Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Co_9S_8 Embedded N/S Doped Carbon Composite: In Situ Derivation from Sulfonate-based Metal-Organic Framework and Electrochemical Properties

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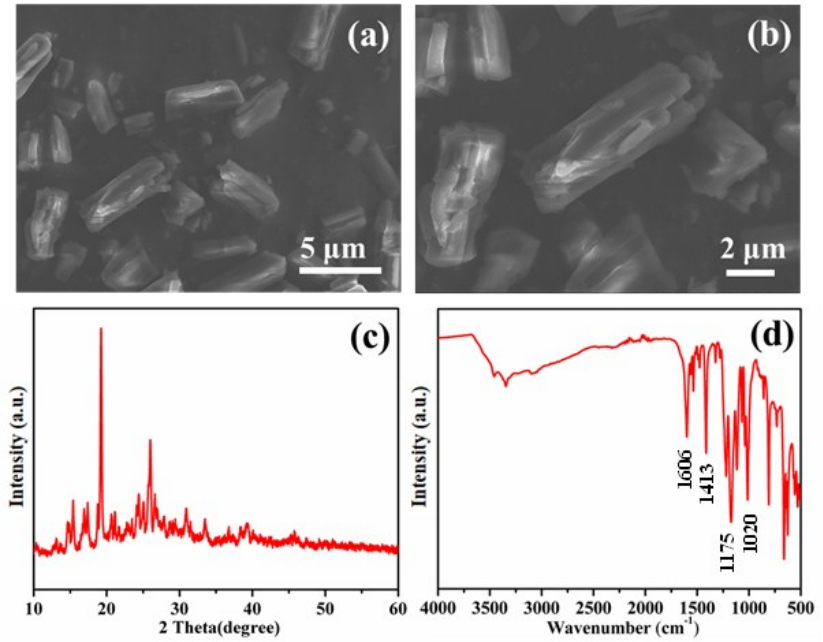

Fig. S1 (a, b) SEM images, (c) XRD pattern and (d) IR spectrum of Co-MOF.

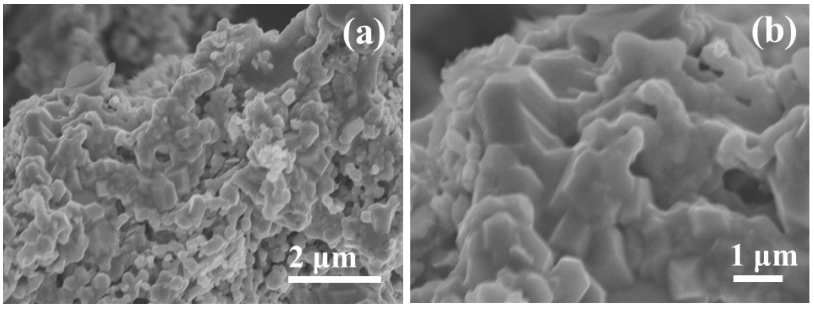

Fig. S2 SEM images of Co_9S_8.

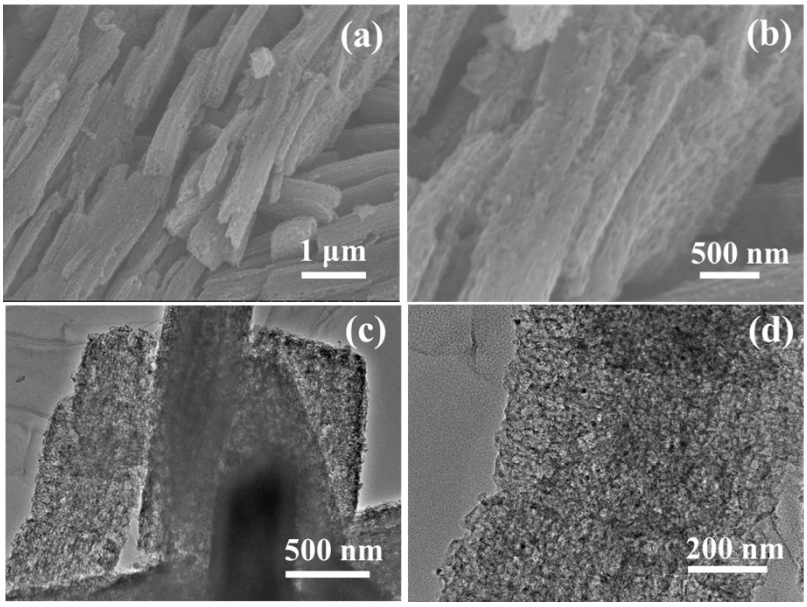

Fig. S3 (a, b) SEM images and (c, d) TEM images of NSC.

