Electronic Supplementary Information

Two-dimensional CoNi nanoparticles@S,N-doped carbon composites derived from S, N-containing Co/Ni MOFs for high performance supercapacitors

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Table S1 Performance comparison of Co/Ni based electrode materials for supercapacitors.

Num.	Materials	Specific capacitance F g^{-1}(conditions)	Electrolyte	Capacitance retention (cycles)	References
a	Ni-Co alloy NPs in 3D porous graphitic carbon	1091 (1 A g^{-1})	6 M KOH	95% (1500)	1
b	Co-rich Ni-Co oxides	473 (1.67 A g^{-1})	6 M KOH	none	2
c	Ni/Co-based MOFs	1049 (1 A g^{-1})	6 M KOH	97.4% (5000)	3
d	Ni-MOF/CNT	1765 (0.5 A g^{-1})	6 M KOH	95% (5000)	4
e	Zn-doped MOFs	1620 (0.25 A g^{-1})	6 M KOH	91% (3000)	5
f	MOF derived 2D $CoS_{1.097}$/N –doped Carbon	360.1 (1.5A g^{-1})	2 M KOH	90% (2000)	6
g	MOF derived CoS ollow structrue	980 (1A g^{-1})	2 MKOH	88% (10000)	7
h	MOF derived $Ni_xCo_{1-x}(OH)_2$ microspheres	1235.9 (0.5A g^{-1})	6 M KOH	73% (10000)	8
i	MOF derived CoNi@SNC	1970(1A g^{-1})	6 M KOH	95.1% (3000)	Our work

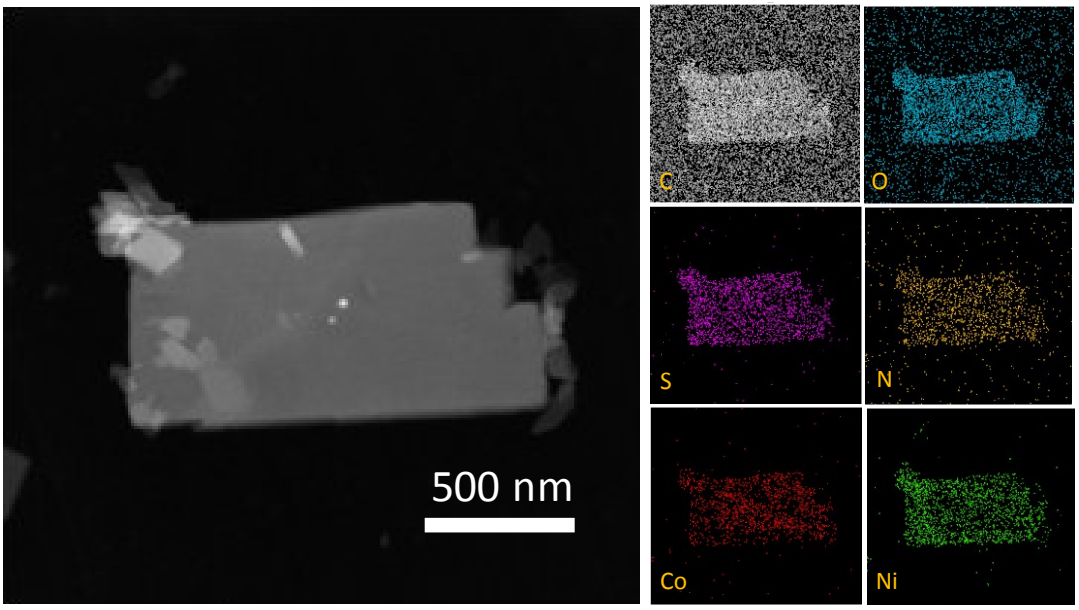

Fig. S1 (a) TEM image of the synthesized Co/Ni MOFs and corresponding element mapping images of C, O, S, N, Co and Ni elements.

