Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting information

Zeolitic imidazolate framework-derived Co_3S_4@$Co(OH)_2$ nanoarrays as self-supported electrodes for asymmetric supercapacitors

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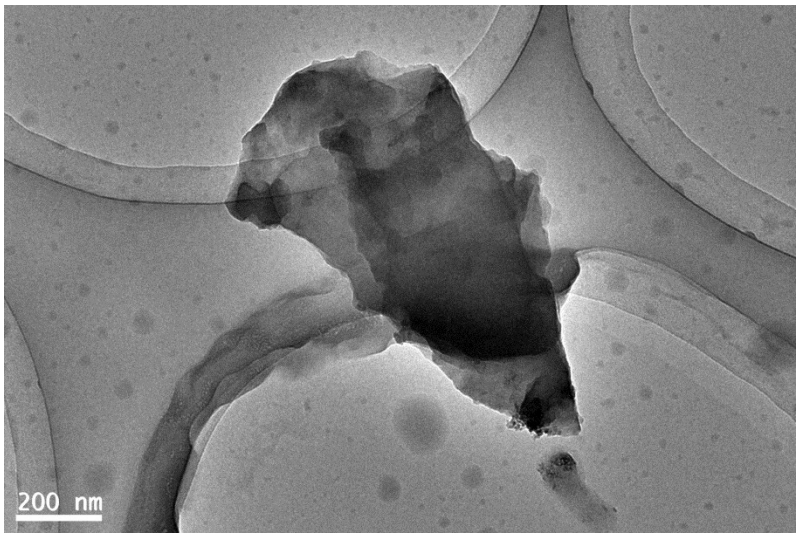

Fig. S1 TEM image of Co_3S_4 nanosheet.

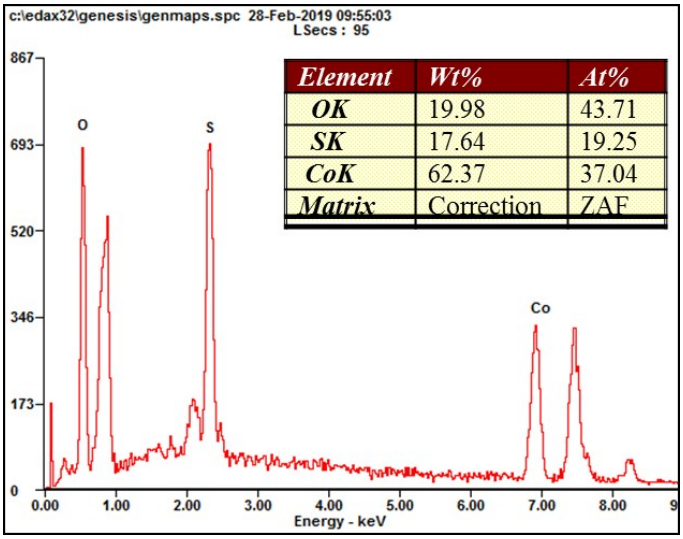

Fig. S2 EDS spectrum for the Co_3S_4@$Co(OH)_2$ NSAs.

