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A cycle-durable hollow nanoneedle structure with a nanosheet as a conductive substrate $CoS_{1.097}/Ni_9S_8$@RGO to enhance supercapacitor performance

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Table. S1 The specific capacitance values of different electrodes at 1 to 20 A g^{-1}

Current densities / A g^{-1} samples / C g^{-1}	2-CSNS@RGO	2-CSNS	1-CSNS
1	1650.13	1522.80	1370.74
2	1583.04	1392.60	1270.61
4	1480.96	1301.20	1151.73
6	1452.00	1243.20	1070.73
8	1396.91	1205.60	1014.62
10	1352.40	1172.00	961.60
20	1220.80	1066.00	831.36
rate performance	74.0 %	69.9 %	60.6 %

Table. S2 The specific capacitance values of 2-CSNS//AC and 2-CSNS@RGO//AC at 1 to 20 A g^{-1}

Current densities / A g^{-1} samples / F g^{-1}	2-CSNS@RGO//AC	2-CSNS//AC
0.8	247.58	224.86
1.6	225.90	185.37
3.2	197.78	147.32
4.8	178.18	134.80
6.4	161.66	115.51
8	149.26	94.08
12	127.99	74.14
rate performance	51.7 %	33.0 %

Table. S3 Characteristics of supercapacitors in literature and this paper

Supercapacitors	Potential window (V)	Maximum energy density (Wh kg^{-1})	Power density (kW kg^{-1})	Retention (%) cycling Number current density	Refs.
$NiCo_2S_4$@NiS/CoS//Fe_3O_4 NSs@ERGO	1.6	58.44	0.8002	86.4% after 10,000 times at 20 A g^{-1}	1
NiS@CoS//AC	1.5	24.1	0.7521	80% after 5000 times at 5 A g^{-1}	2
$Ni_XCo_{1-X}S$/C-3//AC	1.5	45.31	0.748	91.0% after 8000 times at 50 mV s^{-1}	3
Co_9S_8//AC	1.7	15.47	0.1275	81.3% after 7000 times at 7 A g^{-1}	4
NCS-1//AC	1.6	29.3	0.4	87.27% after 3000 times at 4 A g^{-1}	5
2-CSNS//AC	1.6	79.95	0.80	-	This work
2-CSNS@RGO//AC	1.6	88.0	0.80	131.6% after 30000 times at 10 A g^{-1}	This work

Fig. S1. (a) the CV of the 1-CSNS electrodes at scan rates of 5, 10, 20, 30, 40 and 50 mV s^{-1}, (b) the CV of the 2-CSNS and 2-CSNS@RGO electrodes was performed at scan rates of 5, 10, 20, 30, 40 and 50 mV s^{-1}, (c) the CV of the 2-CSNS@RGO electrodes was performed at scan rates of 5, 10, 20, 30, 40 and 50 mV s^{-1}.

Fig. S2. (a) the GCD of 1-CSNS electrodes 1 to 20 A g^{-1}, (b) the GCD of 2-CSNS electrodes 1 to 20 A g^{-1}, (c) the GCD of 2-CSNS@RGO electrodes 1 to 20 A g^{-1}.

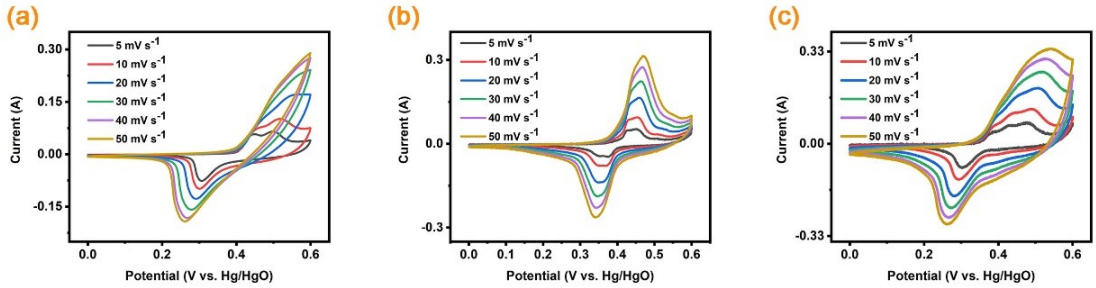
(a)
(b)
(c)
5 mV s-1
10 mV s-1
20 mV s-1
30 mV s-1
40 mV s-1
50 mV s-1
Current (A)
Potential (V vs. Hg/HgO)

Fig. S1.

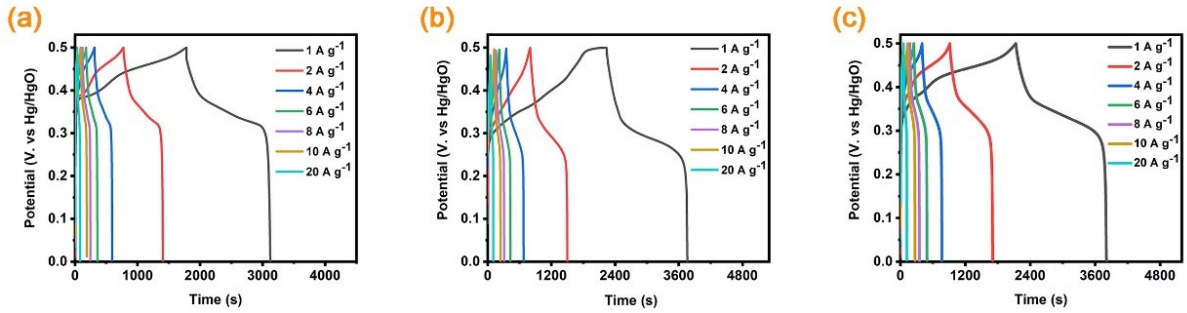
(a)
(b)
(c)
1 A g-1
2 A g-1
4 A g-1
6 A g-1
8 A g-1
10 A g-1
20 A g-1
Potential (V. vs Hg/HgO)
Time (s)

Fig. S2.