Electronic supplementary information

Three-dimensional self-assembled SnS_2-Nano-Dots@Graphene Hybrid Aerogel as an Efficient Polysulfide Reservoir for High-performance Lithium-sulfur Batteries

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Supporting figures

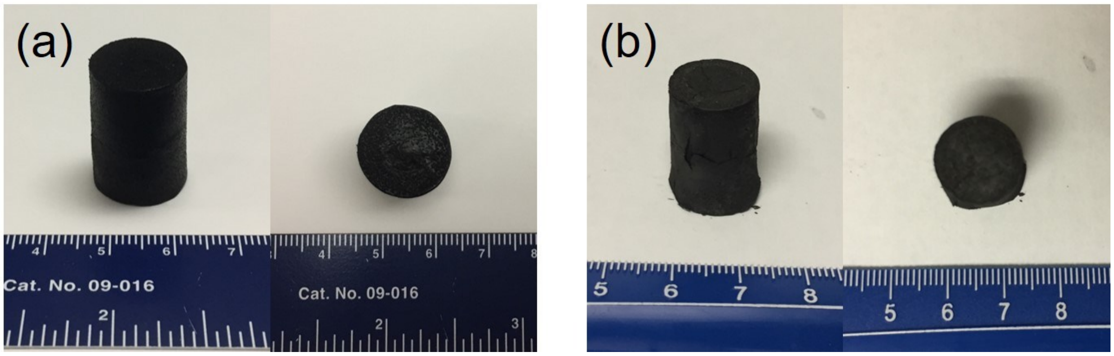

Fig. S1 Digital photos of the as-prepared (a) SnS_2-ND@G and (b) graphene aerogels with front and top views.

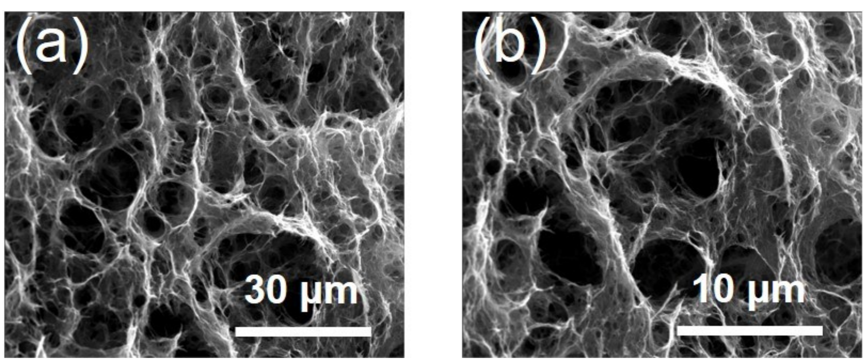

Fig. S2 SEM images of graphene aerogel under (a) high and (b) low magnifications.

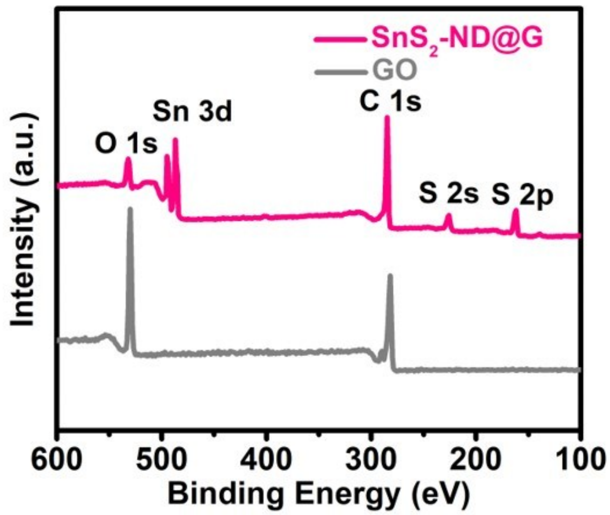

Fig. S3 XPS survey spectra of GO (gray line) and SnS_2-ND@G aerogels (pink line).

