Synthesis of iron dopped nickel sulfide/rGO as an electroactive material for asymmetric supercapacitors

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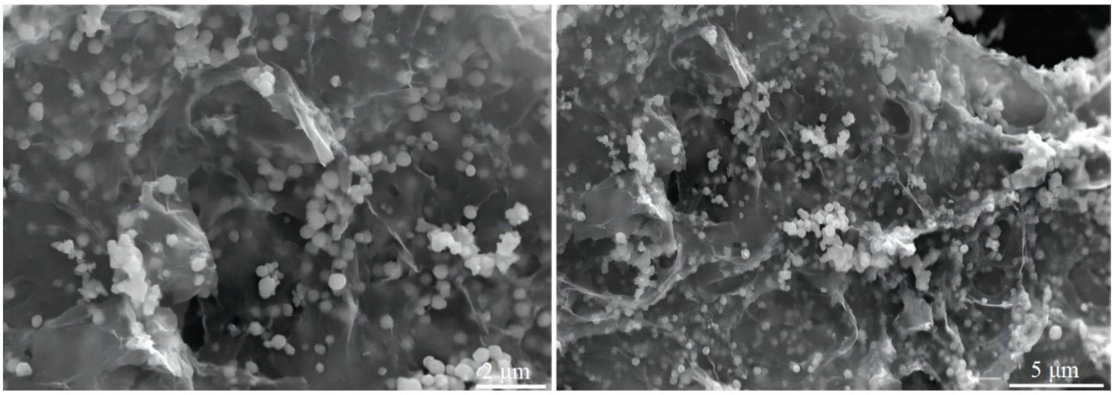

Figure S1 SEM images of Ni-S/rGO.

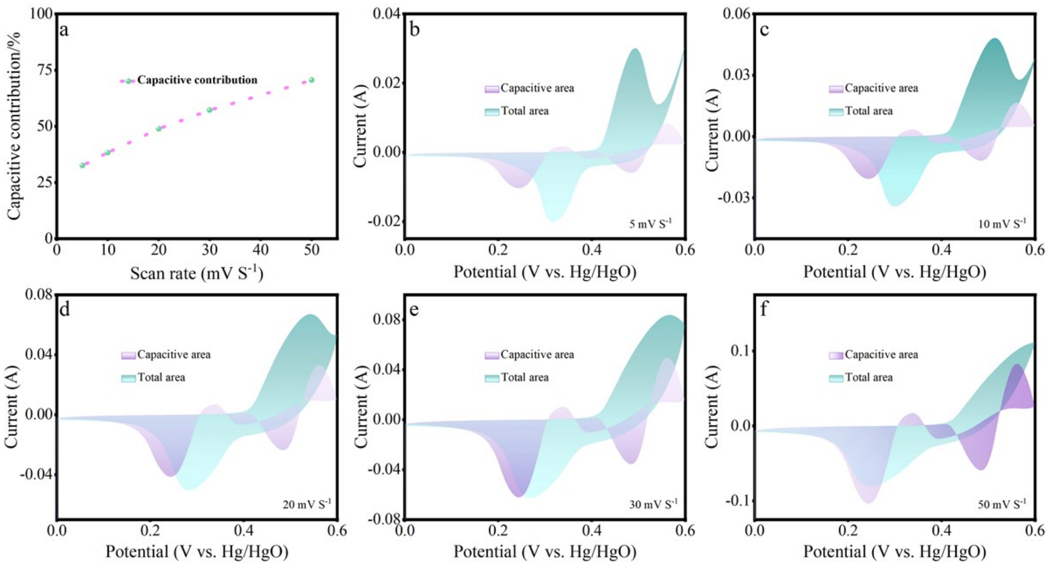

Figure S2 capacitive contributions to the total current at different scan rates.

