Electronic Supplementary Information

S, N-Containing Co-MOFs Derived Co_9S_8@S,N-Doped Carbon Materials as Efficient Oxygen Electrocatalysts and Supercapacitor Electrode Materials

Shengwen Liu,‡[a] Mingyu Tong,‡[a,b] Guoqiang Liu,[a,b] Xian Zhang,[a,b] Zhaoming Wang,[a] Guozhong Wang,[a] Weiping Cai,[a] Haimin Zhang,[a]* and Huijun Zhao[a,c]

[a] Key Laboratory of Materials Physics, Centre for Environmental and Energy Nanomaterials, Anhui Key Laboratory of Nanomaterials and Nanotechnology, Institute of Solid State Physics, Chinese Academy of Sciences, Hefei 230031, China

[b] University of Science and Technology of China, Hefei 230026, China

[c] Centre for Clean Environment and Energy, Griffith University, Gold Coast Campus, QLD 4222, Australia

‡ These authors contributed equally to this work

Table. S1 Summary of the ORR and OER performances for some other Co_9S_8-based catalysts reported recently.

Sample	OER Current density of 10 mA cm^{-2} at 0.1M KOH	ORR 0.1M KOH		Reference
		potential	n (electron transfer number)	
Co_9S_8/NSPC9–45	0.31 V	0.79 V ($E_{1/2}$)	3.94 at 0.3 V	1
Co-C@Co_9S_8DSNCs		0.96 V (onset)	3.9 at 0.1-0.4 V	2
N-Co_9S_8/G	0.28 V	0.94 V(onset)	3.7 ~3.9 at -0.2-0.8 V	3
Fe_3O_4@Co_9S_8/rGO	0.47 V			4
Co_9S_8@SNCC	0.33 V	0.75 V($E_{1/2}$) 0.84 V(onset)	3.99 at 0.2-0.6V	this work

Table. S2 Summary of the capacitances of some other Co_9S_8-based composites reported recently.

Sample	Capacitance	Electrolyte	Reference
Co_9S_8/RGO/Ni_3S_2	2611.9 F g^{-1} at 3.9 A g^{-1}	2 M KOH	5
Co_9S_8@$Ni(OH)_2$ core@shell structure	1620 F g^{-1} at 0.5 A g^{-1}	2 M KOH	6
C@Co_9S_8 hollow structures	654 F g^{-1} at 2 A g^{-1}	2 M KOH	7
Co_9S_8/NF	1645 F g^{-1} at 3 A g^{-1}	2 M KOH	8
Co_9S_8 nanotubes	1775 F g^{-1} at 4 A g^{-1}	2 M KOH	9
Co_9S_8@SNCC	429 F g^{-1} at 1 A g^{-1}	6M KOH	this work

