Electronic Supplementary Information

Sulfate Assisted Synthesis of α-type Nickel Hydroxide Nanowires with 3D Reticulation for Energy Storage in Hybrid Supercapacitors

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Evaluation of the NSOH NWs electrode and NSOH NWs//AC HSCs

The NSOH NWs paste was mixed by the NSOH NWs powder, acetylene black and binder (PVDF) in a weight ratio of 8:1:1, which was evenly coated on the nickel foam (1cm×1cm) and dried under vacuum at 100 ºC for 24 h, finally pressed at 10 MPa.

The specific capacity of the NSOH NWs electrode and HSCs can be respectively calculated according to the following formula:

$$C = \frac{I\Delta t}{3.6m} \tag{S1}$$

$$C_{HSCs} = \frac{I\Delta t}{3.6M} \tag{S2}$$

Where C and C_{HSCs} (mAh g^{-1}) is the specific capacity of the NSOH NWs electrode the NSOH NWs//AC HSCs, respectively. I (A) is the discharge current, Δt (s) is the discharge time, m (g) is the weight of the NSOH NWs electroactive material in the NSOH NWs electrode, M (g) is the total mass of the electroactive materials on both the NSOH NWs electrode and AC electrode of the NSOH NWs//AC HSCs.

The balance of the stored charge between the NSOH NWs and AC electrodes was calculated according to the following formula:

$$\frac{m_+}{m_-} = \frac{C_-}{C_+} \tag{S3}$$

Where m is the mass of the active material in NSOH NWs (positive, +) or AC (negative, -) electrode, C is the specific capacity for the single electrode. Thus, the mass ratio of NSOH NWs to AC is calculated to be approximately 0.3 at the current density of 1A

g^{-1}.

The energy density (E) and power density (P) of the NSOH NWs//AC HSCs could be calculated on the total weight of the two electrodes material, the formulas are as follows.

$$E = \frac{I\int V dt_d}{3.6M} \tag{S4}$$

$$P = \frac{E}{t_d} \tag{S5}$$

Where t_d (s) is the discharge time, V (V) is the voltage windows of the discharge curves, M (g) is the total mass of the electroactive materials of the NSOH NWs and AC in as-assembled HSCs.

