Electronic Supplementary Material (ESI) for Nanoscale.

Hierarchically hollow structured $NiCo_2S_4$@NiS for high-performance flexible hybrid supercapacitors

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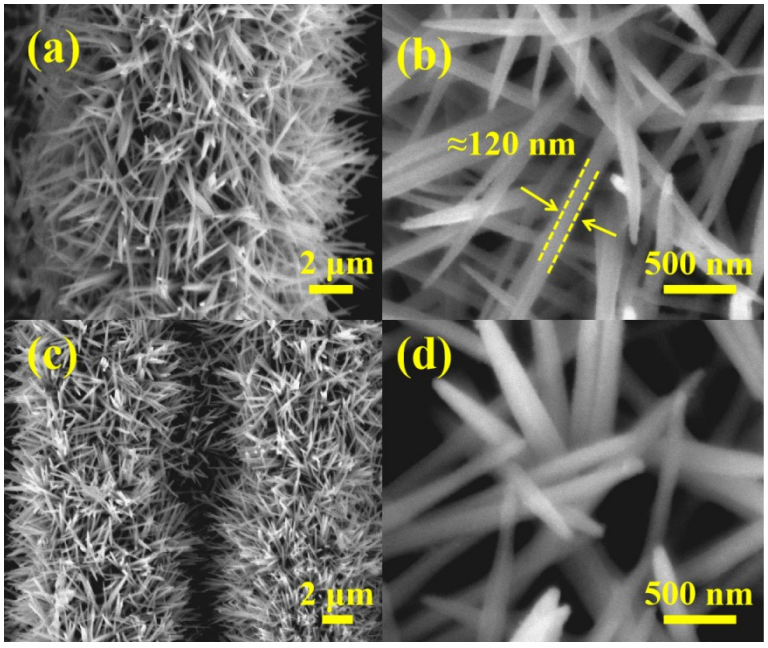


Fig. S1 SEM images. Low and high magnifications of NiCo-DHs nanoneedle arrays (a,b)and $NiCo_2S_4$ nanoneedle arrays (c,d).

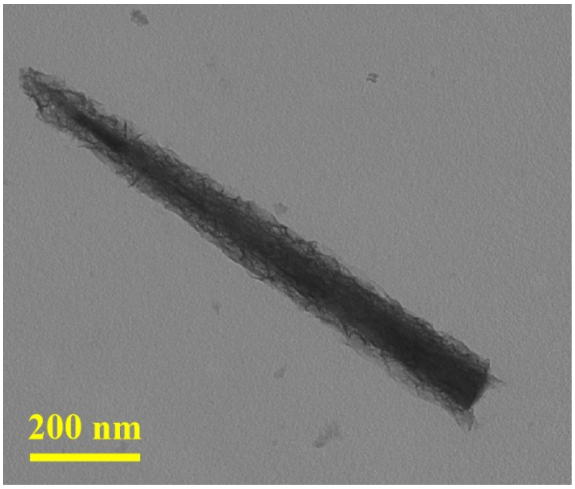
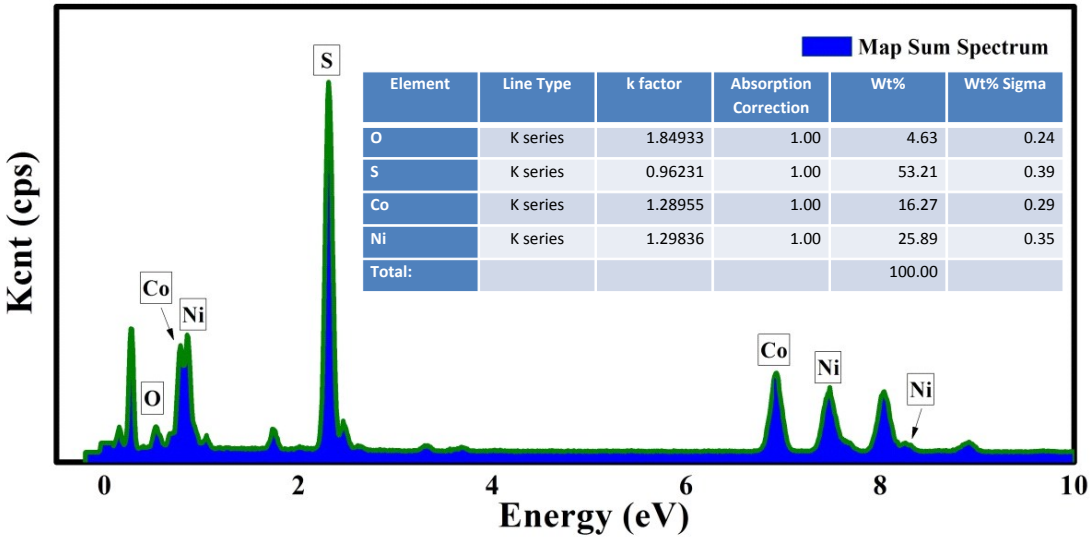