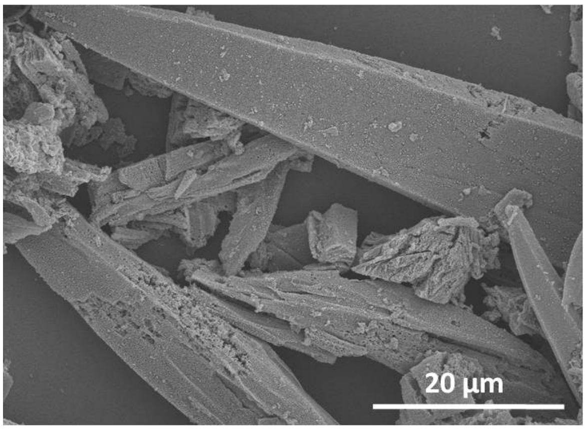

Fig. S1 SEM image of the Co_9S_8@SNCB

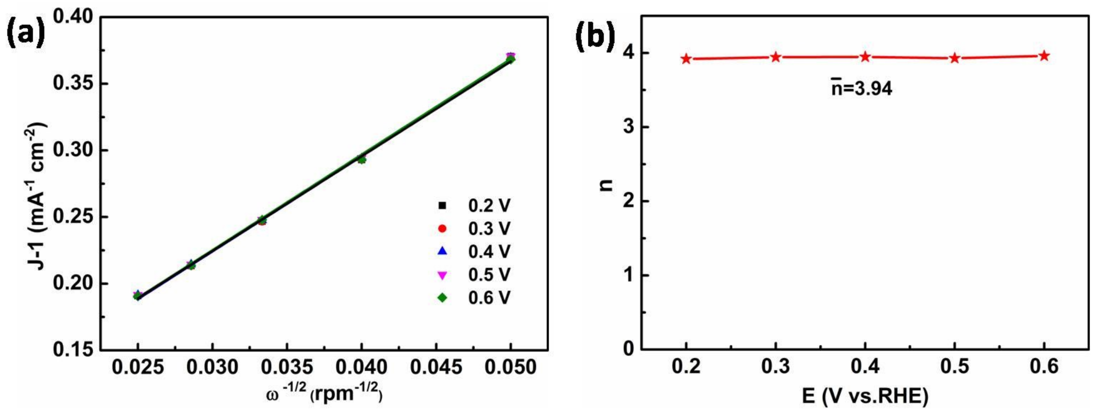

Fig. S2 (a) Koutecky-Levich plots derived from the RDE data of Co_9S_8@SNCC, (c) electron transfer number of Co_9S_8@SNCC at 0.2 V~0.6 V.

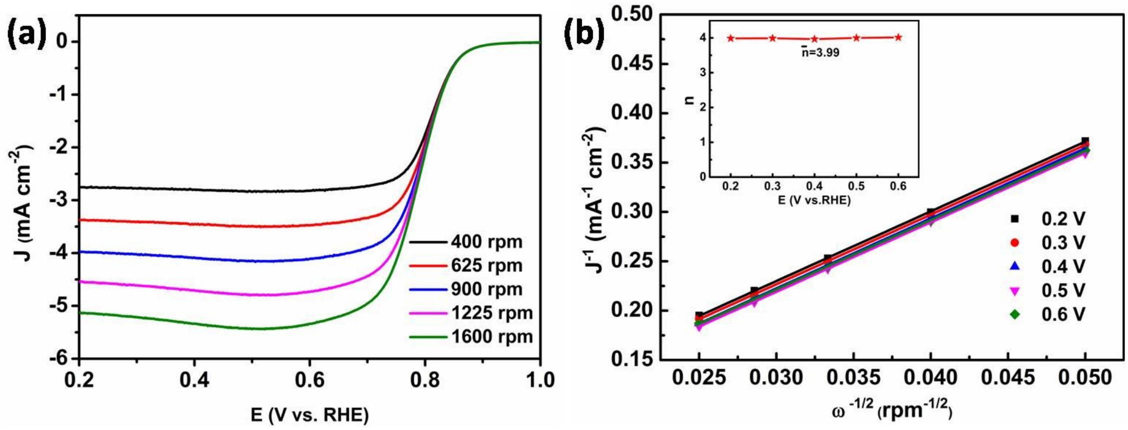

Fig. S3 (a) LSV curves of Pt/C at various rotation rates; (b) Corresponding Koutecky–Levich plots derived from the RDE data; inset of electron transfer number of Pt/C at 0.2 V~0.6 V.

