

Nest-like Ni@Ni_{1.4}Co_{1.6}S₂ Electrode for Flexible High-Performance

Rolling Supercapacitors Device Design

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Method of preparing roll-up supercapacitor device: For the assembly of roll-up cell, the positive electrode is the as-obtained nest-like flexible electrodes (20 cm×1.5 cm), the negative electrode is the active carbon electrode with the similar size of positive electrode, and the non-woven and 2 M KOH aqueous solution are diaphragm and electrolyte, respectively. The positive electrode, diaphragm, negative electrode and diaphragm were folded together in this order, wined up, putted into shell, and then injected electrolyte. So the roll-up supercapacitor device was successfully assembled.

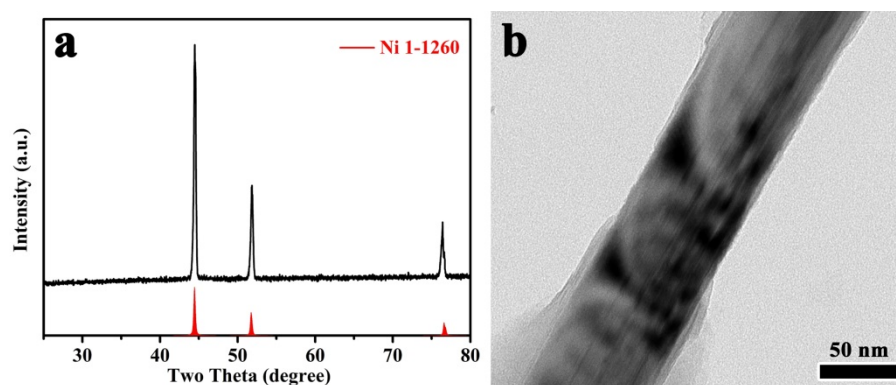


Figure S1. (a) XRD pattern of sample synthesized by the similar method of Ni@Co₉S₈, the difference is that the template is no longer Ni@Ni₃S₂ but a piece of foam nickel (0.0305 g), which is to prove metal nickel no participate in the reaction during the replacement process. (b) TEM image of Ni₃S₂ nanowires on the surface of nest-like Ni@Ni₃S₂.

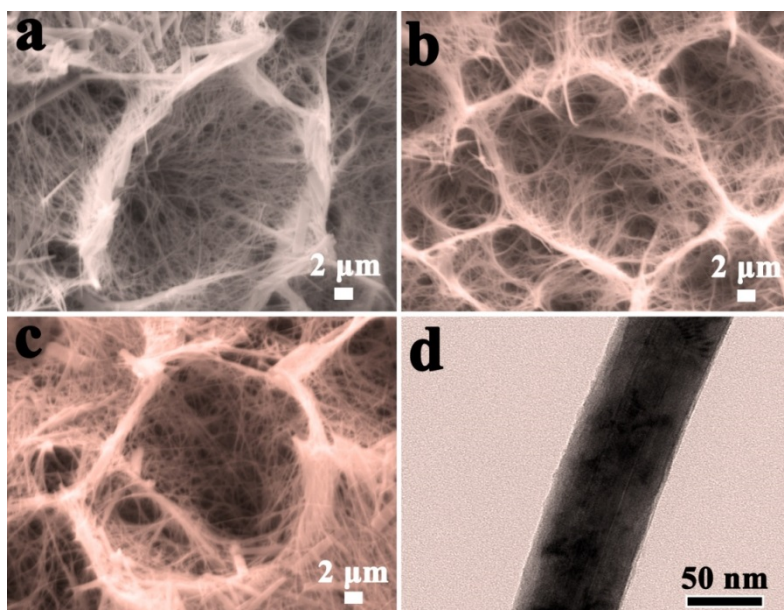


Figure S2. SEM images of (a) Co-1, (b) Co-2 and (c) Co-6. (d) TEM image of nanowire as the building block of nest-like materials on the surface of Co-4.

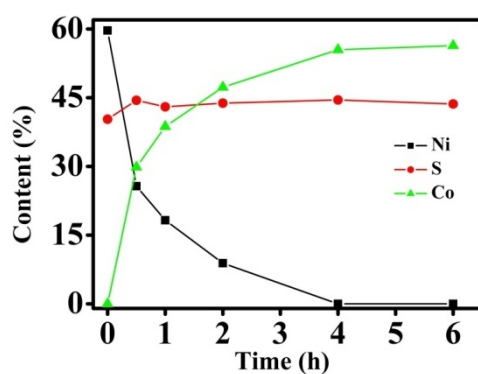


Figure S3. Curves of element ratio of S, Co, and Ni in Ni@Ni₃S₂, Ni@Ni_{1.4}Co_{1.6}S₂, Ni@NiCo₂S₂, Ni@Ni_{0.5}Co_{2.5}S₂, Ni@Co₉S₈, and Co-6, which were obtained by the EDX measure.

