Electronic Supplementary Information for

Mesoporous Ni@C hybrids for a high energy aqueous asymmetric supercapacitor device

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1. The specific capacitance of the Ni@C electrode in a three-electrode system can be calculated from the CV curves via the following formula:

$$C = \frac{1}{mv(V_a - V_c)} \int_{V_a}^{V_c} I(V)dV \text{ ----------[1]}$$

where I (A) is the current, m (g) is the mass of the active material in the electrode, v (V s^{-1}) is the scan rate, V_a and V_c are the maximum and minimum voltage in the CV curve, respectively.

2. The specific capacitance of the Ni@C electrode in a three-electrode system and the ASC device can be calculated from the galvanostatic charge-discharge curves via the following formula:

$$C = \frac{I\Delta t}{m\Delta V} \text{ ----------[2]}$$

where I (A) is the discharge current, ∆t (s) is the discharge time, ∆V (V) is the voltage ranged , m (g) is the mass of the active material in the Ni@C electrode and the sum of the positive electrode and the negative electrode in the ASC device, respectively.

3. The energy density and power density of the ASC device can be calculated from the galvanostatic charge-discharge curves via the following formula:

$$E = \frac{CV^2}{2 \times 3.6} \text{ ---------- [3]}$$

$$P = \frac{E}{\Delta t} \text{ ---------- [4]}$$

Where C (F g^{-1}) is the discharge specific capacitance, V (V) is the potential window, ∆t (h) is the discharge time.

Supplementary Figures

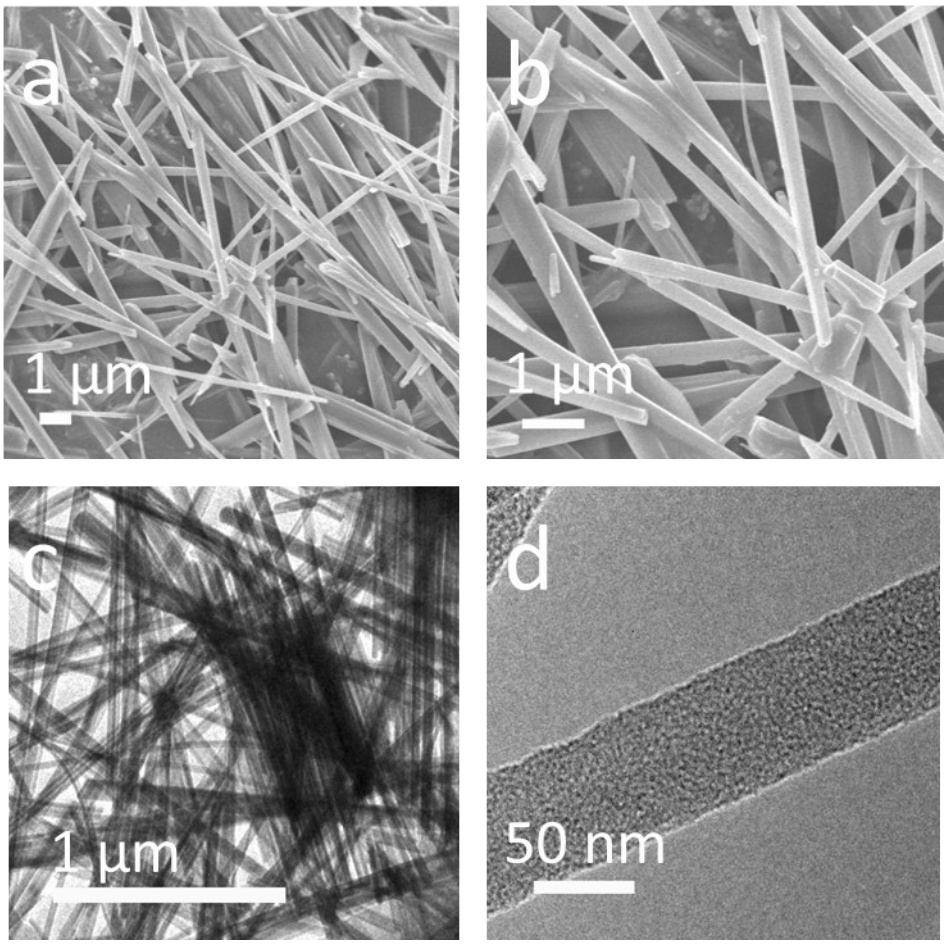

Fig.S1 SEM images (a, b) and TEM images (c, d) of pure Ni-IDA precursor.