Fig. S2 TEM image of single root NiCo-DHs@$Ni(OH)_2$.



Element	Line Type	k factor	Absorption Correction	Wt%	Wt% Sigma
O	K series	1.84933	1.00	4.63	0.24
S	K series	0.96231	1.00	53.21	0.39
Co	K series	1.28955	1.00	16.27	0.29
Ni	K series	1.29836	1.00	25.89	0.35
Total:				100.00	

Fig. S3 EDS spectrum of $NiCo_2S_4$@NiS/CF.

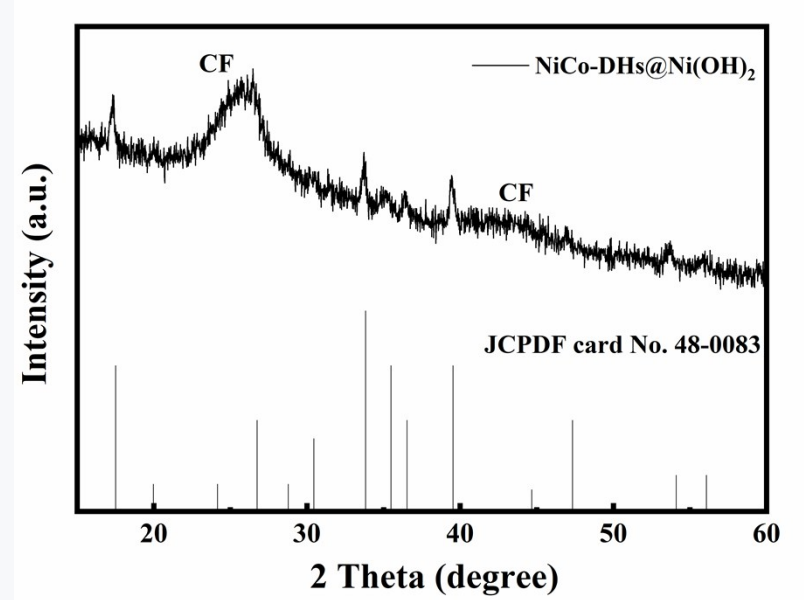


Fig. S4 XRD spectrum of the NiCo-DHs@$Ni(OH)_2$/CF.