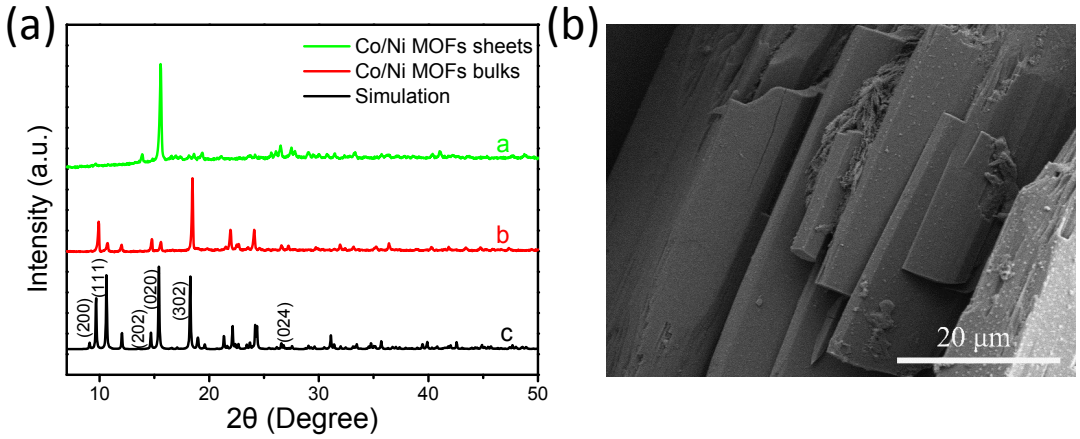

Fig. S2 (a) XRD patterns of the as-prepared Co/Ni MOFs. Co/Ni MOFs bulks (line b) were obtained by similar synthetic method with 2D Co/Ni MOFs nanosheets except for reaction temperature of 120°C for 12 h under hydrothermal conditions; (b) SEM image of Co/Ni MOFs bulks.

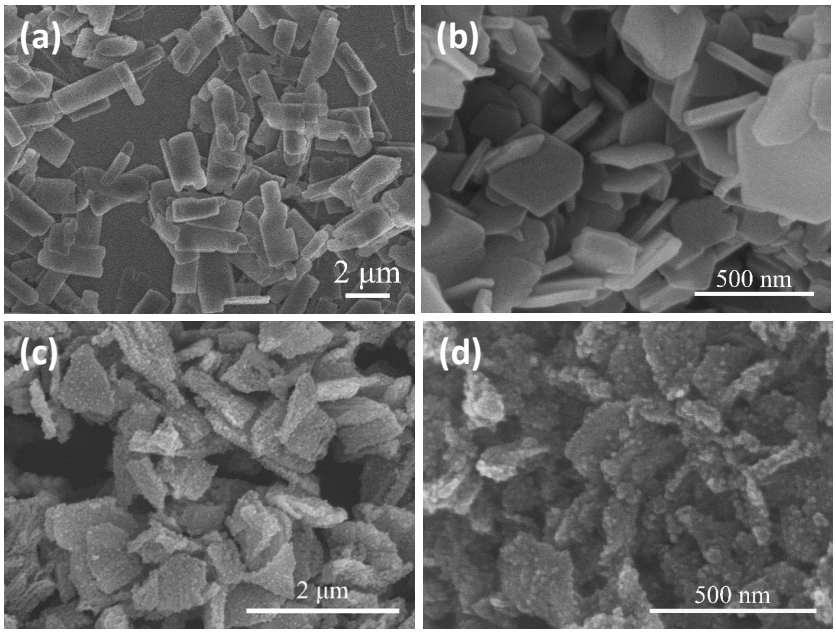

Fig. S3 SEM images of (a) Co-MOFs; (b) Ni-MOFs; (c) Co@SNC and (d) Ni@SNC.

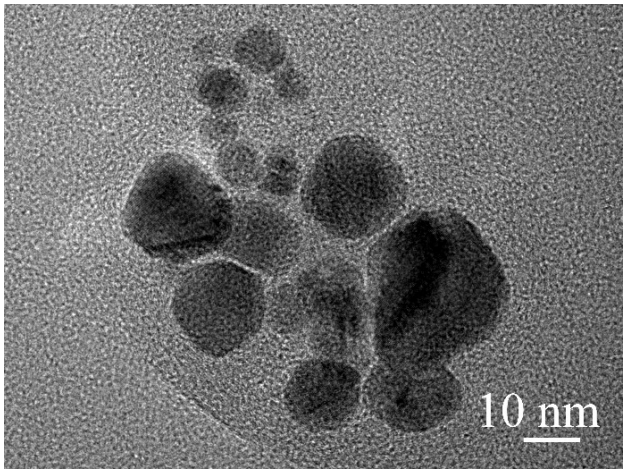

Fig. S4 TEM image of Co/Ni MOFs derived carbon material corresponding to EDX mapping images.