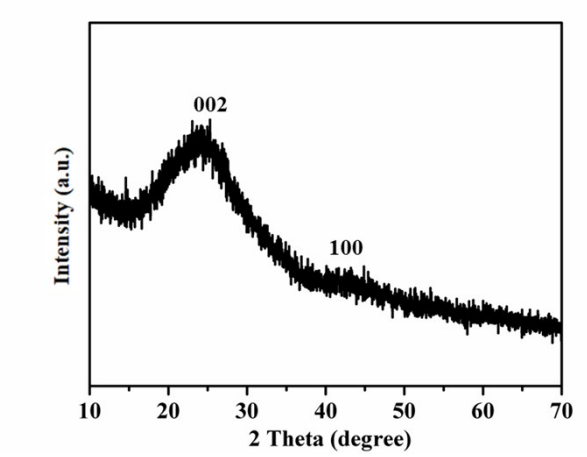

Fig. S4 XRD pattern of NSC.

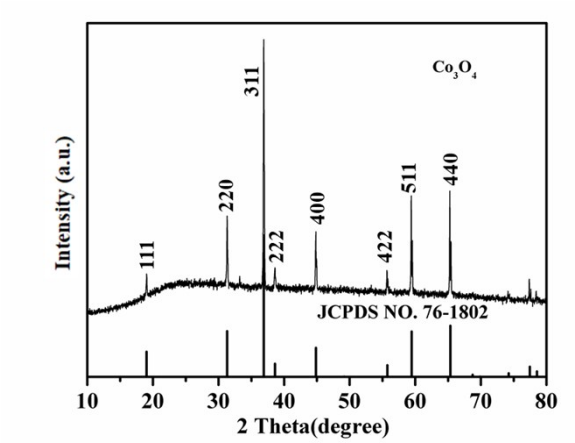

Fig. S5 XRD patterns of Co_9S_8/NSC after TGA measurement.

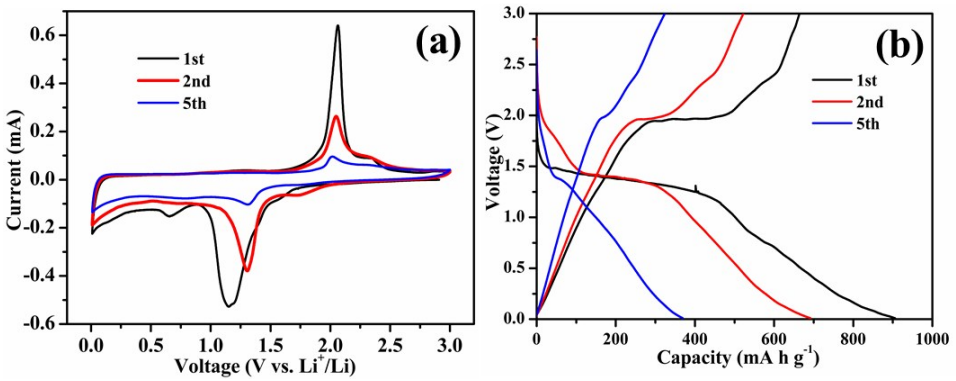

Fig. S6 (a) CV curves at 0.2 mV s^{-1} and (b) charge-discharge profiles at 0.1 A g^{-1} of Co_9S_8, respectively.

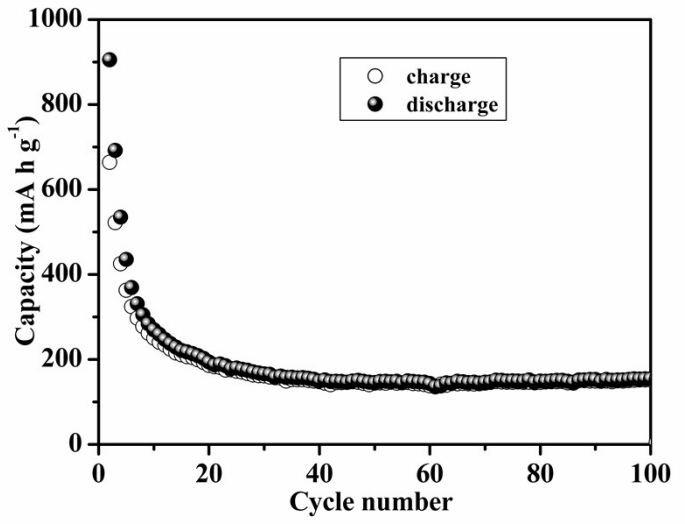

Fig. S7 The cycling performance of Co_9S_8 at 0.1 A g^{-1}.