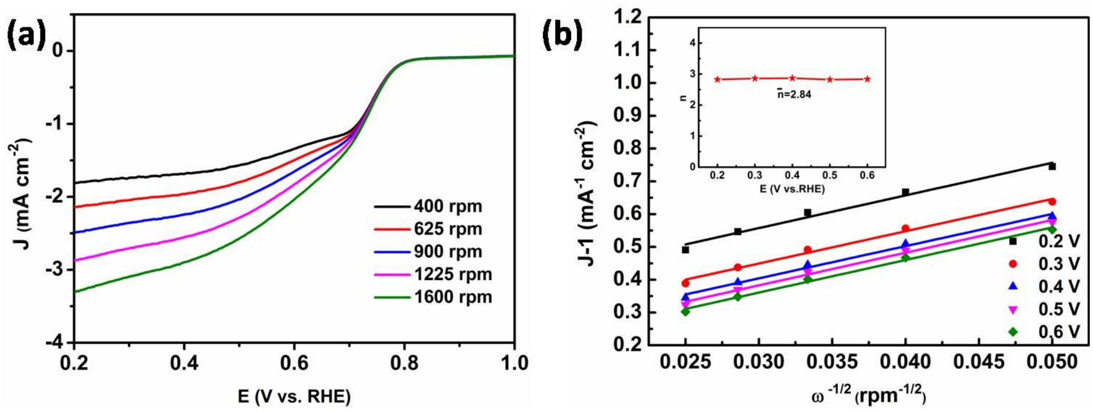

Fig. S4 (a) LSV curves of Co_9S_8@SNCB at various rotation rates; (b) Corresponding Koutecky–Levich plots derived from the RDE data; inset of electron transfer number of Co_9S_8@SNCB at 0.2 V~0.6 V.

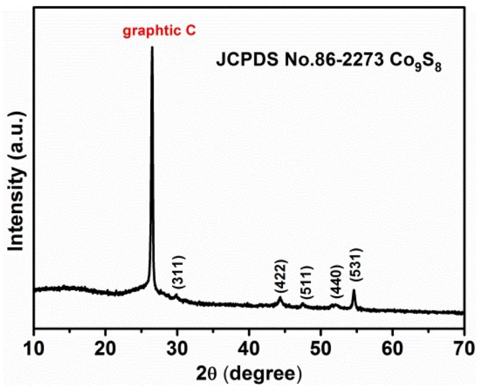

Fig. S5 XRD pattern of the Co_9S_8@SNCC composite after electrochemical test at 0.1 KOH, 250 cycles for cyclic voltammetry at a scan rate of 50 mV s^{-1}, illustrated that the Co_9S_8 is very stability during this electrochemical test. The Co_9S_8@SNCC was coated on the graphitic carbon paper as an electrode for electrochemical test.

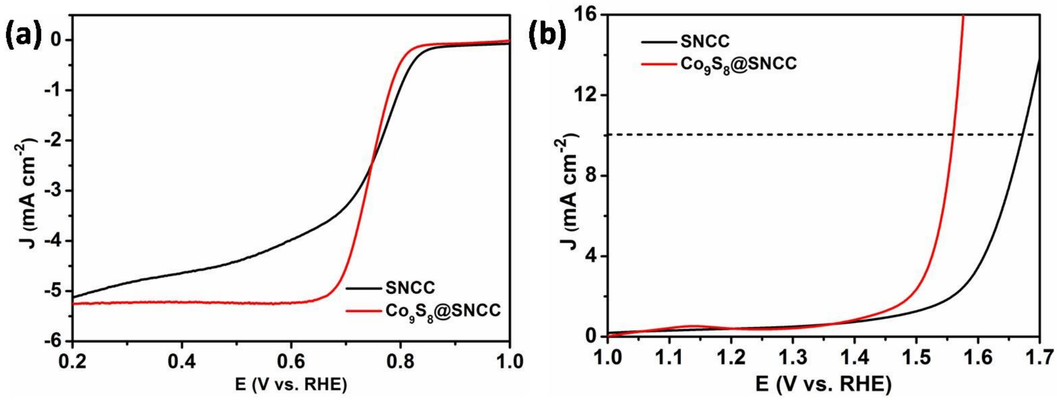

Fig. S6 LSV curves of electrocatalysts of Co_9S_8@SNCC, SNCC for (a) ORR and (b) OER measurements.