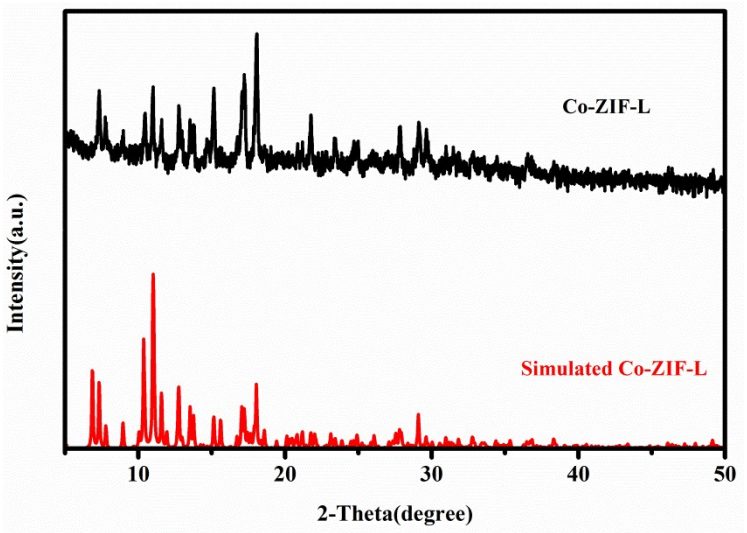

Fig.S3 XRD pattern of Co-ZIF-L NSAs

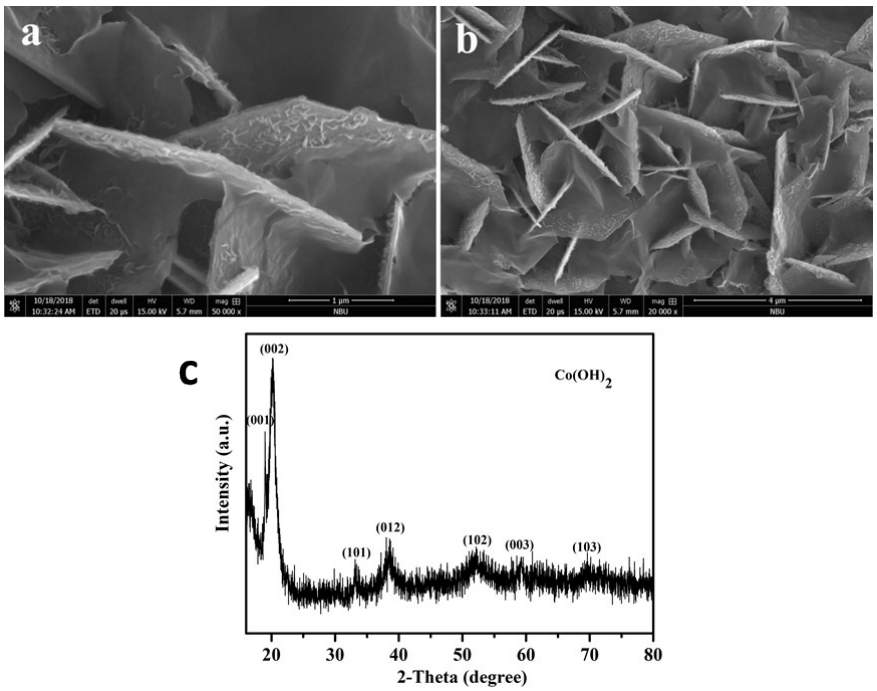

Fig. S4 SEM images (a, b) at different magnifications and XRD pattern (c) of $Co(OH)_2$ NFAs.

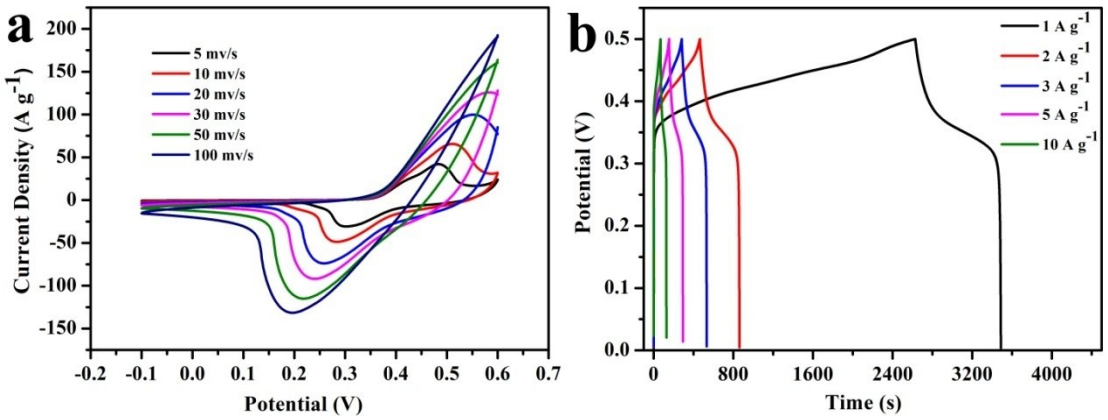

Fig. S5 CV (a) and GCD (b) curves of Co_3S_4 NSAs electrode.