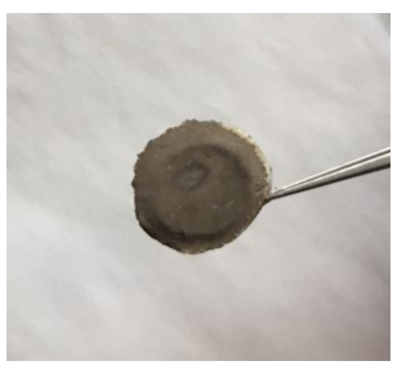

Fig. S4 Digital picture of the cycled lithium metal anode retrieved from the cell employing the SnS_2-ND@G cathode.

Table S1 Comparative summary of the Li-S cell parameters of the cell parameters in this work and other reported studies involving metal-sulfide/carbon and other metal compounds as sulfur cathode materials

Cathode material	Preparation method	Metal sulfide content in the composite (wt.%)	Sulfur content in the cathode (wt.%)	Sulfur loading (mg cm^{-2})	Peak capacity (mA h g^{-1})	Remaining capacity (mA h g^{-1})	Peak areal capacity (mA h cm^{-2})	Cycle number	Capacity retention (%)	Capacity-fate rate (% per cycle)	E/S ratio	Condition	Reference
MoS_2 + rGO	Physical mixing	22	60	2 – 4	1200	628	3.6	600	52	0.083	13 – 25	1.8 – 2.6 V (C/2)	45
CoS_2+G	Physical mixing	15 – 30	60	0.4 – 2.9	1368	750	3.2	250	55	0.18	4 – 30	1.7 – 2.8 V (C/2)	18
VS_2@G/CNT	Ball-milling	50	56	0.5 – 0.6	830	701	0.5	300	84	0.052	33 – 40	1.5 – 2.8 V (C/2)	23
CoS_2@G/CNT	Ball-milling	50	56	0.5 – 0.6	684	581	0.41	300	85	0.049	33 – 40	1.5 – 2.8 V (C/2)	23
TiS_2@G/CNT	Ball-milling	50	56	0.5 – 0.6	700	546	0.42	300	78	0.073	33 – 40	1.5 – 2.8 V (C/2)	23
FeS@G/CNT	Ball-milling	50	56	0.5 – 0.6	705	334	0.42	300	47.4	0.175	33 – 40	1.5 – 2.8 V (C/2)	23
SnS_2@G/CNT	Ball-milling	50	56	0.5 – 0.6	610	191	0.37	300	31.3	0.23	33 – 40	1.5 – 2.8 V (C/2)	23
Ni_3S_2@G/CNT	Ball-milling	50	56	0.5 – 0.6	526	153	0.32	300	29.1	0.24	33 – 40	1.5 – 2.8 V (C/2)	23
CuS + carbon aerogel	Physical mixing	--	48	1.3 – 3.0	1137	840	2.4	500	74	0.05	--	1.8 – 3.0 V (C/2)	21
TiO_2 + G	Hydrothermal	41	52	1.1 – 1.3	1065	663	1.3	100	62	0.38	--	1.7 – 2.8 V (C/10)	8
Co_3S_4 + S	Hydrothermal	21 – 34	53	2 – 4	975	760	2.1	200	78	0.11	10 – 20	1.6 – 2.6 V (C/2)	39
TiS_2 + S	Physical mixing	45	45	--	875	810	--	30	93	0.25	--	1.7 – 2.8 V (C/10)	20

Co_9S_8 + S	Melt-diffusion	25	60	1.5	857	643	4.3	400	75	0.06	--	1.8 – 3.0 V (2C)	46
TiO + carbon hollow sphere	Coating and annealing	57	56	1.5	1190	750	3.5	500	63	0.08	36	1.9 – 2.6 V (C/5)	13
MgO + S	Ball-milling	10	54	1.8 – 2.0	860	700	1.6	100	81	0.19	--	1.5 – 3.0 V (C/5)	16
MnO_2 + S	Physical mixing	25	56	0.7 – 1.0	1120	1030	1.12	200	92	0.04	--	1.8 – 3.0 V (C/5)	15
Ti_4O_7 + S	Melt-diffusion	30 – 40	56	1.5 – 1.8	850	600	1.53	500	88	0.06	28 – 33	1.7 – 3.0 V (2C)	14
SnS_2-ND@G	Hydrothermal process	16	75	2.5 – 10	1234	1016	11	300	82	0.06	10	1.7 – 2.8 V (C/5)	This work