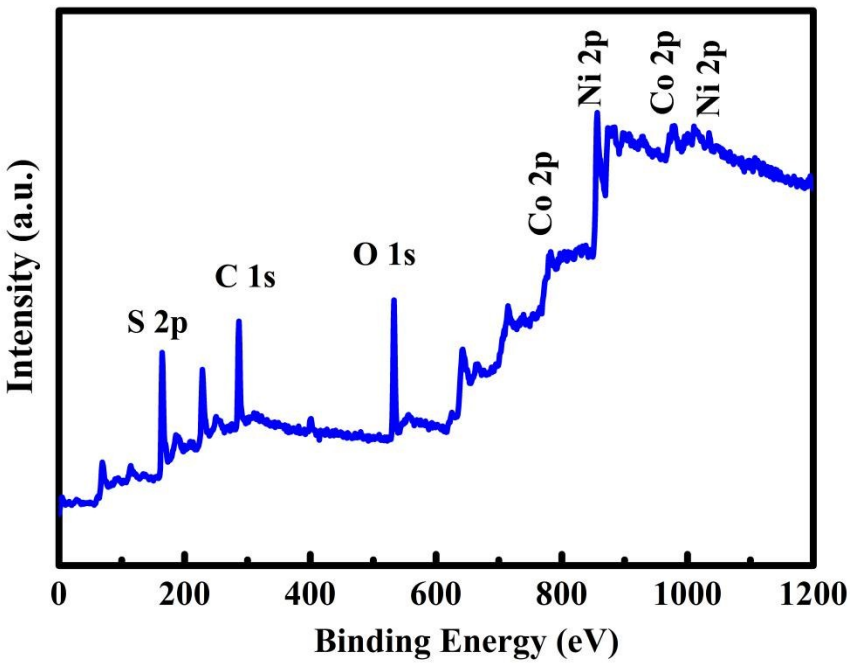


Fig. S5 XPS survey spectrum of the $NiCo_2S_4$@NiS/CF.

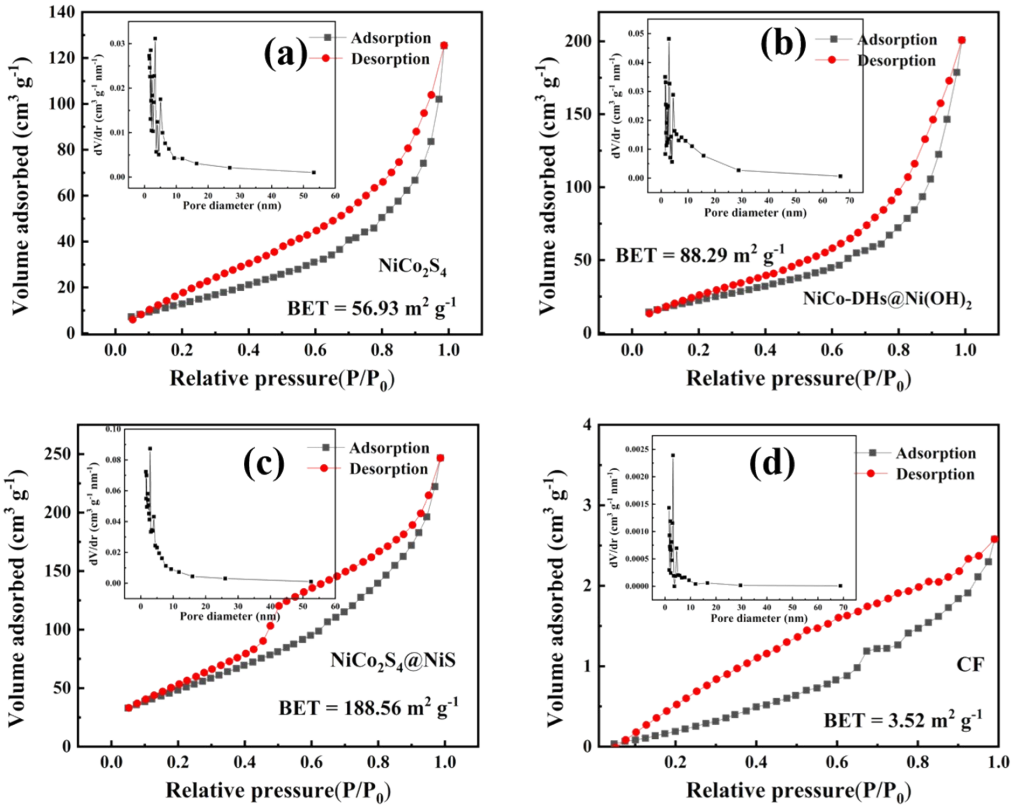


Fig. S6 XPS survey spectrum of the $NiCo_2S_4$@NiS/CF.

