Flowery nickel-cobalt hydroxide via a solid-liquid sulphur ions grafting route and its application in hybrid supercapacitive storage

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Electrochemical Calculations

The loading mass of positive and negative electrodes should meet the requirement of charge balance, as shown in Equation (1):

$$m_+/m_- = Cs_- V_- / (Cs_+ V_+) \tag{1}$$
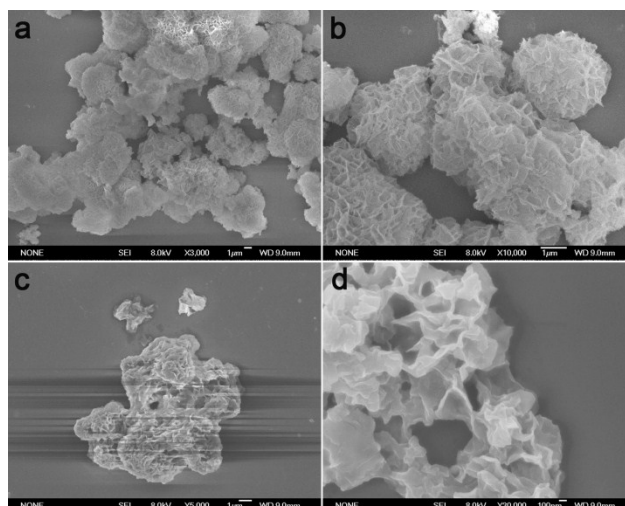
wherein m, Cs and V are the mass loadings (g), specific capacitance (F g^{-1}) and potential window (V), and + and – are corresponding to the positive and negative electrodes.

The specific capacitance (Cs, F g^{-1}), energy density (E, Wh kg^{-1}) and power density (P, W kg^{-1}) values of the individual electrode or ASC were calculated according to the Equations as follow:

$$Cs = I\Delta t / (mV) \tag{2}$$

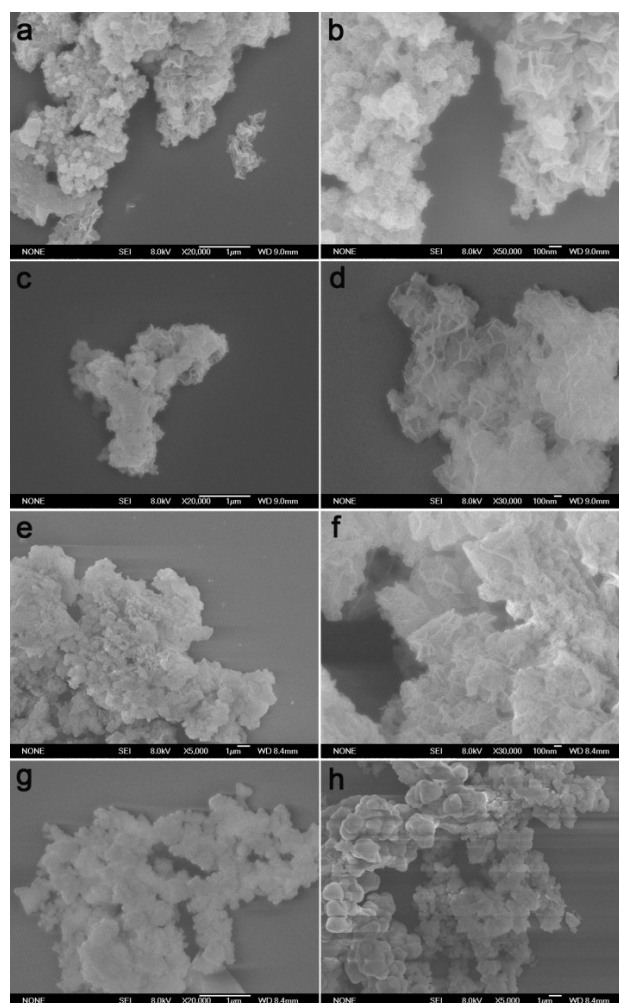$$E = 1/2 Cs V^2 \tag{3}$$

$$P = E/\Delta t \tag{4}$$

Fig. S1 FESEM figures for different samples: (a, b) Ni1Co2 precursor; (c, d) Ni1Co2-S.