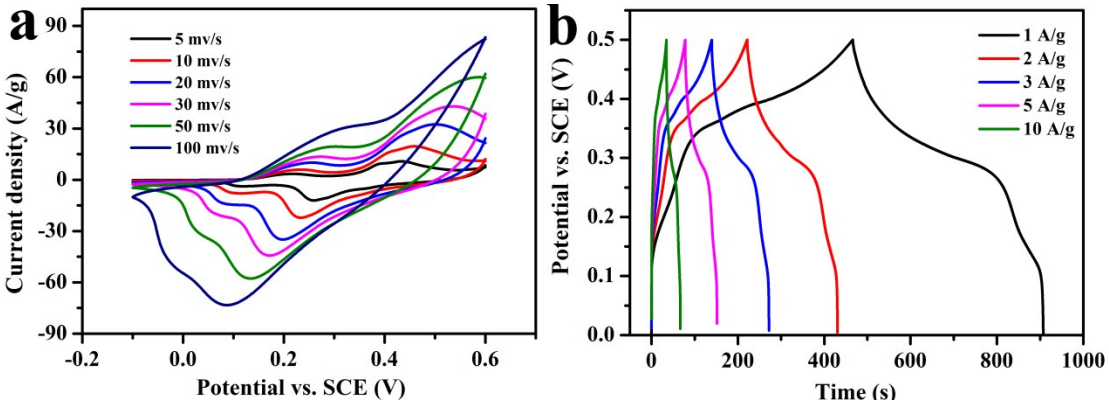

Fig. S6 CV (a) and GCD (b) curves of $Co(OH)_2$ NFAs electrode.

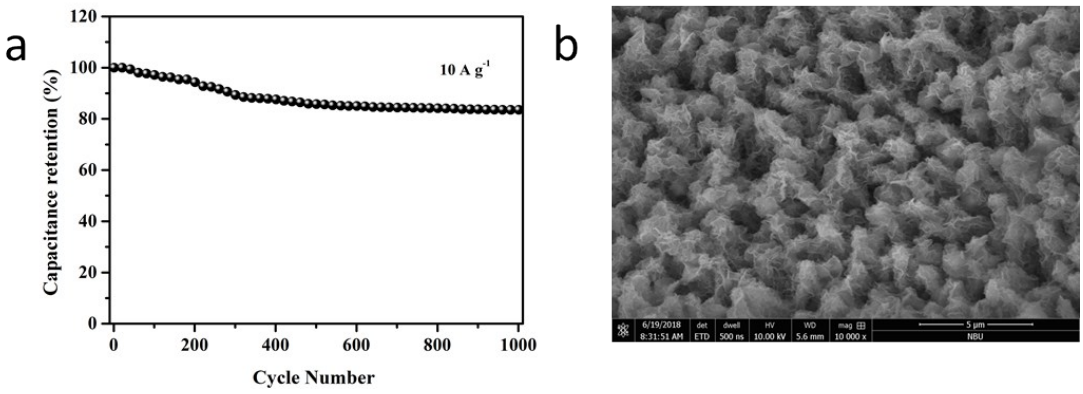

Fig. S7 Cycling performance at a current density of 10 A^{-1} of the Co_3S_4@$Co(OH)_2$ NSAs electrode in three-electrode system (a) and SEM image of used Co_3S_4@$Co(OH)_2$ NSAs electrode (b).

About 83.5% of initial capacity of Co_3S_4@$Co(OH)_2$ NSAs is retained after 1000 cycles (Fig. S7a), showing an excellent cycling stability. The good cycling stability of the as-synthesized Co_3S_4@$Co(OH)_2$ NSAs is further confirmed by the SEM image of the sample after cycles (Fig. S7b), where the overall core-shell nanoarrays structure of Co_3S_4@$Co(OH)_2$ NSAs is maintained.