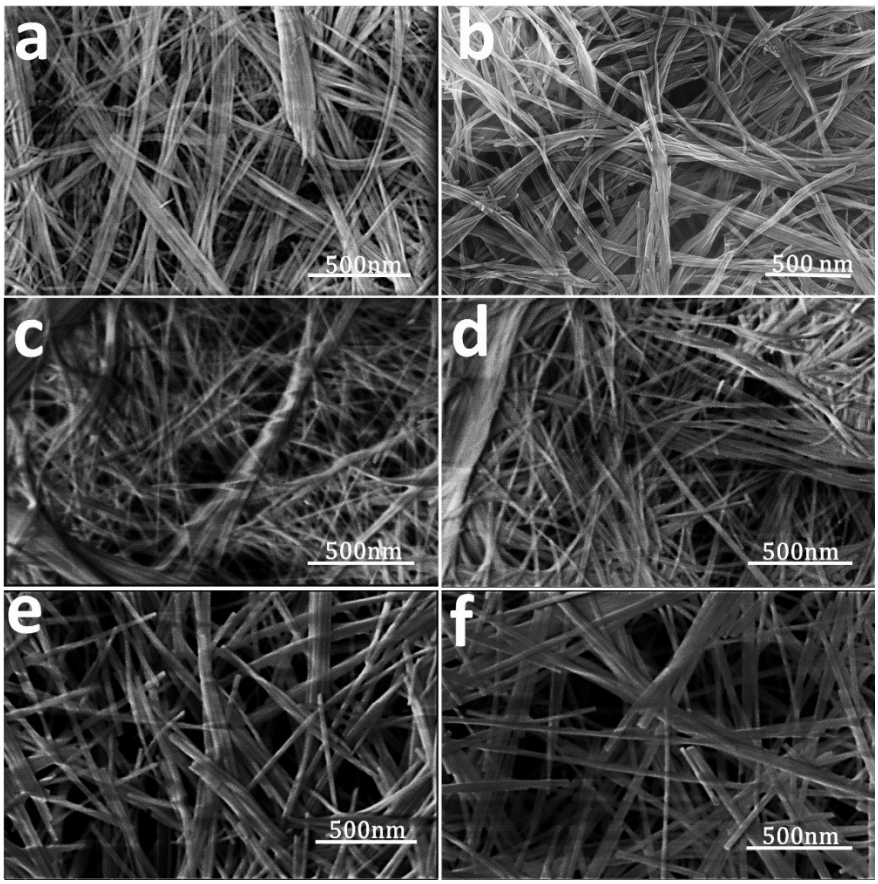

Fig. S1 SEM images of the NSOH NWs under different reaction temperatures for 24h. (a) 100 ºC, (b) 120 ºC, (c) 140 ºC, (d) 160 ºC, (e) 180 ºC, (e) 200 ºC.

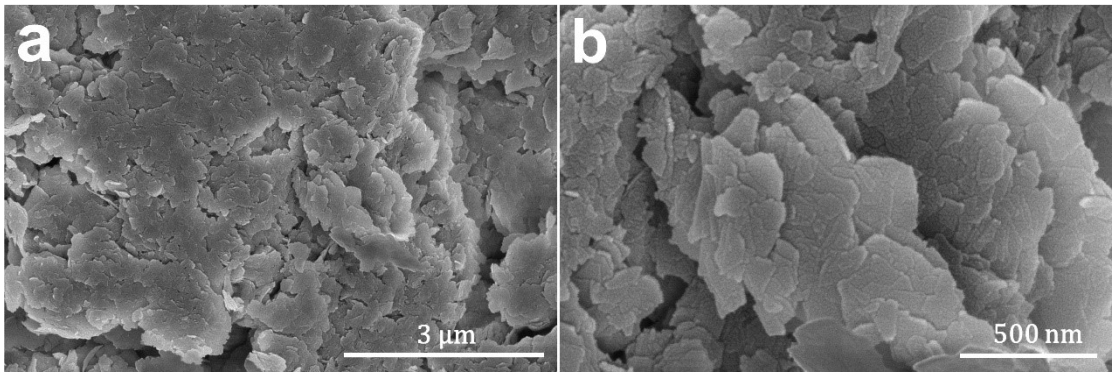

Fig. S2 SEM images of the as-prepared pure $Ni(OH)_2$ by the same method without sulfate. (a) and (b) is obtained under different magnifications.

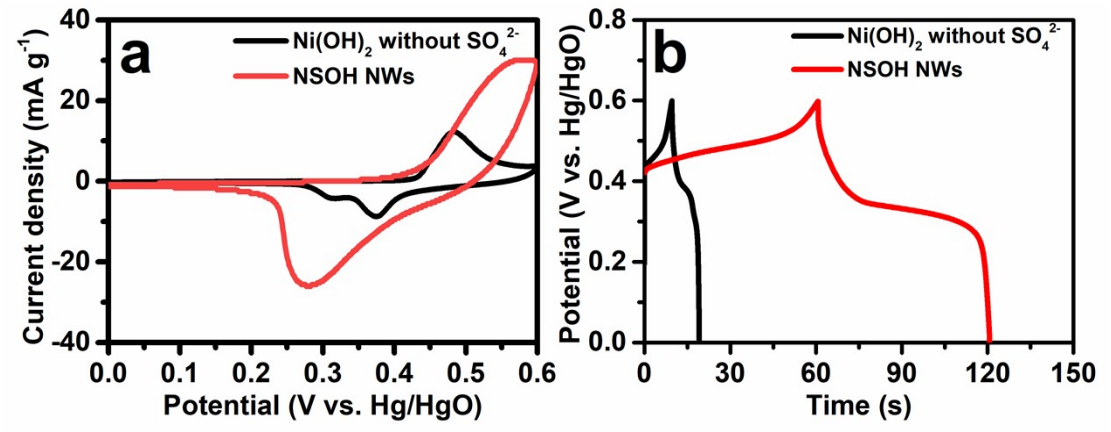

Fig. S3 Comparison of the CV and GCD curves for NSOH NWs and $Ni(OH)_2$ obtained without sulfate. (a) CV curve at 10 mV s^{-1}, (d) GCD curve at 10 A g^{-1}.