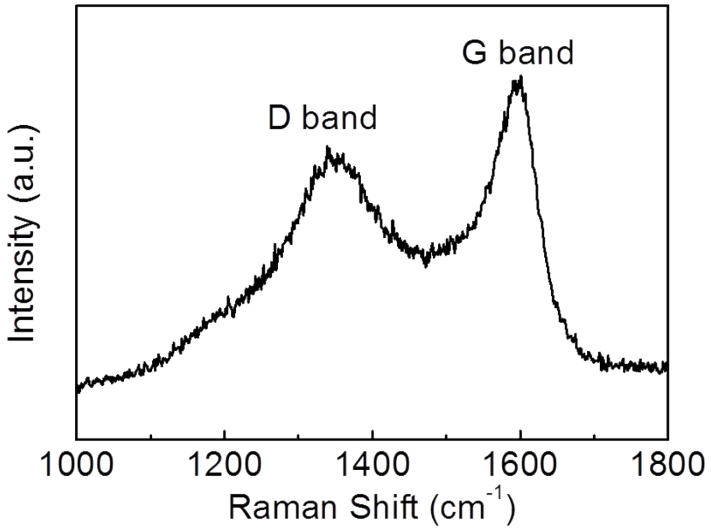

Fig.S2 Raman spectrum of the obtained Ni@C hybrids.

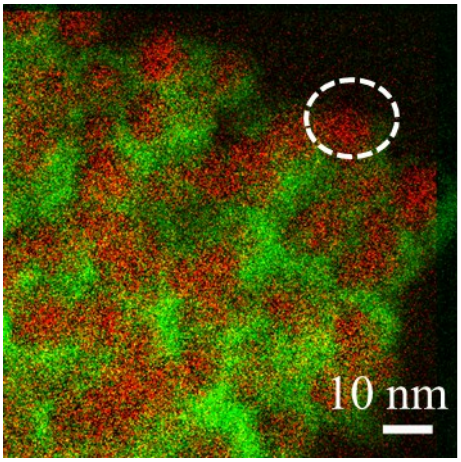

Fig.S3 EFTEM image for the as-prepared Ni@C hybrids (red color represent the element Ni and green color represent the element C).

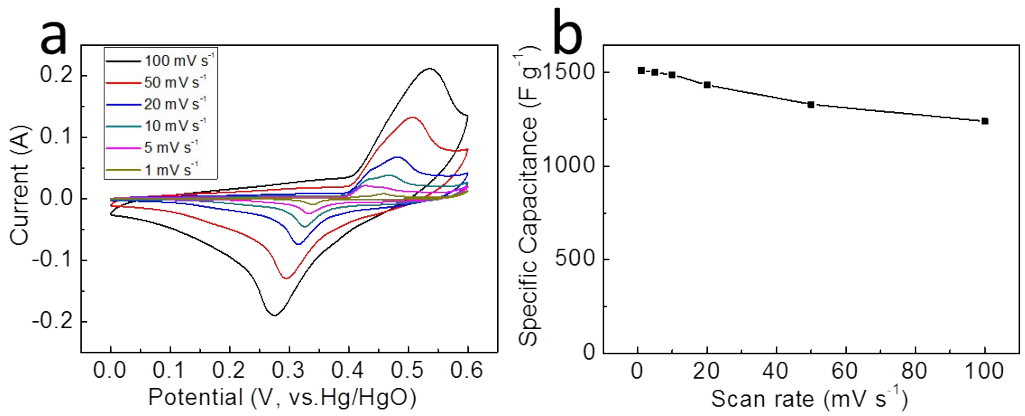

Fig.S4 CV curves (a) and average specific capacitance (b) of the Ni@C electrodes at various scan rates.