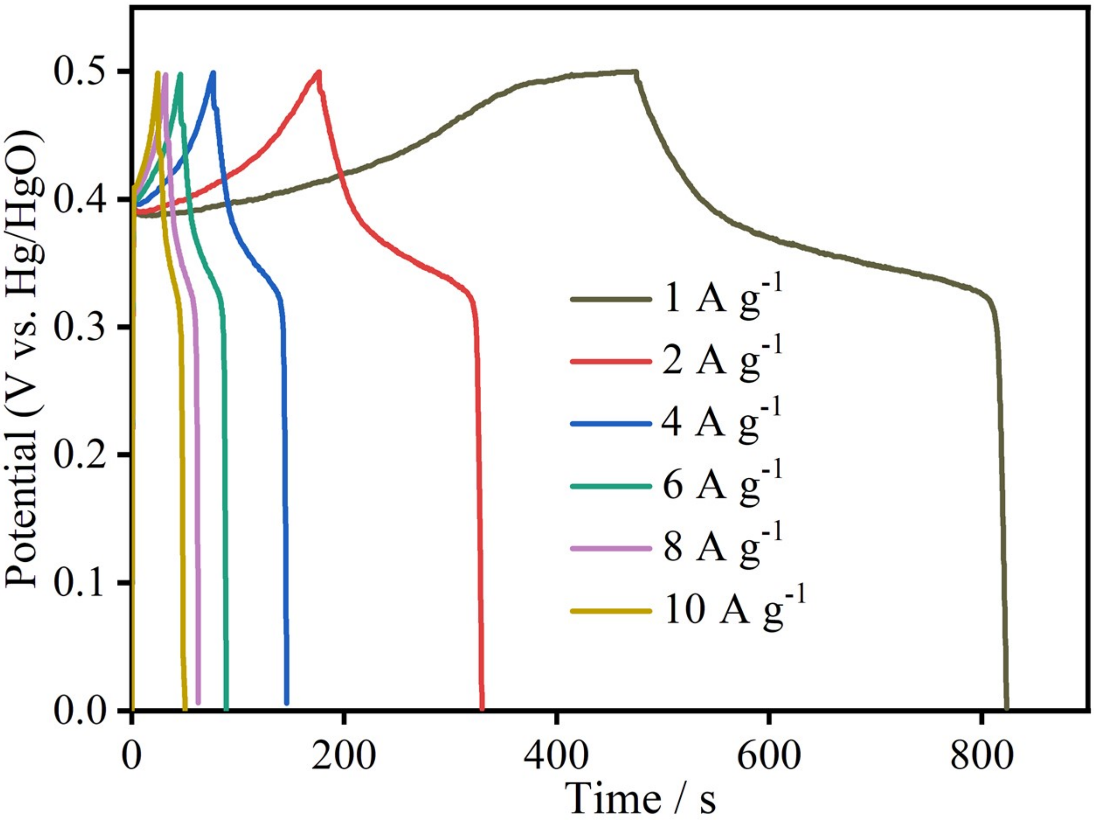

Figure S3 GCD curves at varied current densities for Fe-Ni-S

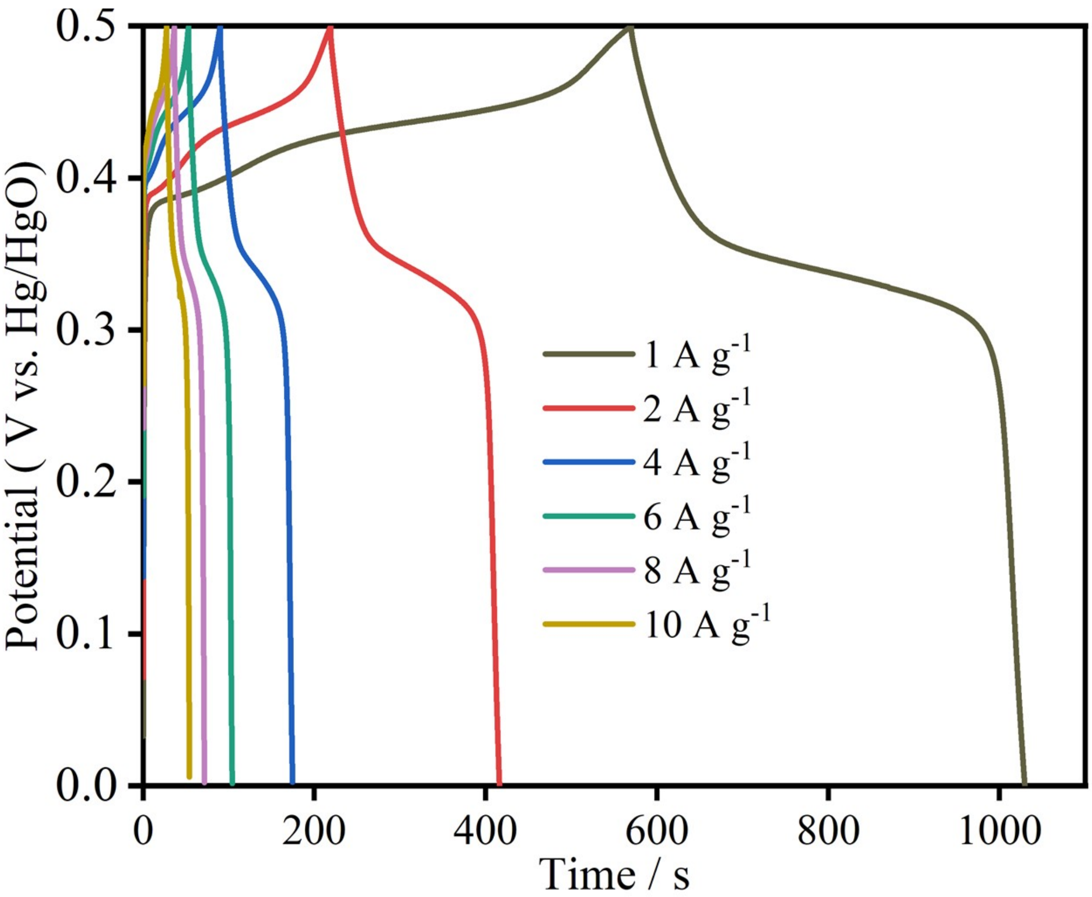

Figure S4 GCD curves at varied current densities for Ni-S/rGO

Table S1 The 2θ values observed in the XRD patterns of Fe-Ni-S/rGO and Ni-S/rGO.

Fe-Ni-S/rGO	Ni-S/rGO	
2θ (degree)	2θ (degree)	Description
30.1	30.1	$Ni_{0.96}S$(100)
34.5	34.6	$Ni_{0.96}S$(101)
45.7	45.8	$Ni_{0.96}S$(102)
53.5	53.6	$Ni_{0.96}S$(110)
21.3	21.3	Ni_3S_2(101)
73.0	73.1	Ni_3S_2(214)
31.5	31.6	NiS_2(200)
38.9	39.0	NiS_2(211)

Table. S2. Comparison of electrochemical performance for NiS based electrode.

Materials	Electrolyte	Max. SC	Rate Performance	Refs.
NiS	3 M KOH	1122.7 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	28%/30 $A \cdot g^{-1}$	1
NiS/NHCS	2 M KOH	1150 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	52.2%/20 $A \cdot g^{-1}$	2
NiS	3 M KOH	1315.4 $F \cdot g^{-1}$/1 $A \cdot g^{-1}$	24.2%/30 $A \cdot g^{-1}$	3
NiS	2 M KOH	515.98 $C \cdot g^{-1}$/1 $A \cdot g^{-1}$	37.6%/50 $A \cdot g^{-1}$	4
P-NiS	2 M KOH	727.79 $C \cdot g^{-1}$/1 $A \cdot g^{-1}$	50.6%/50 $A \cdot g^{-1}$	4
r-$FeNi_2S_4$-rGO	6 M KOH	746.8 C g^{-1}/1 A g^{-1}	49.01%/10 A g^{-1}	5
NiFe-S/NF	6 M KOH	884.9 F g^{-1}/1 A g^{-1}	73.79%/10 A g^{-1}	6