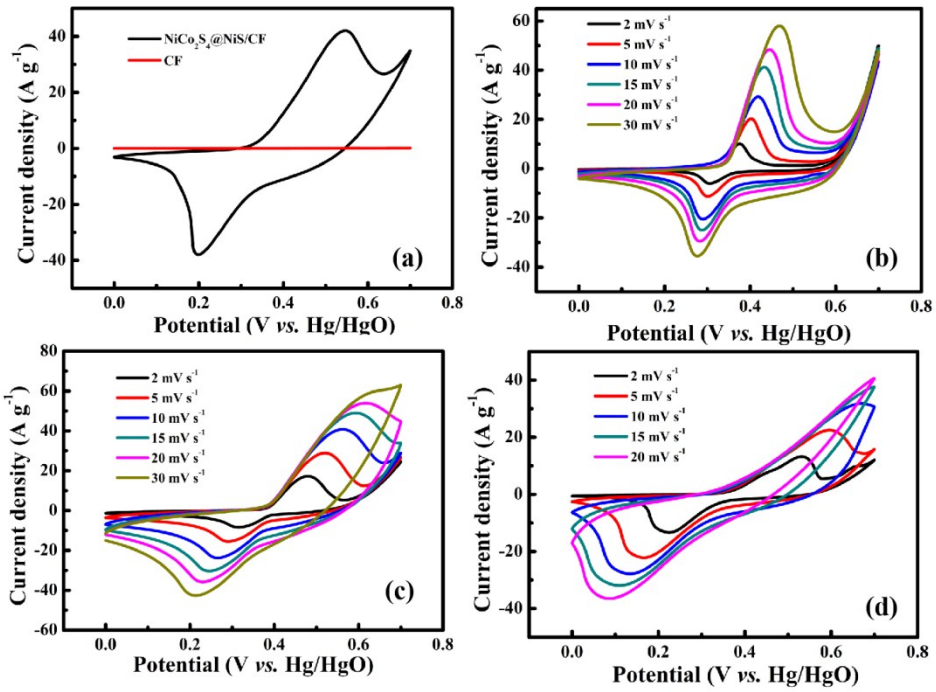


Fig. S7 (a) CV curves of $NiCo_2S_4$@NiS/CF and pure CF at 10 mV s^{-1}; CV curves at different scan rates: (b) $NiCo_2S_4$/CF; (c) NiS/CF; (d) NiCo-DHs@$Ni(OH)_2$/CF.

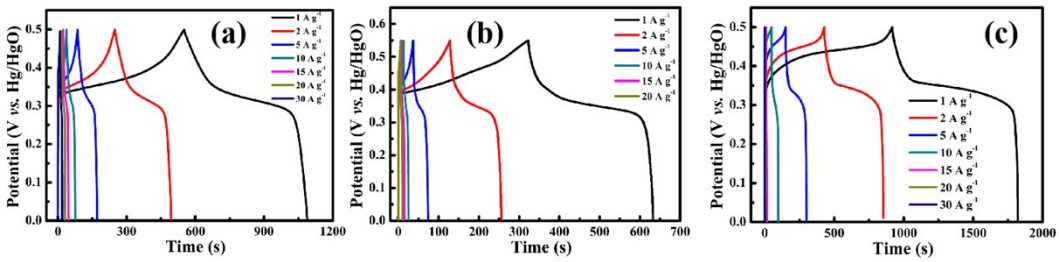


Fig. S8 GCD curves: (a) $NiCo_2S_4$/CF; (b) NiS/CF; (c) NiCo-DHs@$Ni(OH)_2$/CF.