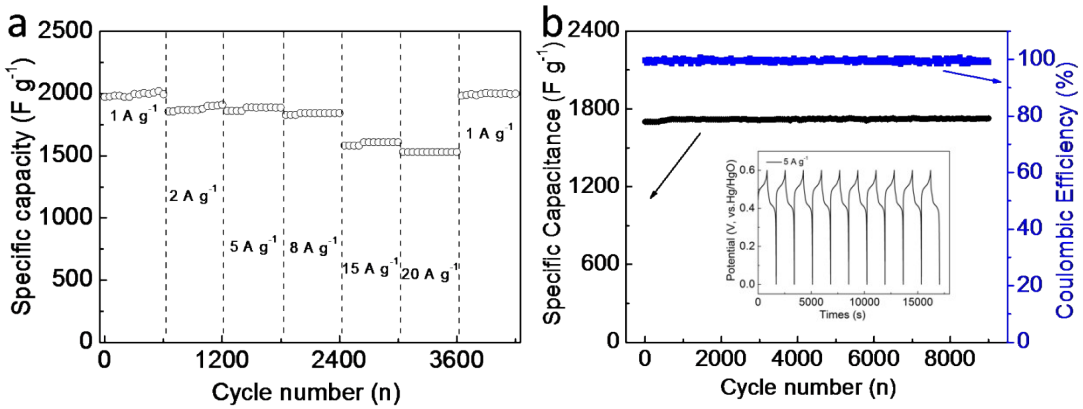

Fig.S5 (a) Specific capacitances versus current densities, (b) Cyclic performance of Ni@C electrode at 8 A g^{-1} for 9000 cycles and corresponding coulombic efficiency (inset: the galvanostatic current charge-discharge curves of the single Ni@C electrode at 5 A g^{-1}).

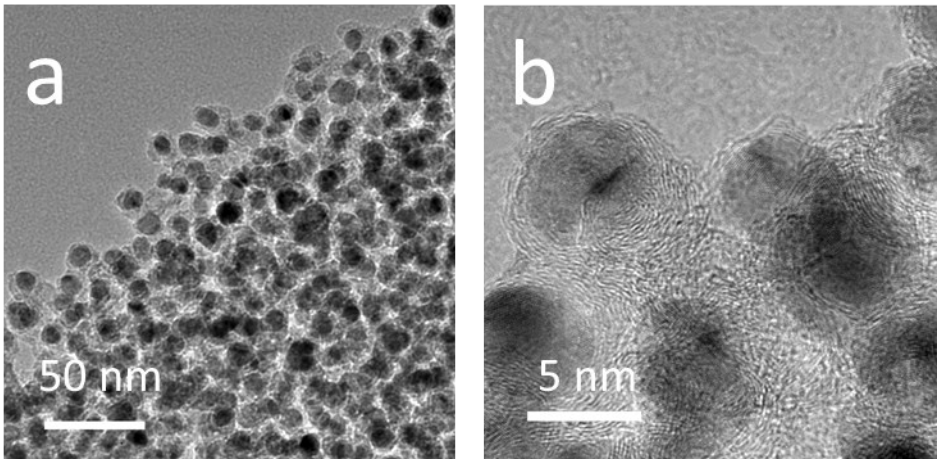

Fig.S6 TEM image (a) and HETEM image (b) of the Ni@C hybrids after 9000 cycles.

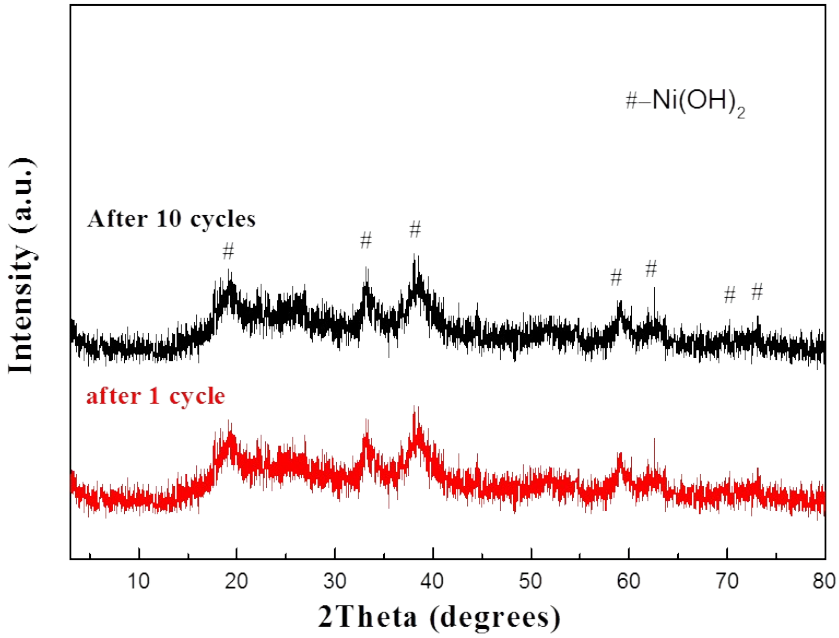

Fig.S7 XRD patterns of the Ni@C electrode after 1 and 10 charge-discharge cycles.