NiS_2/GO	2 M KOH	1020 F g^{-1}/1 A g^{-1}	55.68%/5 A g^{-1}	7
NiS/NF	3 M KOH	1279.8 F g^{-1}/7.5 A g^{-1}	70.5%/12.5 A g^{-1}	8
$NiCo_2S_4$/CNF	3 M KOH	757.97 C g^{-1}/1 A g^{-1}	86%/ 20 A g^{-1}	9
Fe-NiS@MWCNTs/NF	1.5 M KOH	662 C g^{-1}/5 mV s^{-1}	70.2%/100 mV s^{-1}	10
NiS/NF	3 M KOH	613 F g^{-1}/1.1 A g^{-1}	80%/2.8 A g^{-1}	11
SS-NiS@3DNF	3 M KOH	694 F g^{-1}/1 A g^{-1}	41.5%/6 A g^{-1}	12
NiS/CF@NiS	6 M KOH	1691.1 F g^{-1}/1 A g^{-1}	60.3%/10 A g^{-1}	13
carbon sphere@NiS	3 M KOH	1022 F g^{-1}/1A g^{-1}	61.7%/10 A g^{-1}	14
NiS hollow cubes	2 M KOH	874.5 F g^{-1}/1 A g^{-1}	60.3%/10 A g^{-1}	15
NiS/TC-g-C_3N_4	6 M KOH	1162 F g^{-1}/1 A g^{-1}		16
NiS	2 M KOH	529 F g^{-1}/2 A g^{-1}	23.06%/30 A g^{-1}	17
NiS-CFs	2 M KOH	635.1 F g^{-1}/1 A g^{-1}	67.88%/10 A g^{-1}	18
NiS/RGO	6 M KOH	302 F g^{-1}/1.1 A g^{-1}		19
NiS@NF	6 M KOH	603.9 F g^{-1}/1 A g^{-1}	30.65%/10 A g^{-1}	20
rGO- Ni_3S_2	6 M KOH	616 C g^{-1}/1 A g^{-1}	52.27%/20 A g^{-1}	21
NiO/NiS	3 M KOH	386.7 F g^{-1}/1 A g^{-1}	45%/10 A g^{-1}	22
SS-NiS@3DNF-E-3	2 M KOH	694 F g^{-1}/1A g^{-1}	41.5%/6 A g^{-1}	23
NiS	2 M KOH	964 F g^{-1}/1 A g^{-1}	49.6%/10 A g^{-1}	24
rGO@Ni_3S_2/CC	1 M KOH	501.23 C g^{-1}	78.2%/10 A g^{-1}	25
Fe-Ni-S/rGO	3 M KOH	1220 F g^{-1}/1 A g^{-1}	75.4%/10 A g^{-1}	This work