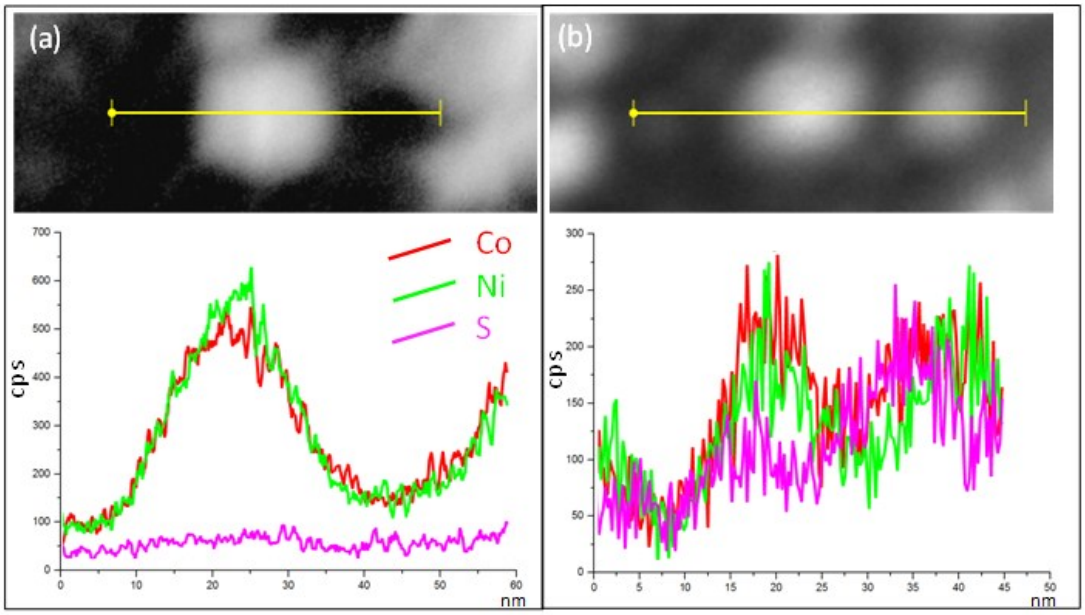

Fig. S5 STEM images of CoNi@SNC and line scanning spectra of element Co, Ni, and S. (a) CoNi alloy nanoparticles imbedded in S, N-doped carbon matrix; (b) CoNi alloy nanoparticles fused with Co_9S_8.

Fig. S5 shows the STEM images and line scanning spectra of CoNi@SNC with different sample areas. In Fig. S5a, the lower and flat-distributed intensity curve of S than Co suggests that S atoms are doped in carbon matrix. However, the intensity curves of S, Co and Ni in Fig. S5b are almost identical, possibly implying a

combination of Co with S to form Co_9S_8, which can be further confirmed by XPS characterization, as shown in Fig. 5d in the manuscript.

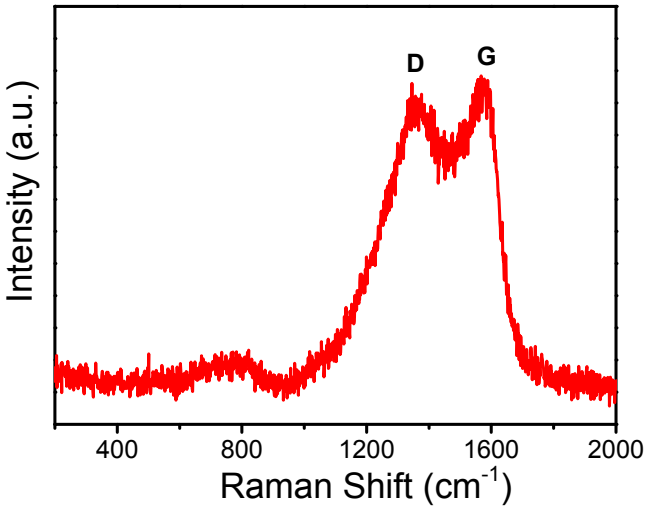

Fig. S6 Raman spectra of CoNi@SNC.