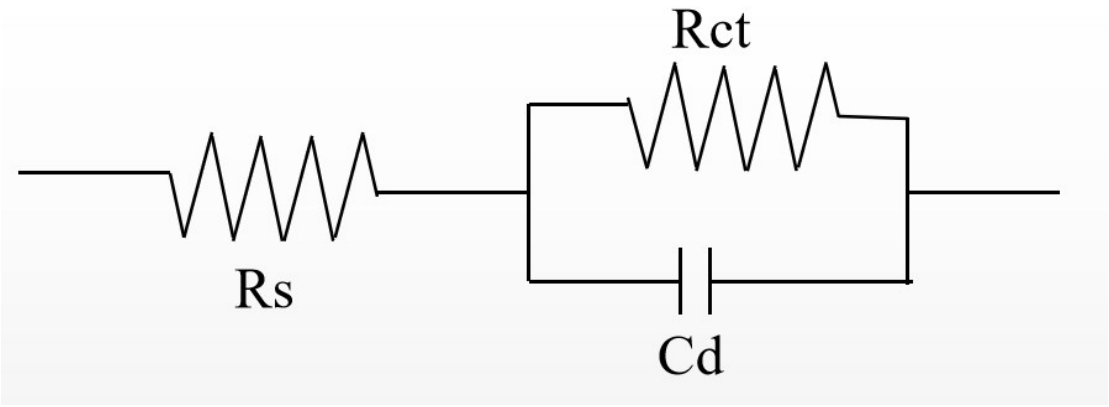


Fig. S9 Equivalent circuit image of EIS fitting.

Table S1. The EIS of $NiCo_2S_4$/CF, NiS/CF, NiCo-DHs@$Ni(OH)_2$/CF and $NiCo_2S_4$@NiS/CF simulation results

Electrodes	R_s **(Ω)**	R_{ct} **(Ω)**
$NiCo_2S_4$/CF	0.50	0.19
NiS/CF	0.69	0.13
NiCo-DHs@$Ni(OH)_2$/CF	0.95	0.29
$NiCo_2S_4$@NiS/CF	0.78	0.04

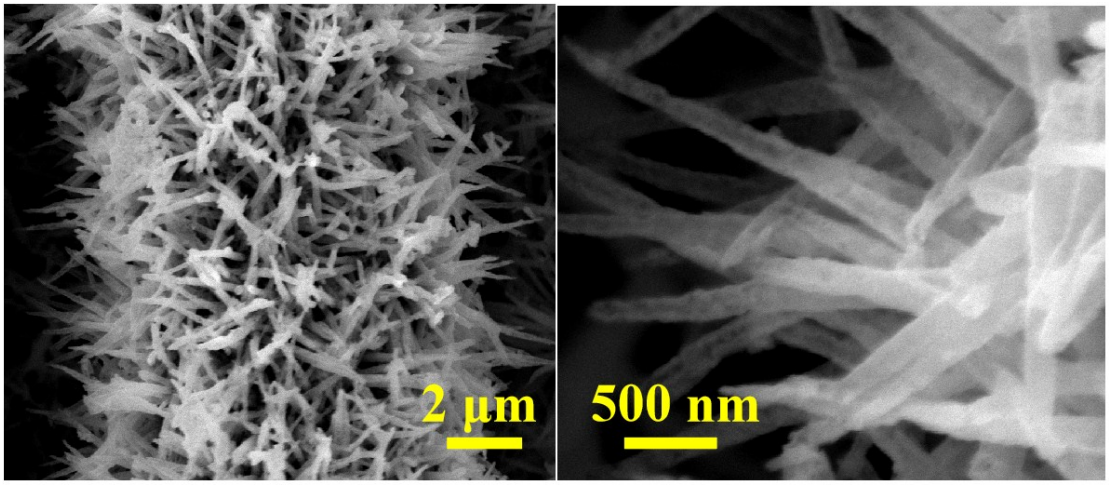


Fig. S10 SEM images of $NiCo_2S_4$@NiS/CF after 5000 cycles.

