Uniform P Doped Co-Ni-S Nanostructures for Asymmetric Supercapacitors with Ultra-high Energy Densities

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Figure S1

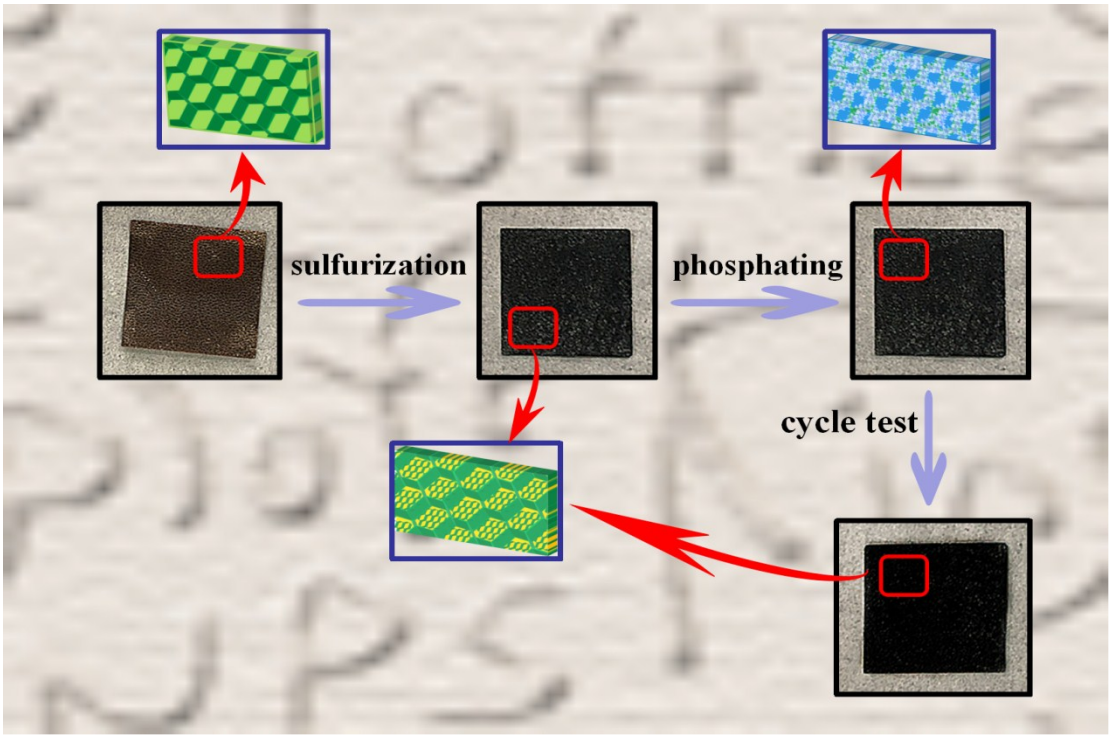

Figure S1. Photographs of the as-prepared different electrode materials.

Figure S2

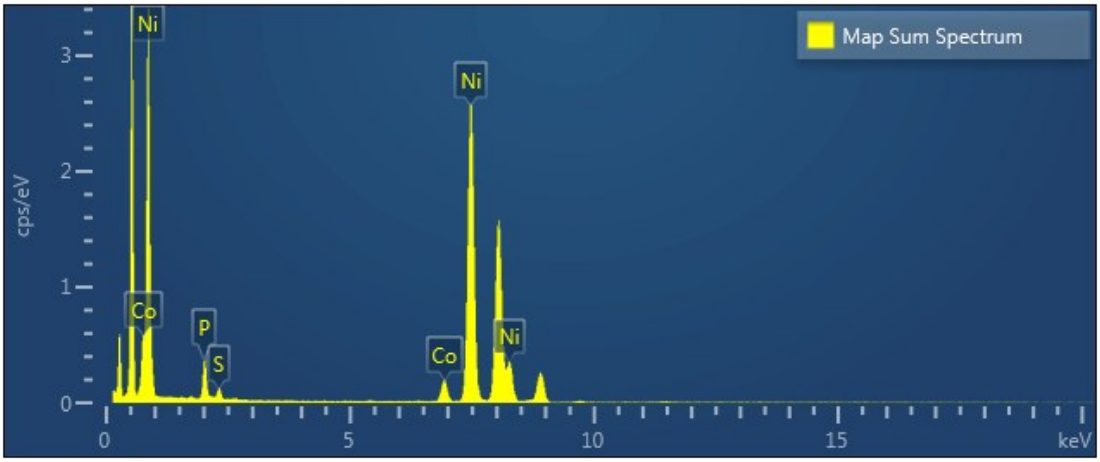

Figure S2. EDAX spectrum of P in Co-Ni-S nanosheets.

