Electronic Supplementary Information

One-pot synthesis of hetero-Co_9S_8-NiS sheets on graphene to boost lithium-sulfur battery performance

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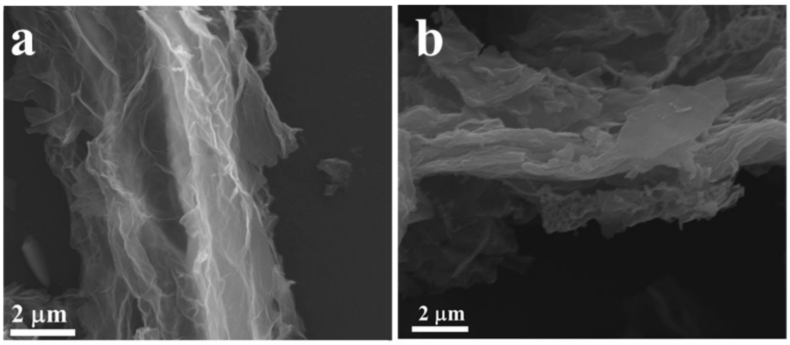

Figure S1 Side view FE-SEM image of BMS-G (a) and S@BMS-G sheets (b).

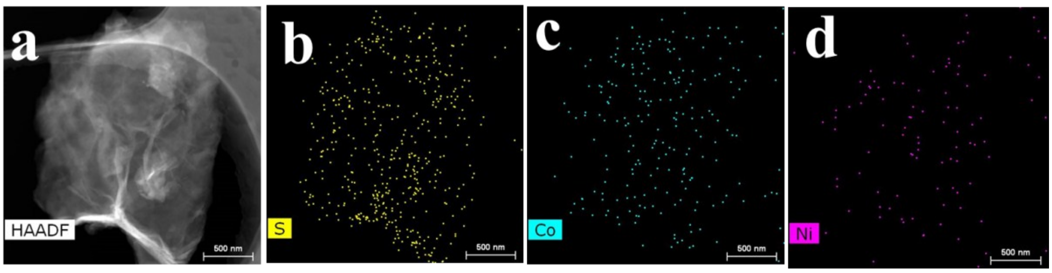

Figure S2 TEM image of S@BMS-G (a), and the corresponding elemental mappings (b, c, d).

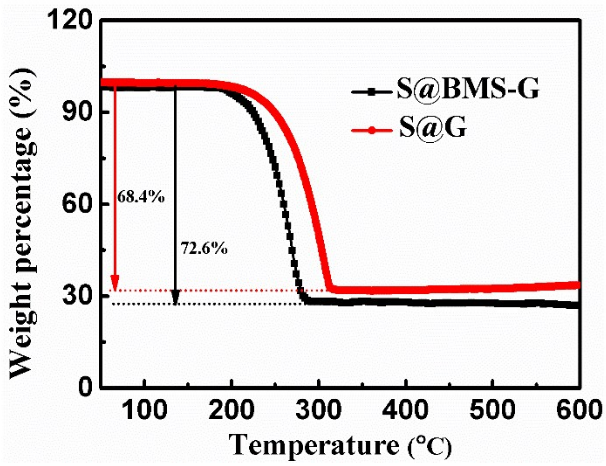

Figure S3 Thermal gravimetry (TG) analysis curves of S@BMS-G and S@BMS composites.

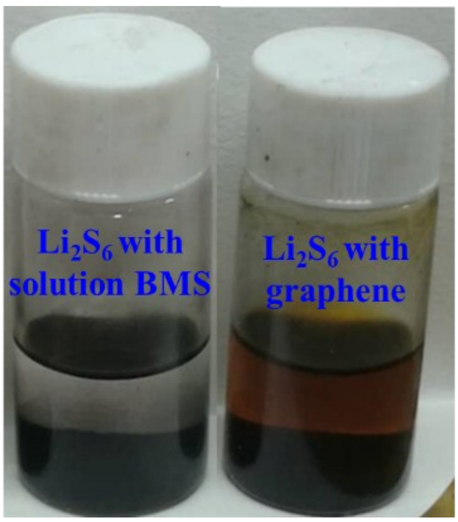

Figure S4 Digital photograph of Li_2S_6 solution absorption test result.