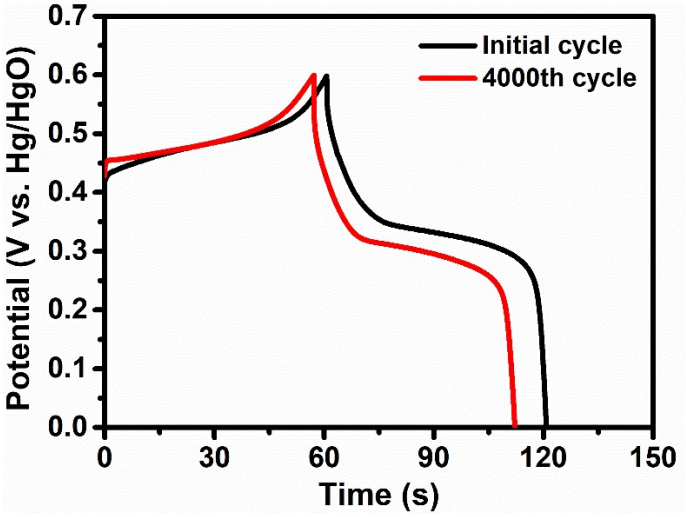

Fig. S4 Comparison of the GCD curve before and after 4000 cycles.

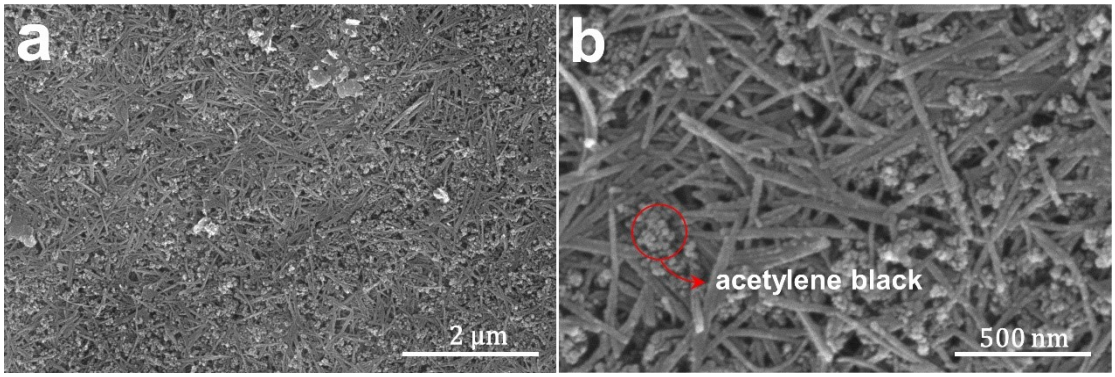

Fig. S5 SEM images of the NSOH NWs after 4000 cycles. (a) The surface of NSOH NWs electrode, (b) the detailed image of the NSOH NWs electrode.

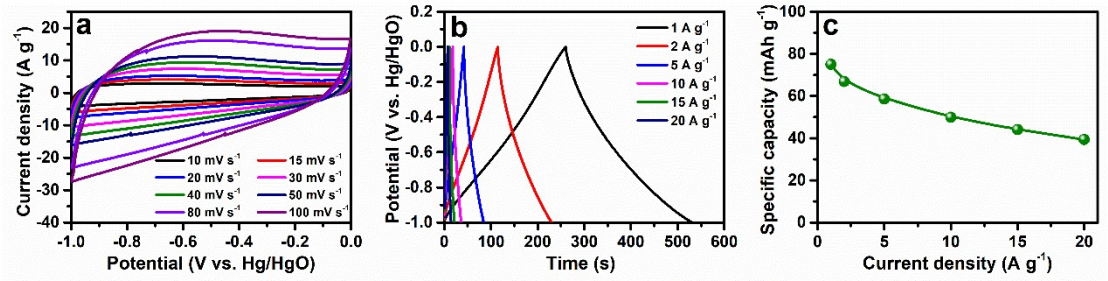

Fig. S6 Electrochemical energy storage performances of the AC electrode in the three-electrode cell. (a) CV curves measured under different scan rates; (b) GCD curves at various current densities; (c) specific capacity under different current density.