Figure S3

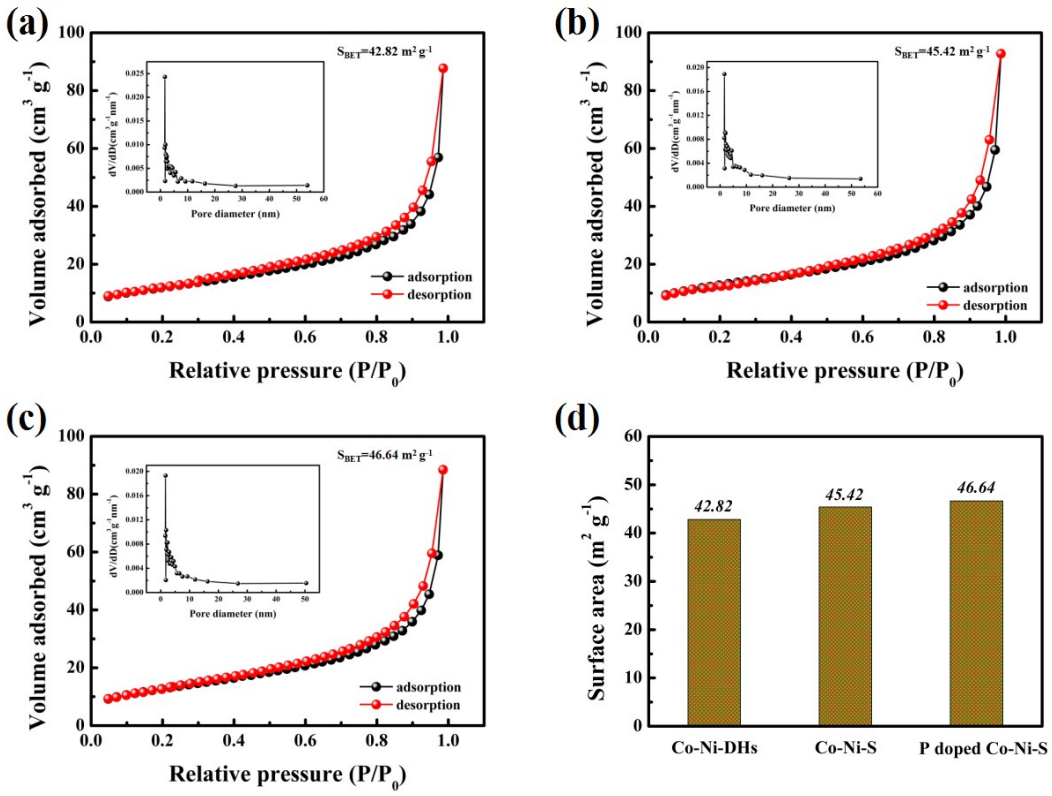

Figure S3. N_2 adsorption–desorption analysis of (a) Co-Ni-DHs (b) Co-Ni-S and (c) P doped Co-Ni-S. Insets show the corresponding pore size distribution profiles, (d) the surface area contrast of as-prepared materials.