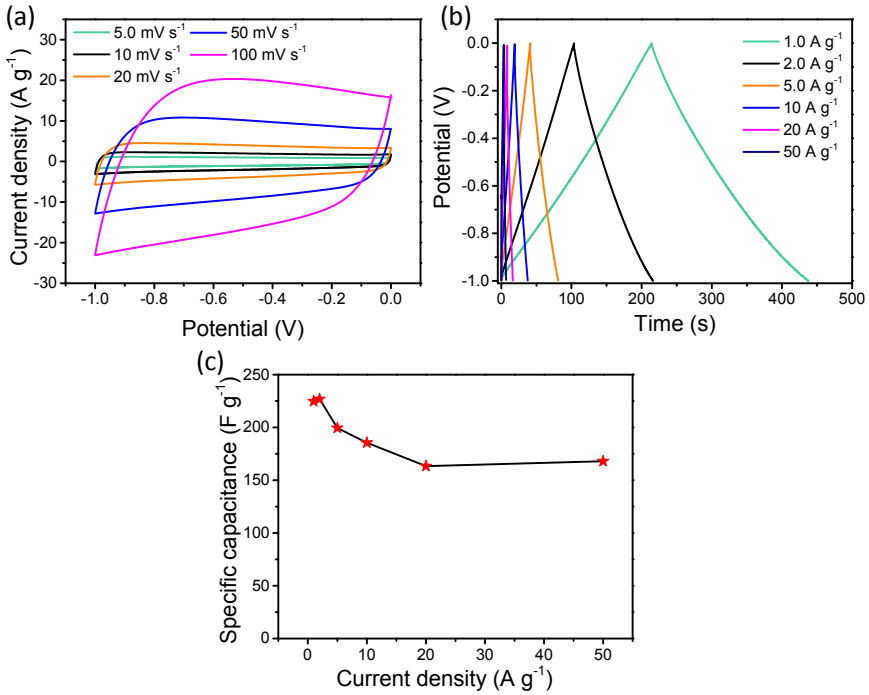

Fig. S7 The electrochemical performance of the activated carbon (AC) electrode in 6.0 M KOH electrolyte. (a) Cyclic voltammetry curves; (b) Galvanostatic charge-discharge curves; (c) Specific capacitance *vs.* current density.

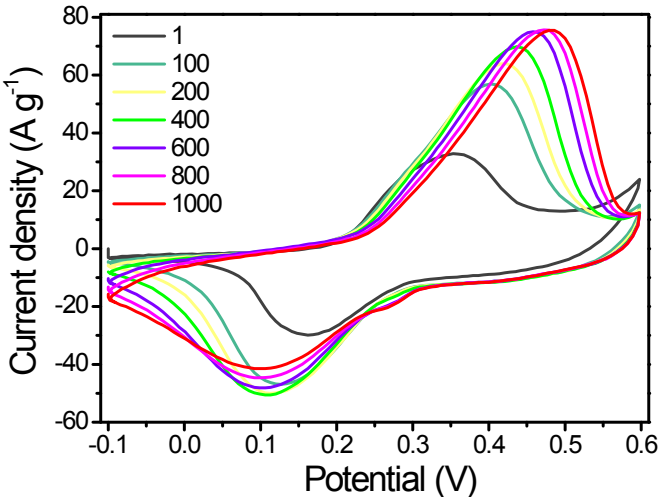

Fig. S8 CV curves at a scan rate of 50 mV s^{-1} with cycling times from 1th to 1000th.

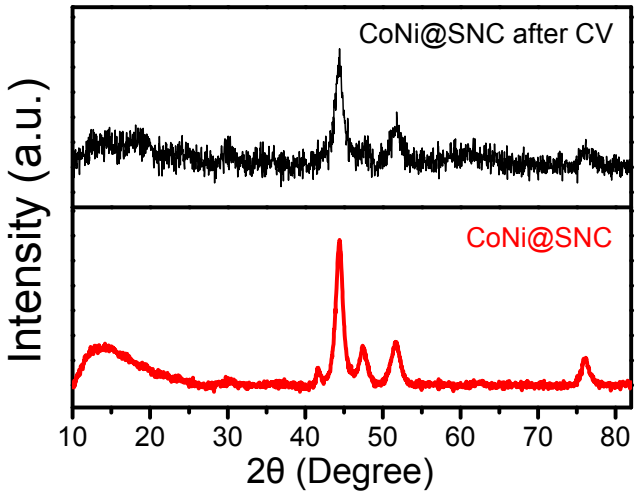

Fig. S9 XRD patterns of CoNi@SNC before and after CV test.

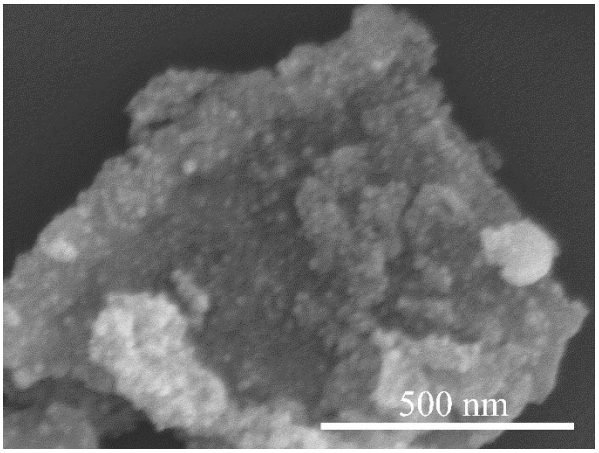

Fig. S10 SEM image of CoNi@SNC after CV test.

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