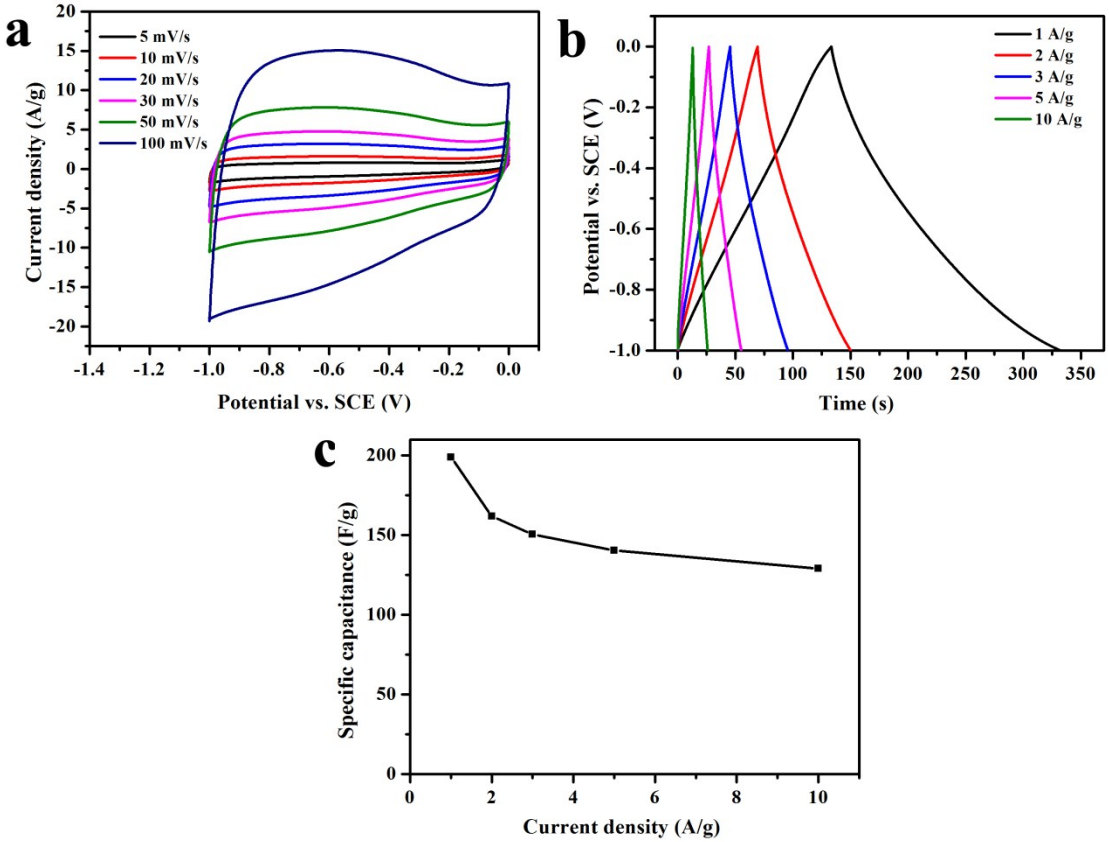

Fig. S8 (a) CV curves of AC electrode at different scan rates, (b) GCD curves of AC electrode at different current densities and (c) The corresponding specific capacitance of AC electrode calculated by the GCD curves.

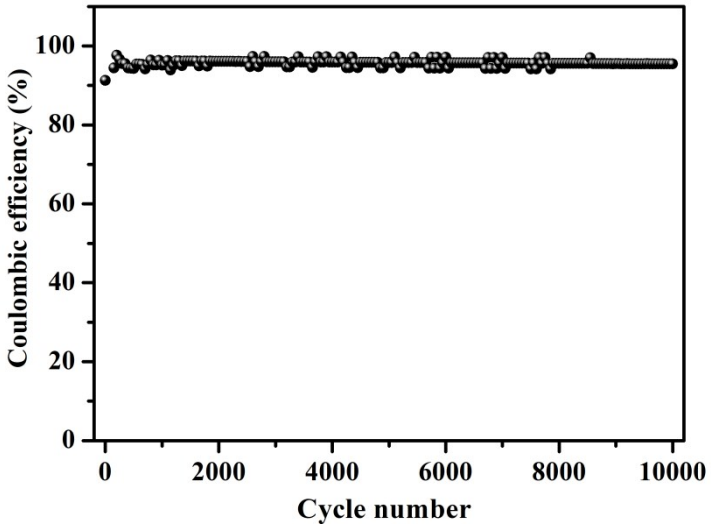

Fig. S9 Coulombic efficiency of Co_3S_4@$Co(OH)_2$ NSAs//AC ASC device over 10000 cycles at 10 Ag^{-1}.