Figure S4

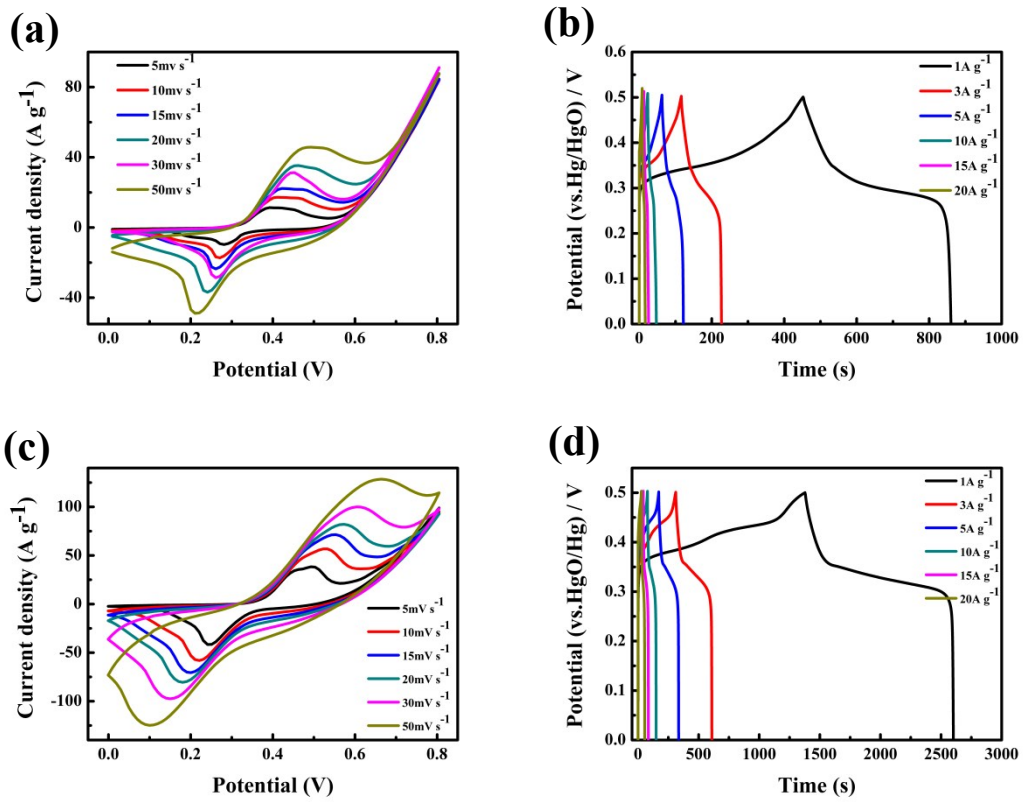

Figure S4. CV curves and GCD curves of the typical Co-Ni-DH (a-b) and Co-Ni-S (c-d).

Figure S5

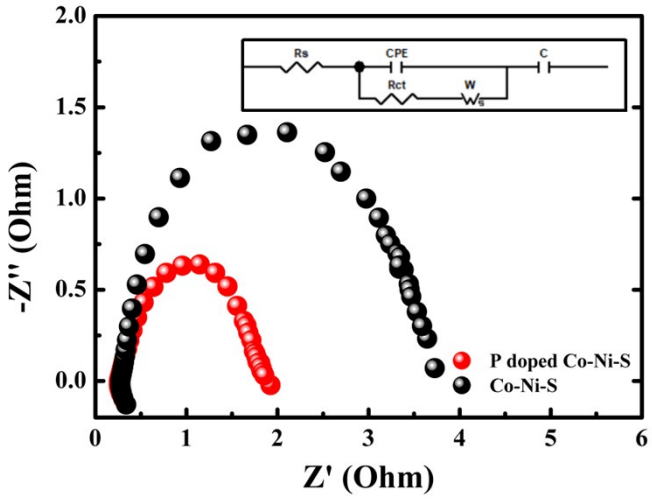

Figure S5. EIS in the frequency of 0.01Hz~100KHz and the equivalent circuit model for the EIS plot of Ni-Co-S and P doped Co-Ni-S.

Figure S6

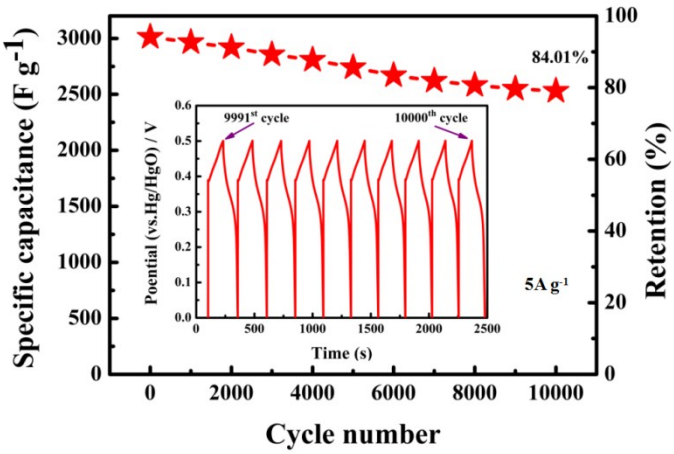

Figure S6. The cycling performance of P doped Co-Ni-S electrode at a constant current density of 5 A g^{-1}.