**Fig. S2** FESEM figures for different comparisons: (a, b) Ni1Co2-AN; (c, d) Ni2Co1; (e, f) Co3 and (g, h) Ni3.

Table S1. ICP-OES measurement results of Ni1Co2, Ni1Co2-AN, Ni2Co1, Co3, Ni3

and Ni1Co2-S samples.

|	average Ni concentration (mg L^{-1})	average Co concentration (mg L^{-1})	mass ratio Ni/Co	atomic ratio Ni/Co
Ni1Co2	0.4523	1.0317	1:2.28	1:2.27
Ni1Co2-AN	0.2697	0.6115	1:2.27	1:1.26
Ni2Co1	1.3533	0.7296	1.85:1	1.86:1
Co3	-0.0035 (ignore)	2.249	0:3	0:3
Ni3	2.766	-0.0017 (ignore)	3:0	3:0
Ni1Co2-S	0.1864	0.4179	1:2.24	1:2.23
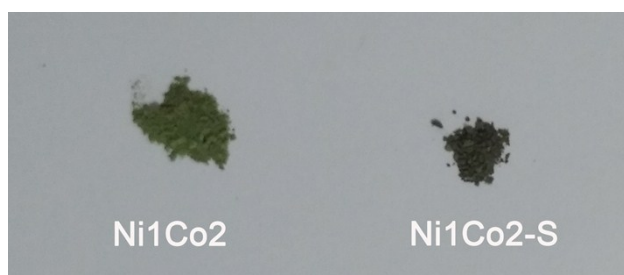
Fig. S3 Optical image of Ni1Co2 and Ni1Co2-S
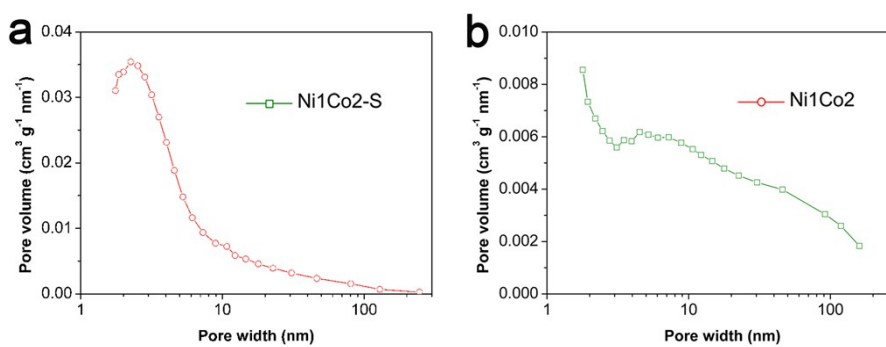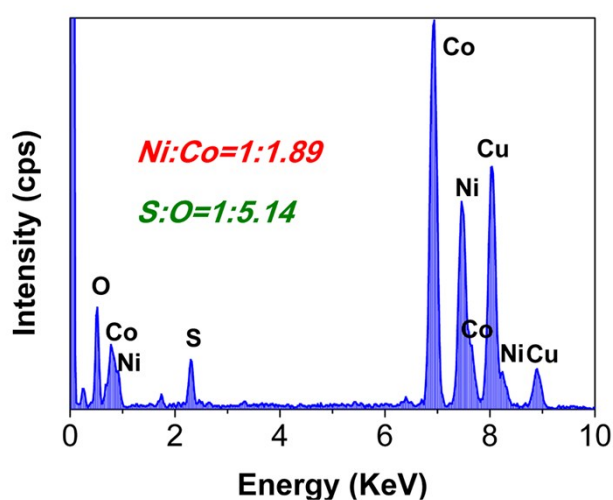