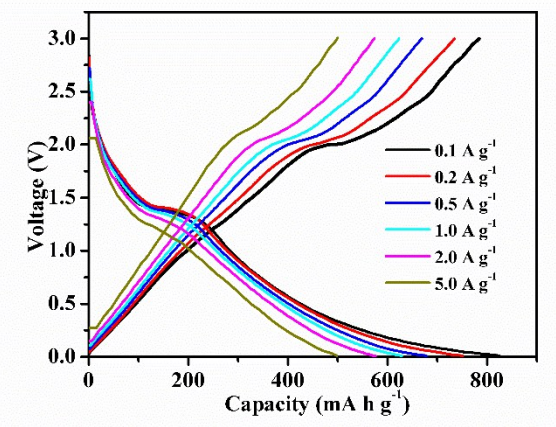

Fig. S8 the charge-discharge curves of Co_9S_8/NSC at varied current density.

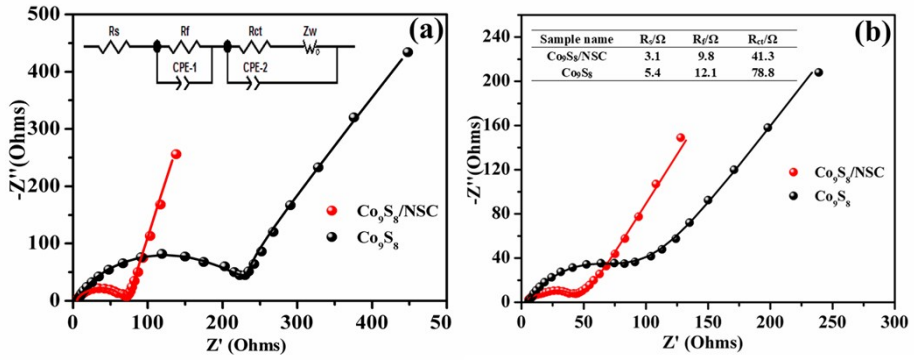

Fig. S9 Impedance plots of Co_9S_8 and Co_9S_8/NSC (a) after 1 cycle (Inset: the equivalent circuit used to fit the experimental data) and (b) after 50 cycles (Inset: Impedance parameters calculated from an equivalent circuit model).

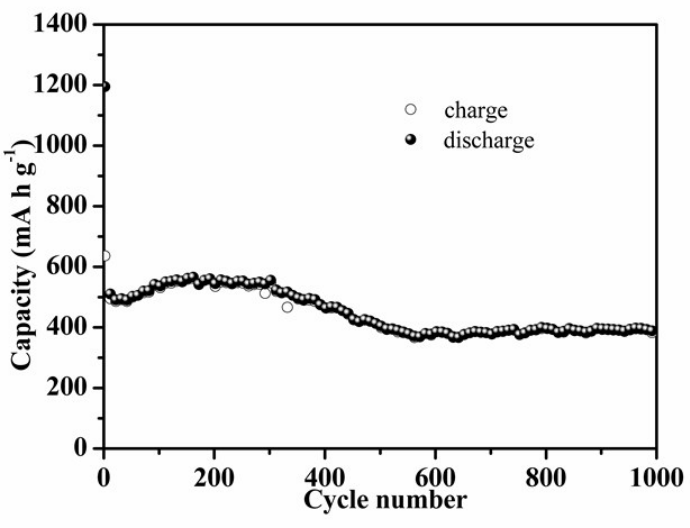

Fig. S10 The cycling performance of NSC at 2.0 A g^{-1}.

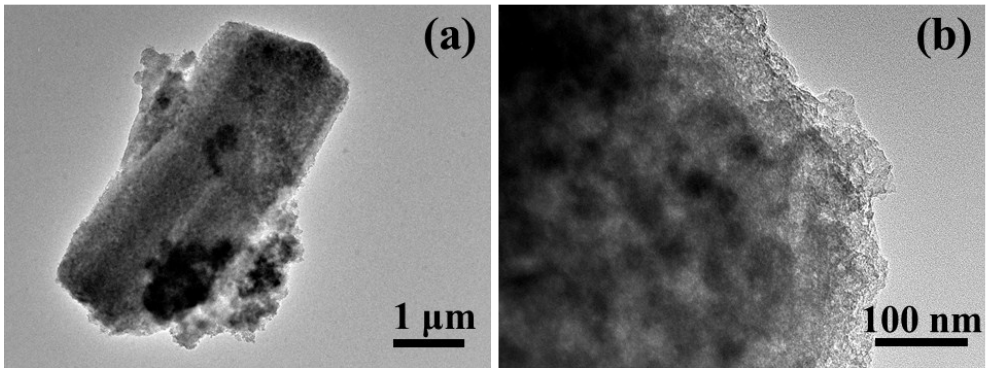

Fig. S11TEM images of Co_9S_8/NSC after cycling test.