Table S3 A comparison of the Ni@CNTs@Co_9S_8//NCNTs asymmetric supercapacitor device with those of advanced supercapacitors recently reported.

Supercapacitor devices	Energy density (Wh kg^{-1})	Power density (W kg^{-1})	Cyclic stability	Ref.
Ni-Co-S//AC	30.1 16.89	800.2 7800	82%, 30 A g^{-1} 10000 cycles	26
$NiCo_2S_4$/Co_9S_8//AC	33.5 17.5	150 3375	70%, 3 A g^{-1} 5000 cycles	27
CC/h-Co_9S_8/NiCo-Mo//AC	37.6	228.7	87.7%, 20 mA cm^{-2} 10000 cycles	28
NiS/NF//NiS/NF	27.58	1320	97%, 10 A g^{-1} 5000 cycles	11
NiS@CoS//AC	24.1	752.15	80%, 5000 cycles	29
Mn-NiS NSs//ONAC	44.2	825	90%, 8 A g^{-1} 5000 cycles	30
Ni-Mn-S//AC	27.3	505.2	75.3%, 8 mA cm^{-2} 6000 cycles	31
NiMn-S//AC	82.2	800	81.1%, 10 A g^{-1} 10000 cycles	32
$MnCo_2S_4$/CC//PCP/rGO	43	801	87%, 10 A g^{-1} 10000 cycles	33
$FeNi_2S_4$-rGO//AC	43.4	800	87.1%, 4 A g^{-1} 1000 cycles	5
Ni_3S_2//pen ink	8.2	214.6	93.1%, 2.4 A g^{-1} 3000 cycles	34
ppy@Ni_3S_2//AC	17.5	179.3	100.1%, 30 mA cm^{-2} 3000 cycles	35
rGO/Ni_3S_2(rGO)	29.1	390	86.1%, 5 A g^{-1} 5000 cycles	36
Ni_3S_2@NF//AC@NF	32	210.8	83.9%, 8 mA cm^{-2} 2000 cycles	37
NiS-C@rGO//AC	44.1	755	93.5, 1 A g^{-1} 10000 cycles	38
NiS_{NF}/CF@NiS_{NP}//AC	31.2	400.1	87.8%, 5 A g^{-1}	13

			5000 cycles	
NiS hollow cubes//AC	34.9	387.5	82.8, 4 A g^{-1} 10000 cycles	[15]
TC-g-C_3N_4/NiS//AC	27	379	87.9%, 5 A g^{-1} 8000 cycles	[16]
NiS@C//C	21.6	400	84%, 5 A g^{-1} 5000 cycles	[39]
NiS@C QDs-CNTs-rGO/GH	21	811	82%, 2 A g^{-1} 5000 cycles	[40]
NiS//NiS	16.5	250	None	[24]
NiS-CFs‖CNFs	13.8	373.9	96.4%， 1A g^{-1} 5000 cycles	[18]
rGO@Ni_3S_2//AC	17.2	2752	79%, 1 A g^{-1} 1000 cycles	[25]
Ni@CNTs@Co_9S_8//NCNTs	30.5	800	82%, 3 A g^{-1} 10000 cycles	This work

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