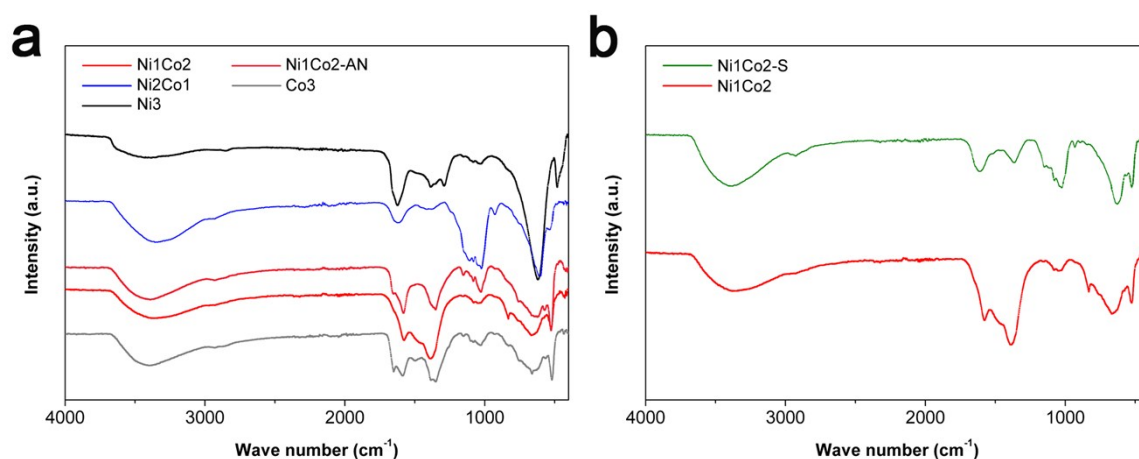**Fig. S4** Pore width distribution of (a) Ni1Co2 and (b) Ni1Co2-S
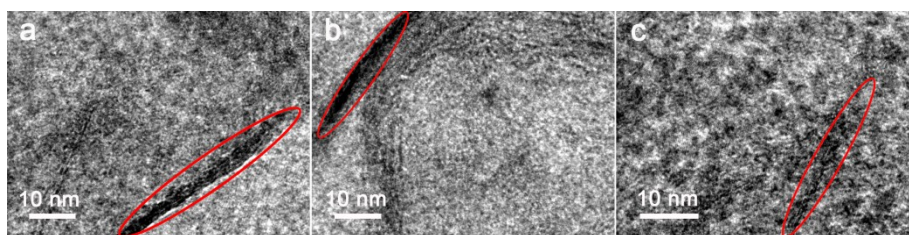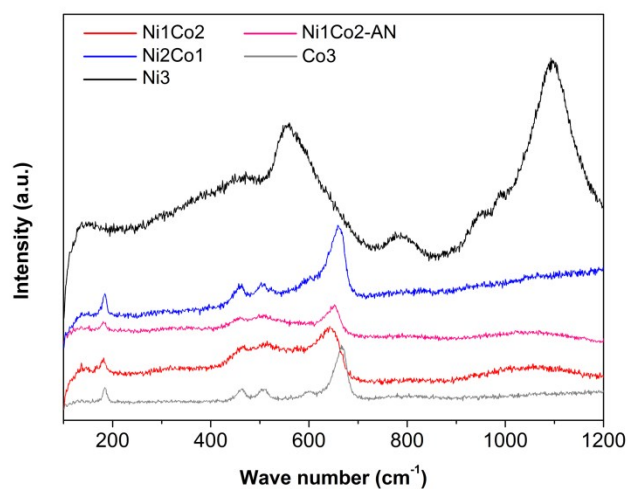
Fig. S5 HRTEM figures of Ni1Co2-S at differnt areas

The nanosheet thickness for Fig. S5a-c is ca. 2-5 nm, also indicative of ultrathin structure of Ni1Co2-S nanosheets.
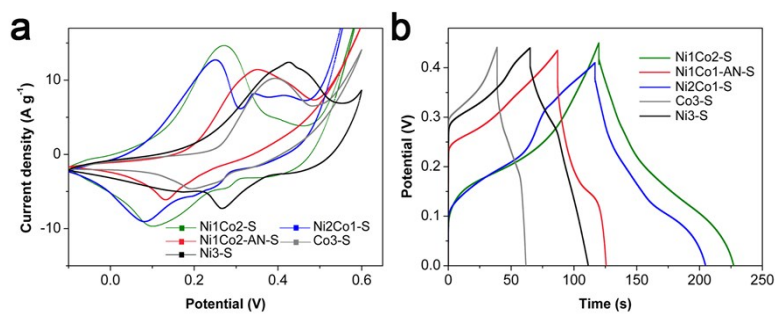

Fig. S6 EDS spectrum of Ni1Co2-S.

Fig. S7 (a) FTIR patterns of Ni1Co2, Ni1Co2-AN, Ni2Co1, Co3 and Ni3 samples; (b) FTIR patterns of Ni1Co2 and Ni1Co2-S samples.
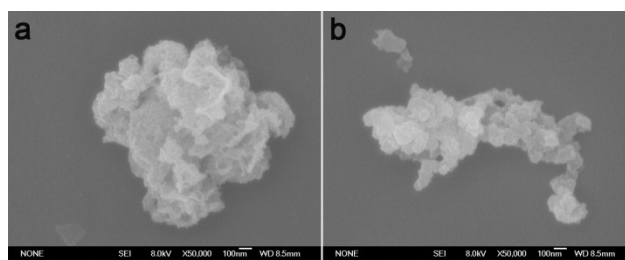
Fig. S8 Raman patterns of Ni1Co2, Ni1Co2-AN, Ni2Co1, Co3 and Ni3 samples.

Herein, the cumulative number of Raman measurement is 8 times for every samples.

Fig. S9 (a) CV curves of Ni1Co2-S, Ni1Co2-AN-S, Ni2Co1-S, Co3-S and Ni3-S electrodes at 5 mV s^{-1}, (b) GCD curves of Ni1Co2-S, Ni1Co2-AN-S, Ni2Co1-S, Co3-S and Ni3-S electrodes at 5 A g^{-1}.

Fig. S10 (a and b) The FESEM figures of Ni1Co2-S electrode after 6000 cycles at 10 A g^{-1}.