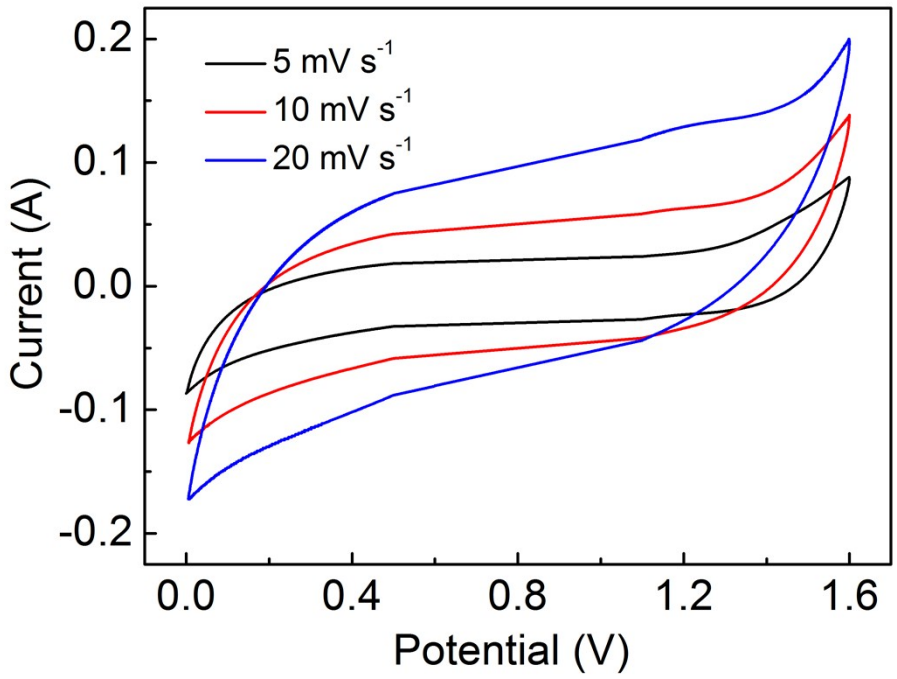

Fig.S8 CV curves of the ASC device at different scans.

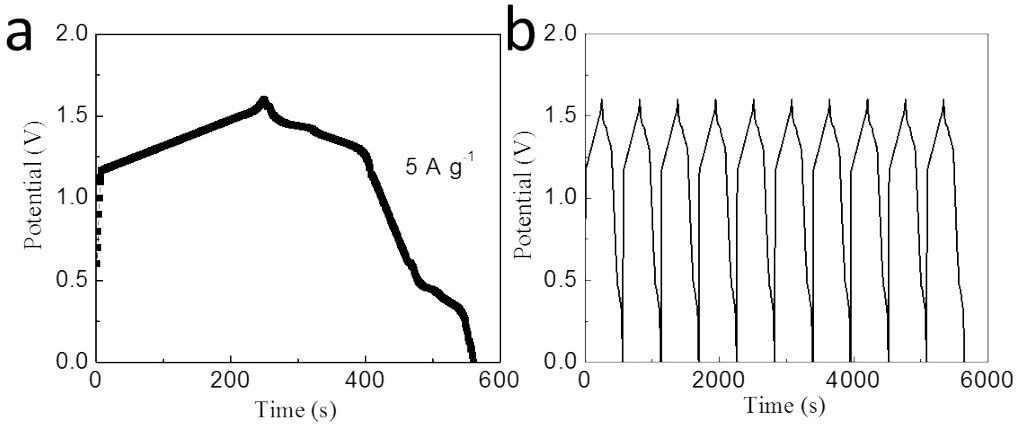

Fig.S9 (a) A separate charge-discharge cycle curve of the ASC device at 5 A g^{-1}. (b) Galvanostatic charge-discharge curves of the initial 10 cycles of the ASC device at 5 A g^{-1}.

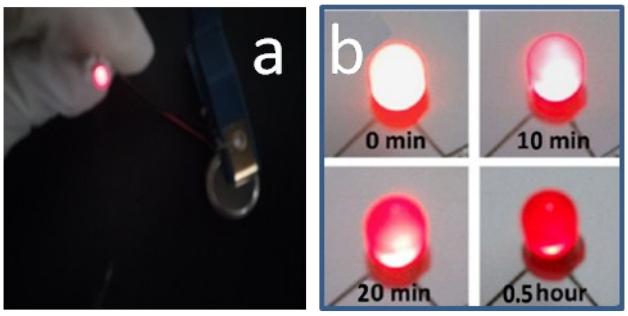

Fig.S10 Photography of two series-connected ASC devices for lighting a red LED (a), Time-dependent optical images of LED applications driven by two series-connected ASC devices (b).