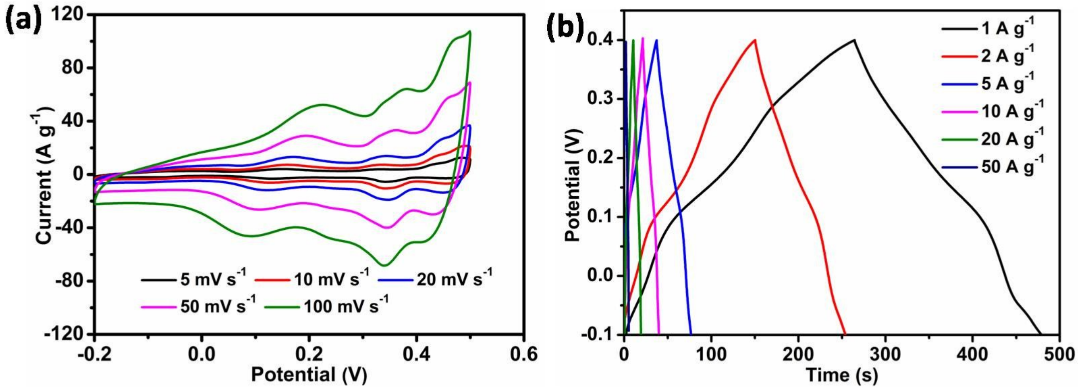

Fig. S7 (a) Cyclic voltammogram curves at various scan rates ranging from 5 mV s^{-1} to 100 mV s^{-1} and (b) charge-discharge curves measured at different current densities of Co_9S_8@SNCC.

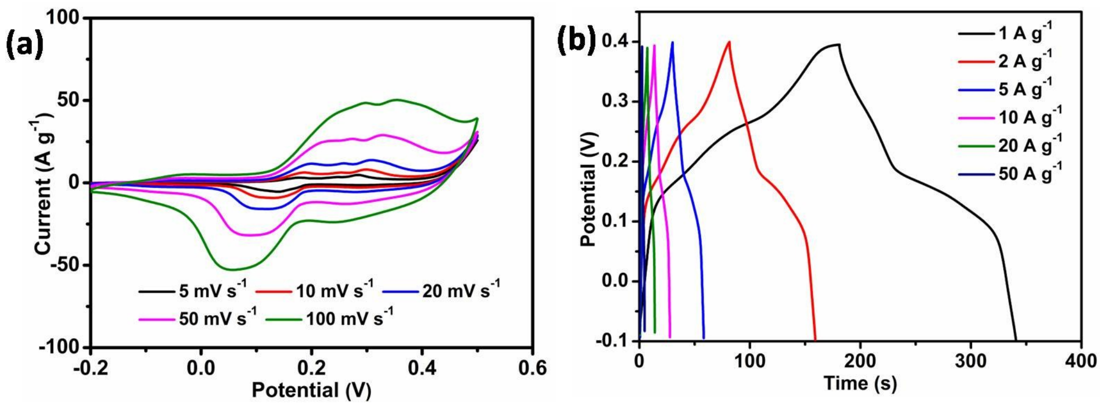

Fig. S8 (a) Cyclic voltammogram curves at various scan rates ranging from 5 mV s^{-1} to 100 mV s^{-1} and (b) charge-discharge curves measured at different current densities of Co_9S_8@SNCB

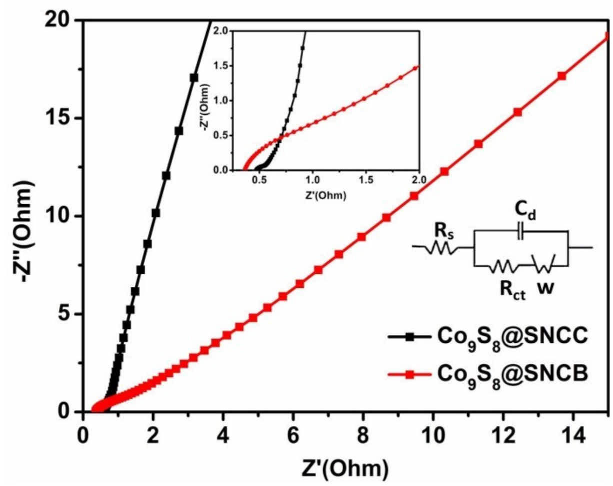

Fig. S9 Nyquist plots of Co_9S_8@SNCB and Co_9S_8@SNCC electrode materials for supercapacitors

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