Figure S7

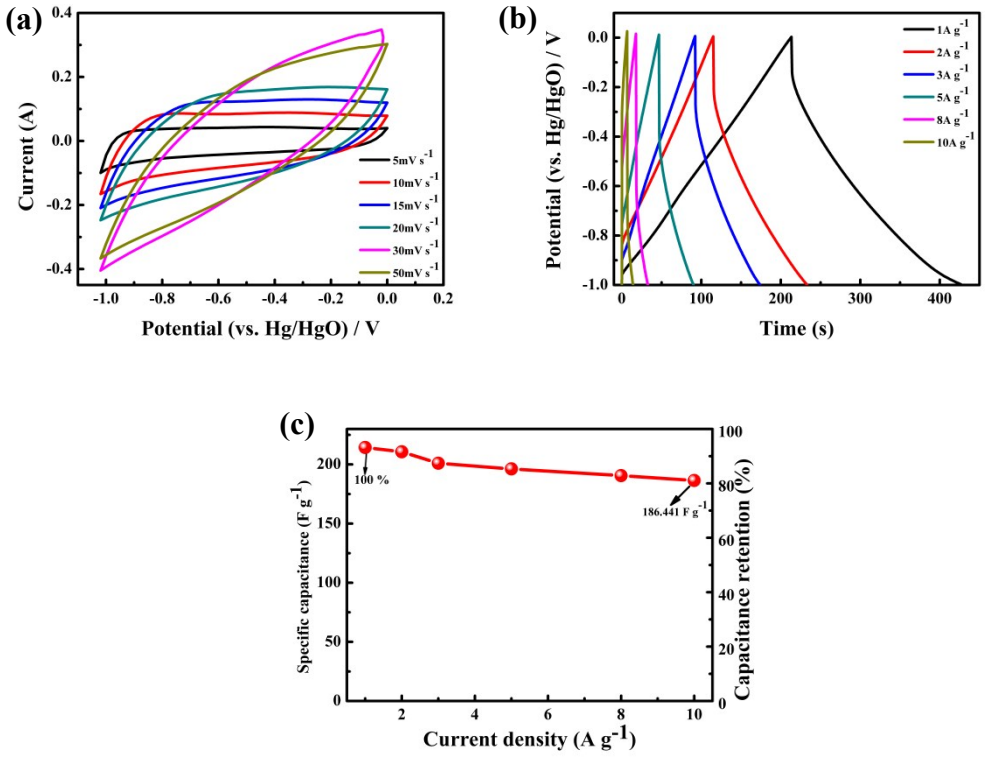

Figure S7. (a) the CV measurements of AC electrode at different scan rates from 5 to 50 mV s^{-1}; (b) GCD curves of AC electrode at the current densities of 1, 2, 3, 5, 8 and 10 A g^{-1}; (c) specific capacitance of AC electrode.

Table S1.

Materials	Electrolyte concentration	Current density	S_c / f g^{-1}	Ref
$Cu_{1-x}Ni_xS$	2 M KOH	2 A g^{-1}	2672 F g^{-1}	1
SP-AG	1 M KOH	1 A g^{-1}	381 F g^{-1}	14
$Ni_3S_2/CoNi_2S_4/NF$	6 M KOH	2 A g^{-1}	2435 F g^{-1}	9
$CuCo_2O_4@Ni_{0.5}Co_{0.5}(OH)_2$	3 M KOH	1 A g^{-1}	295.6 F g^{-1}	8
$NiCo_2O_4@Ni_3S_2$	2 M KOH	1 A g^{-1}	1716 F g^{-1}	42
$NiCo_2S_4$	6 M KOH	2.5 A g^{-1}	2141.9 F g^{-1}	23
Ni-Co sulfide NWAs	1 M KOH	2.5 A g^{-1}	2415 F g^{-1}	40
$NiCo_2S_4$ ball-in-ball	6 M KOH	1 A g^{-1}	1036 F g^{-1}	54
Ni-Co sulfide NSs	6 M KOH	2 A g^{-1}	1304 F g^{-1}	15
$NiCo_2S_4$/MWCNTs	6 M KOH	1 A g^{-1}	2080 F g^{-1}	52
P doped Co-Ni-S ✸	3 M KOH	1 A g^{-1}	3677.4 F g^{-1}	✸

Note:Refers to this work

Table S1. Comparison of specific capacitances of the other electrode materials and present work in a three-electrode system.

Table S2

Materials	Electrolyte type	Energy density	Power density	Ref
$Cu_{1-x}Ni_xS$//NSGNS	Solid state	94.05 Wh kg^{-1}	1.09 kW kg^{-1}	1
SP-AG	Aqueous	88.5 Wh kg^{-1}	5.3 kW kg^{-1}	14
$Ni_3S_2/CoNi_2S_4$//AC	Aqueous	40 Wh kg^{-1}	17.3 kW kg^{-1}	9
$CuCo_2O_4@Ni_{0.5}Co_{0.5}(OH)_2$//AC	Solid state	32 Wh kg^{-1}	0.8 kW kg^{-1}	8
NiCo-S//NG	Aqueous	58.1 Wh kg^{-1}	0.79 kW kg^{-1}	42
$NiCo_2S_4$//rGO	Solid state	38.64 Wh kg^{-1}	1.33 kW kg^{-1}	23
Ni-Co sulfide NWAs//AC	Aqueous	25 Wh kg^{-1}	3.57 Wh kg^{-1}	40
$NiCo_2S_4$ ball-in-ball//G/CSs	Aqueous	42.3 Wh kg^{-1}	0.47 Wh kg^{-1}	54
Ni-Co sulfide NSs//AC	Aqueous	41.4 Wh kg^{-1}	0.41 Wh kg^{-1}	15
$NiCo_2S_4$/MWCNTs//rGO	Aqueous	51.8 Wh kg^{-1}	0.86 Wh kg^{-1}	52
P doped Co-Ni-S//AC	Aqueous	68.76 Wh kg^{-1}	0.81 kW kg^{-1}	

Note: Refers to this work

Table S2. Comparison of specific capacitances of the other asymmertic supercapacitors and present work.