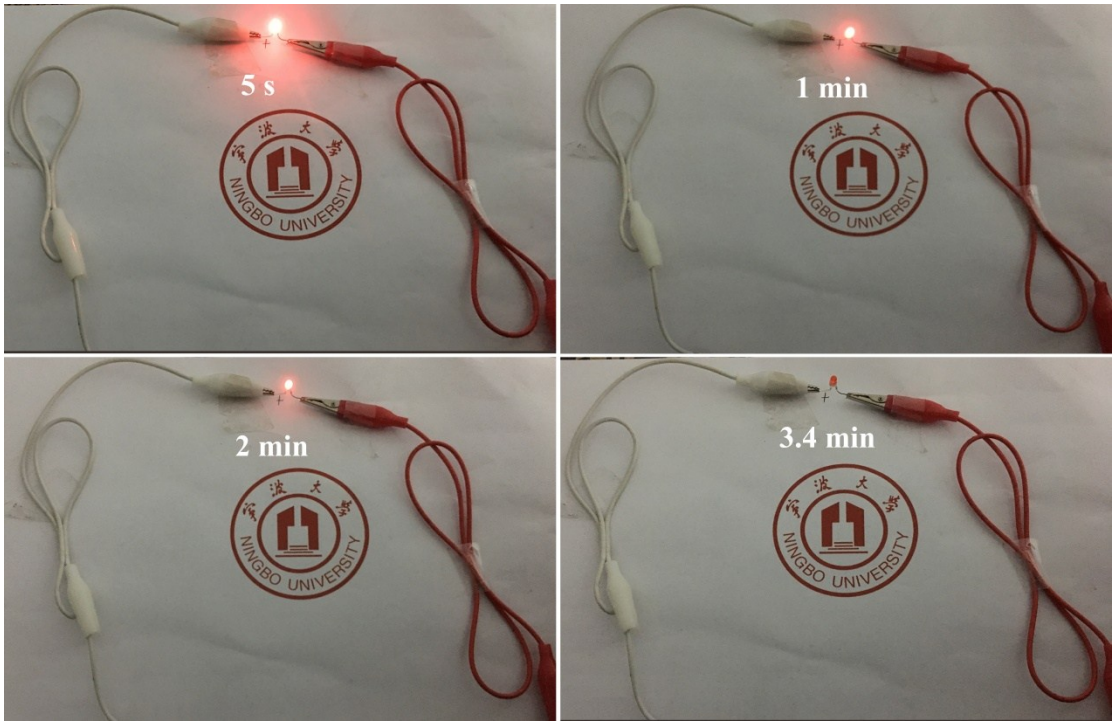

Fig. S10 Photograph of the lighted red LED powered by two assembled ASCs in series.

Table S1. Comparison of the electrochemical performance of this work with metal sulfides, metal hydroxides and their hybrid electrodes reported in literature.

Electrode materials	Specific capacitance	Current density	Refs
Co_3S_4@$Co(OH)_2$ NSAs	2974.0 F g^{-1}	1 A g^{-1}	This work
Co_3S_4@$Co(OH)_2$ NSAs	2250.0 F g^{-1}	10 A g^{-1}	This work
$Zn_{0.76}Co_{0.24}S$/$Ni(OH)_2$ hierarchical hollow nanotube arrays	2157.0 F g^{-1}	1 A g^{-1}	1
Ni_3S_2@Co_9S_8	600 F g^{-1}	0.5 A g^{-1}	2
Co_9S_8 nanosheets array	1098.8F g^{-1}	0.5 A g^{-1}	3
Ni–Co–S nanosheets array	1406.9 F g^{-1}	0.5 A g^{-1}	4
Zn–Co–S nanosheets array	2353.5 F g^{-1}	0.5 A g^{-1}	5
Ni-Co layered double hydroxide/graphene nanoribbons	1765.0 F g^{-1}	1 A g^{-1}	6
$CoMoO_4$@$NiCo_2S_4$	2433 F g^{-1}	5 mA cm^{-2}	7
$NiCo_2S_4$@holey defect graphene hydrogel	1000.0 F g^{-1}	1 A g^{-1}	8
Ni_3S_2@$Ni(OH)_2$/3DGN	1037.5F g^{-1}	5.1 A g^{-1}	9
Co_9S_8 nanorod @Ni(OH)2 nanosheet	1620.0 F g^{-1}	0.5 A g^{-1}	10

Table S2. Simulated resistances of the samples.

Electrode materials	Rs (Ω)	Rct (Ω)
Co_3S_4@$Co(OH)_2$ NSAs	1.65	0.45
Co_3S_4 NSAs	1.0	0.38
$Co(OH)_2$ NFAs	1.82	0.66

References

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