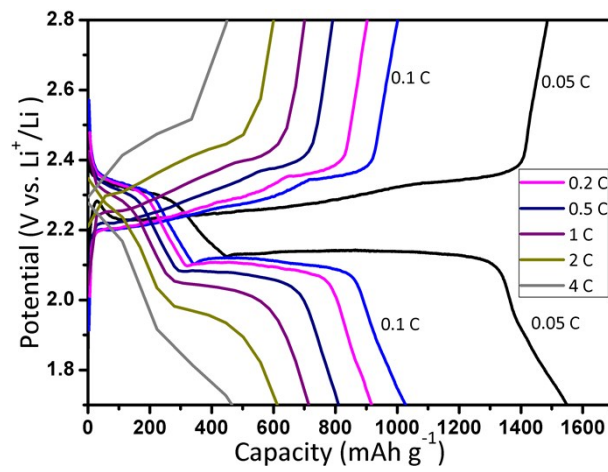


Figure S2 Voltage-capacity curves of S@PANI/GO electrode at different rates (increased from 0.05 C to 4 C).

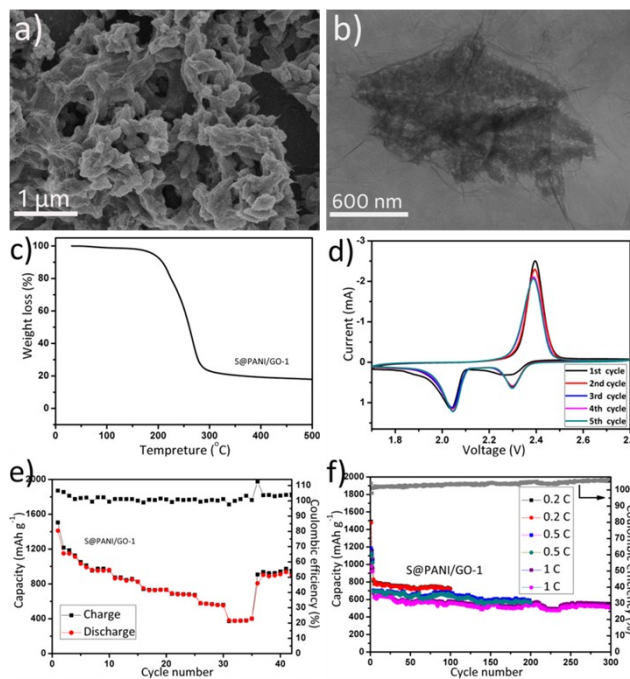


Figure S3 (a) SEM image of S@PANI/GO-1 composite; (b) TEM (after dealing with acetone) image of S@PANI/GO-1 composite; (c) TGA curve of S@PANI/GO-1 composite, including 78.1 wt% content of sulfur and 1.5 wt% absorbed water; (d) Cyclic voltammograms of S@PANI/GO-1 and the scan rate of all tests is 0.1 mV s<sup>-1</sup>; (e) Cycle performance of S@PANI/GO-1 composite (the gray line is the coulombic efficiency of 1 C).

Table S1 Summary of representative graphene-based PANI/ S composite

Cathode content	sulfur loading (wt %)	Sulfur loading (wt %)	Mass loading (mg cm <sup>-2</sup> )	Discharge current rate	Reversible discharge capacity/(mA h g <sup>-1</sup> )		Voltage range (V vs.Li/Li <sup>+</sup> )	Reference number
					Initial	After (nth)		
S@PANI/GO	54.3	54.3	1.8-3.0	1 C	1027	641 (300)	1.7-2.8	this work
S@PANI/GO	78.9	78.9	1.8-3.0	0.2 C	1485	730 (100)	1.7-2.8	this work
S@PANI/GO	78.1	78.1	1.8-3.0	1 C	1100	540 (300)	1.7-2.8	this work
nanoS@PANI/G	53	53	0.8	0.1 C	1625	600 (100)	1.5-3.0	1
PANI-modified CTAB-GO-S	70.1	70.1	0.8	0.2 C	1016	715 (300)	1.6-2.8	2
PANI/GO@S	66.4	66.4	1.5	0.2 C	1037	599 (200)	1.8-2.7	3
Sulfur-PANI-GNRs	62	62	1.2	0.4 C	673	514 (400)	1.7-3.0	4
NGNS-S-PANI	52.5	52.5	N/A	0.5 C	1277	694 (100)	1.4-3.0	5
graphene/S/PANI	75	75	N/A	0.1 C	N/A	740 (150)	1.5-3.0	6
CG-S@PANI	55	55	0.6-1.2	0.2 C	851	633 (100)	1.5-2.8	7

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Table S2 Equivalent-Circuit Parameters Obtained from Fitting the Experimental Impedance Spectra

Samples	$R_1(\Omega)$	$R_2(\Omega)$	$R_3(\Omega)$	$CPE_1(F)$	$CPE_2(F)$	W-P
S	3.469	47.39	36.81	$8.01 \times 10^{-6}$	$8.89 \times 10^{-4}$	0.43268
S/GO	2.329	27.54	18.72	$1.02 \times 10^{-5}$	$2.50 \times 10^{-3}$	0.36798
S@PANI	1.872	11.33	17.16	$8.29 \times 10^{-6}$	$1.32 \times 10^{-3}$	0.36175
S@PANI/G O	2.321	7.604	12.42	$1.08 \times 10^{-5}$	$2.33 \times 10^{-3}$	0.41274

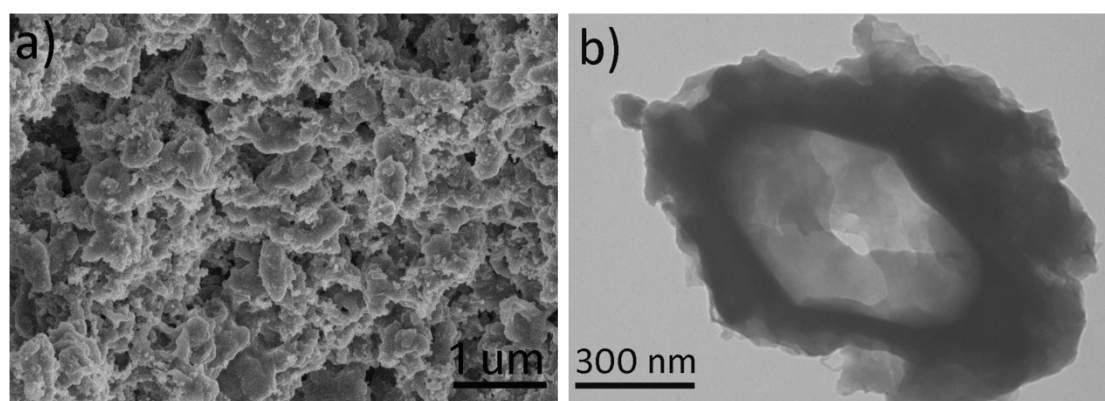


Figure S4 (a) SEM image, and (b) TEM (after dealing with acetone) image of S@PANI/GO composite after 100 cycles.