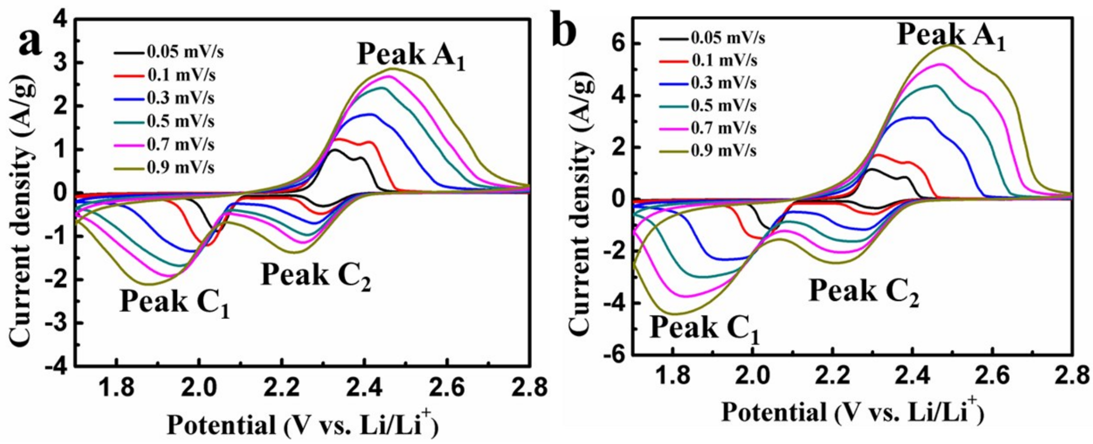

Figure S5 CV curves of (a) S@G and (b) S@BMS-G cathodes obtained at 0.05-0.9 mV/s between 1.7 and 2.8 V versus Li/Li^+.

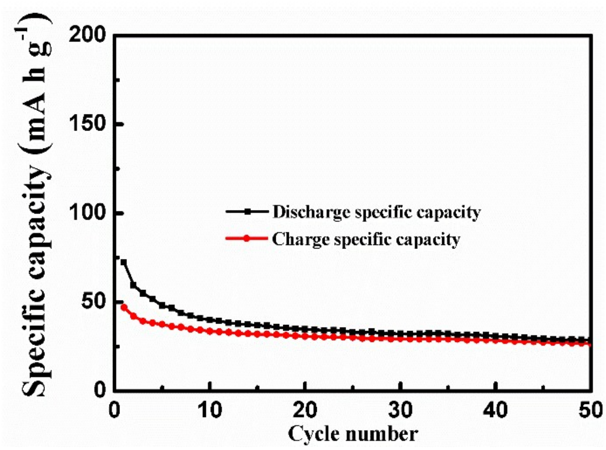

Figure S6 The cycling performance of the cathode based on BMS-G host material without sulfur loading, which was conducted over the voltage range of 1.7-2.8 V (vs. Li^+/Li) at 1 C for 100 cycles

Table S1. The electrochemical impedance spectroscopic (EIS) parameters in detail.

Cathode	R_S (Ω)	R_{CT} (Ω)	W_O (Ω)
S@BMS-G	3.37	21.24	40.94
S@G	2.06	26.65	49.36

Table S2. Comparison of previous reports with carbon/metal sulfides as host materials in lithium sulfur cathode with our work.[1-7]

Ref.	**Electrode material**	**Sulfur content (%)**	**Initial specific capacity**	**Cycling stability**	**Fading rate (% per cycle)**
1	Co_9S_8-CNT/S	68.8	1415 mAh g^{-1} at 0.2 C	560.6 mA h g^{-1} at 2 C after 1000 cycles	0.0448
2	Co_9S_8/C/S	80	1160 mAh g^{-1} at 0.2 C	560 mA h g^{-1} at 2 C after 1000 cycles	0.041
3	S@Co_9S_8	80	1136 mAh g^{-1} at 0.2 C	756.6 mA h g^{-1} at 1 C after 600 cycles	0.026
4	cobalt nickel sulfide/N-rGO/S	72.8	1430 mAh g^{-1} at 0.1 C	685 mA h g^{-1} at 0.5 C after 300 cycles	0.075

5	Co_9S_8 /MWCNTs/S	75	1154 mAh g^{-1} at 0.1 C	549 mA h g^{-1} at 0.5 C after 400 cycles	0.09
6	NiS_2/rGO/S	56.7	913.3 mAh g^{-1} at 0.2 C	400.6 mA h g^{-1} at 1 C after 800 cycles	0.117
7	NiS_2/C-S	70	1358 mAh g^{-1} at 0.2 C	744 mA h g^{-1} at 1 C after 200 cycles	0.2
This work	S@hetero-Co_9S_8-NiS -G	70	1142.9 mA h g^{-1} at 0.2 C	664.7 mA h g^{-1} at 1 C after 800 cycles	0.031

Reference

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