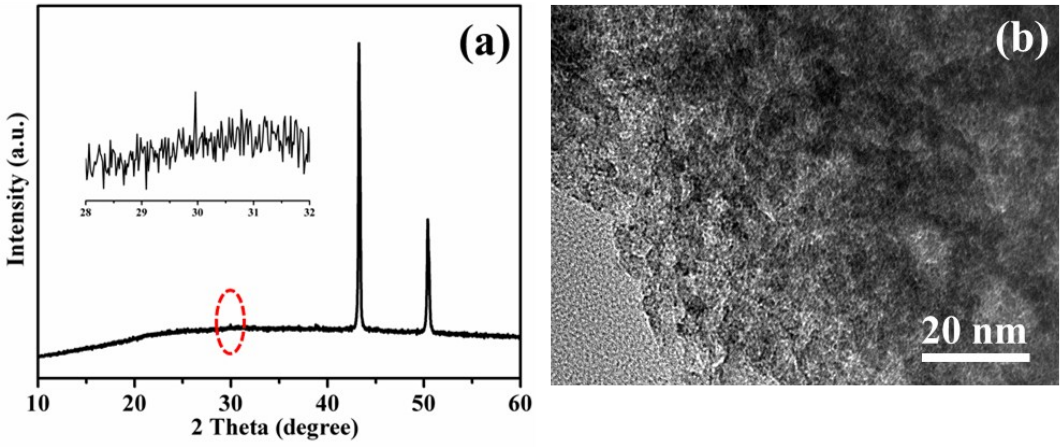

Fig. S12 XRD pattern and TEM image of Co_9S_8/NSC after first cycle.

Table S1. Comparison of the electrochemical properties of cobalt sulfides based anode materials

Materials	Voltage window (V vs. Li^+/Li)	Current rate (mA g^{-1})	Capacity retention (mA h g^{-1})	Cycle number	References
Co_9S_8/NSC	**0.01-3.0**	**100** **2000**	**1179** **789**	**200** **1000**	**Our work**
CoS_2-C/CNT	0.01-3.0	100 1000	1030 510	120 500	*ACS Nano*, 2018, **12**, 7220-7231
CoS_x@PC	0.01-3.0	100 1000	781.2 717	100 500	*Adv. Sci.*, 2018, **5**, 1800829
$(Ni_{0.3}Co_{0.7})_9S_8$/ N-CNTs/rGO	0.01-3.0	100 1000	800 746	100 400	*Chem. Commun.*, 2018, **54**, 8909-8912
$Co_9S_8/Co_{1-x}S$@NC	0.01-3.0	100 2000	1230 813	110 -	*J. Mater. Chem. A*, 2017, **5**, 3628-3637
CoS_2-in-wall-NCSs	0.01-3.0	200 1000	1080.6 735.5	500 -	*J. Mater. Chem. A*, 2018, **6**, 7148-7154
MWCNT@a-C@Co_9S_8	0.01-3.0	1000 2000	662 1065	120 700	*Nanoscale*, 2015, **7**, 3520-3525
Co_9S_8-650@C	0.01-3.0	100 2000	1414 896	100 800	*Nano Energy*, 2015, **12**, 528-537
Co_9S_8/N-C	0.01-3.0	544	784	400	*Chem. Eur. J.*, 2017, **23**, 9517-9524
Worm-like CoS_2	0.01-3.0	100 2000	1140 501	100 -	*J. Mater. Chem. A*, 2015, **3**, 10677-10680
CoS_2 hollow prisms	0.05-3.0	200 1000	910 737	- 200	*Angew. Chem. Int. Ed.*, 2016, **55**, 13422-13426
CoS@PCP/CNTs	0.01-3.0	100	1668	100	*Adv. Mater.*, 2015, **20**, 3038-3044
Graphene-anchored Co_9S_8	0.01-3.0	500 1000	910 622	100 200	*Electrochim. Acta*, 2017, **250**, 196-202