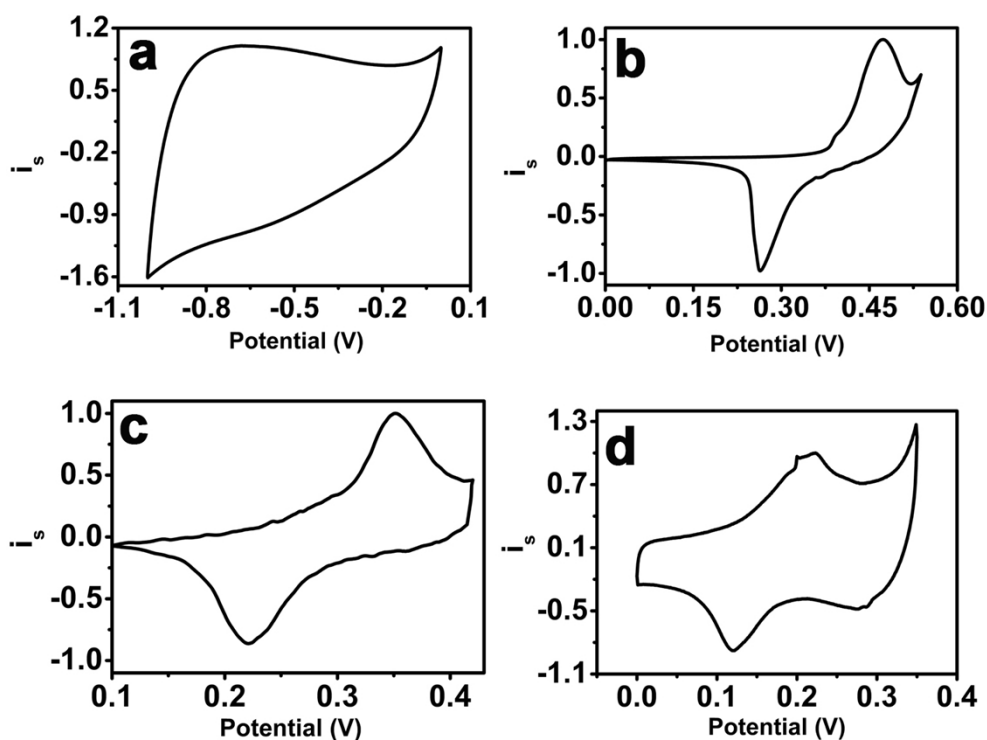


Figure S4. CV curves of active materials, Ni@Ni₃S₂, Ni@Ni_{1.4}Co_{1.6}S₂ and Ni@Co₉S₈ in 3-electrode system (Work electrode: the as-obtained nest-like electrode materials, reference electrode: Hg/HgO electrode, and counter electrode: platinum electrode).

Table S1. The text results of EDX, XPS, ICP and AAS.

Sample	Atomic Ratio (Ni:Co)			
	EDX	XPS	ICP	AAS
Ni@Ni _{1.4} Co _{1.6} S ₂	1.4: 1.6	1.37:1.63	1.49:1.51	1.42:1.58
Ni@NiCo ₂ S ₂	1:2	—	1.02:1.98	1.03:1.97
Ni@Ni _{0.5} Co _{2.5} S ₂	0.5:2.5	—	0.62:2.38	0.45:2.55

Table S2. The detailed data of energy density and power density of Ni@Ni₃S₂, Ni@Ni_{1.4}Co_{1.6}S₂, Ni@NiCo₂S₂, and Ni@Co₉S₈//active carbon supercapacitor devices

Sample	Data								
E (W h kg ⁻¹) Ni@Ni ₃ S ₂	183	145	114	98	86	66	41	26	22
P_{av} (kW kg ⁻¹) Ni@Ni ₃ S ₂	0.26	0.67	1.39	2.15	2.95	4.72	8.87	16.48	23.89
E (W h kg ⁻¹)	234	185	156	139	122	93	56	32	25

Ni@Ni _{1.4} Co _{1.6} S ₂									
<i>P_{av}</i> (kW kg ⁻¹) Ni@Ni _{1.4} Co _{1.6} S ₂	0.17	0.41	0.84	1.28	1.74	2.68	4.75	8.17	10.85
<i>E</i> (W h kg ⁻¹) Ni@NiCo ₂ S ₂	211	177	156	141	128	111	92	70	58
<i>P_{av}</i> (kW kg ⁻¹) Ni@NiCo ₂ S ₂	0.17	0.44	0.9	1.37	1.85	2.86	5.09	8.93	11.74
<i>E</i> (W h kg ⁻¹) Ni@Co ₉ S ₈	130	114	100	88	81	68	49	33	26
<i>P_{av}</i> (kW kg ⁻¹) Ni@Co ₉ S ₈	0.16	0.4	0.81	1.23	1.66	2.57	4.51	8.00	11.03