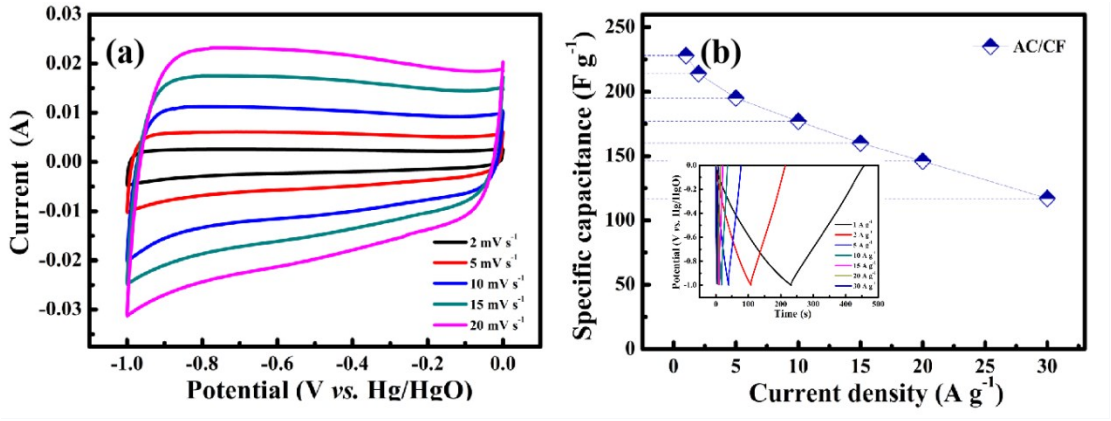


Fig. S11 (a) CV curves of the AC with different scan rates; (b) GCD curves of the AC with different current densities.

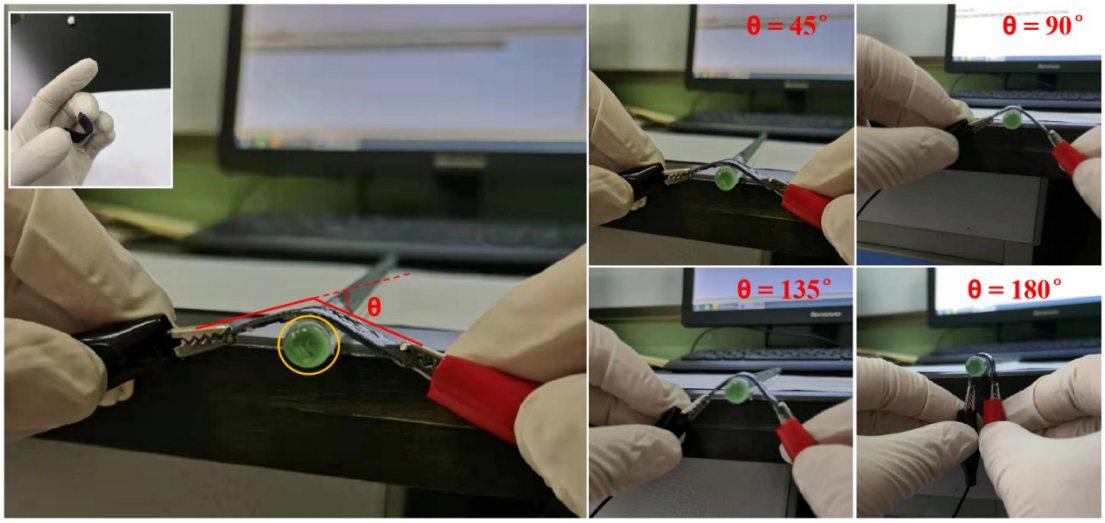


Fig. S12 Bending test equipment for all-solid-state $NiCo_2S_4$@NiS/CF//AC HSC.