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Supporting Information

for

High-performance asymmetric supercapacitor made of $NiMoO_4$ nanorods@Co_3O_4 on a cellulose-based carbon aerogel

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Details of the preparation of the ASCs, photographs and SEM images of the cellulose aerogel, electrochemical tests and the LED photograph of the ASCs device

Preparation and characterization of the asymmetric supercapacitor (ASC)

The ASC device was assembled using $NiMoO_4$@Co_3O_4/CA as the positive electrode and AC as the negative. A piece of cellulose paper as the separator soaked in the electrolyte was sandwiched between the two electrodes. The electrochemical tests of the ASC device (denoted as $NiMoO_4$@Co_3O_4/CA//AC) was performed using 2.0 M KOH as alkaline electrolyte. Positive and negative charges should be balanced in an ASC as expressed by the formula $q^+ = q^-$, where q^+ and q^- represent the charges stored in the positive and in the negative electrode, respectively. The following equation was used to calculate q [1]:

$$q = mC_m\Delta V \qquad \text{(S1)}$$

When $q^+ = q^-$, the ratio between the masses of the positive electrode (m_+) and the negative electrode (m_-) were determined by the following equation [2]:

$$\frac{m_+}{m_-} = \frac{C_-\Delta V_-}{C_+\Delta V_+} \qquad \text{(S2)}$$

The device specific capacitance, energy density (E) and power density (P) are calculated from the charge–discharge curve using the following equations [3, 4]:

$$C = \frac{I\times\Delta t}{m\Delta V} \qquad \text{(S3)}$$

$$E = \frac{C\times\Delta v}{2\times3.6} \qquad \text{(S4)}$$

$$P = \frac{3600\times E}{\Delta t} \qquad \text{(S5)}$$

Where C (F/g) is the specific capacitance, I (A) is the current, Δt (s) is the discharge time, ΔV (V) is the working voltage window, m (g) is the mass of the active material, E (Wh/kg) is the energy density and P (W/kg) is power density.

Figure S1: Digital photograph of the cellulose hydrogel, the cellulose aerogel and CA.

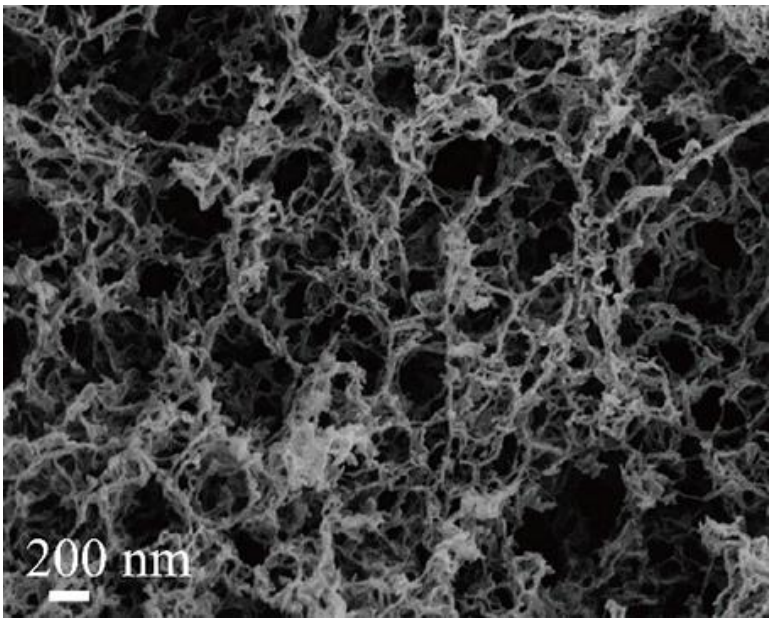

Figure S2: SEM of the cellulose aerogel.

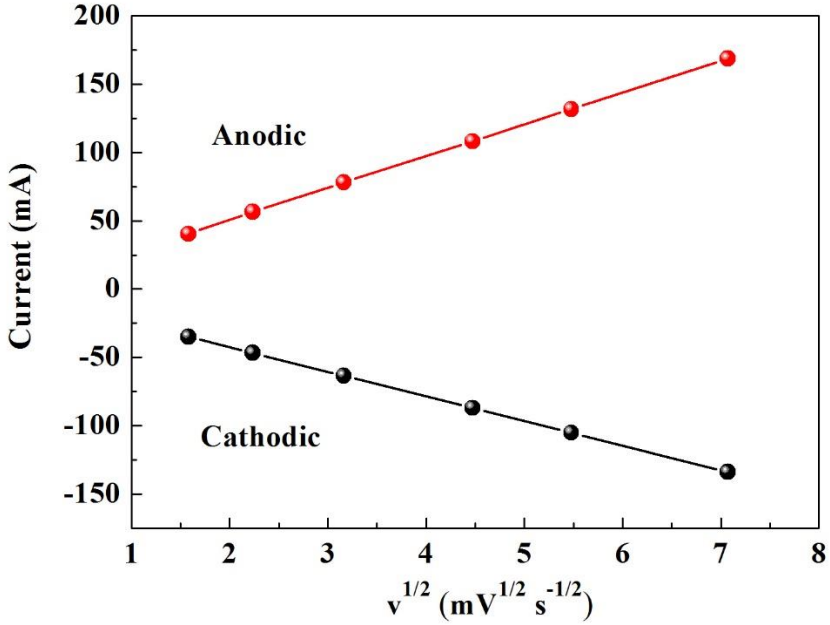

Figure S3: Linear fit of the experimental values of the current of the CV redox peaks as a function of $v^{1/2}$ of the $NiMoO_4@Co_3O_4/CA$ composite.

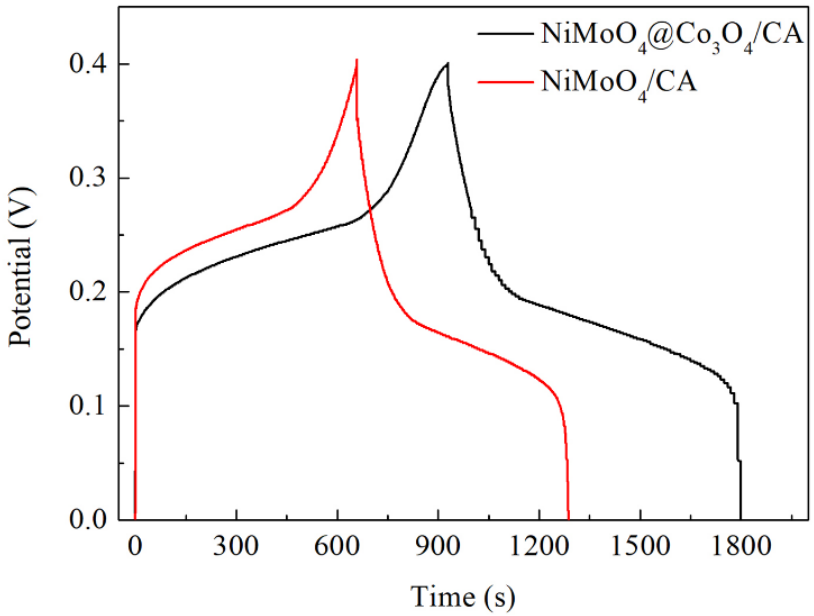

Figure S4: GCD curves of the $NiMoO_4/CA$ and the $NiMoO_4@Co_3O_4/CA$ at a current density of 0.5 A/g.

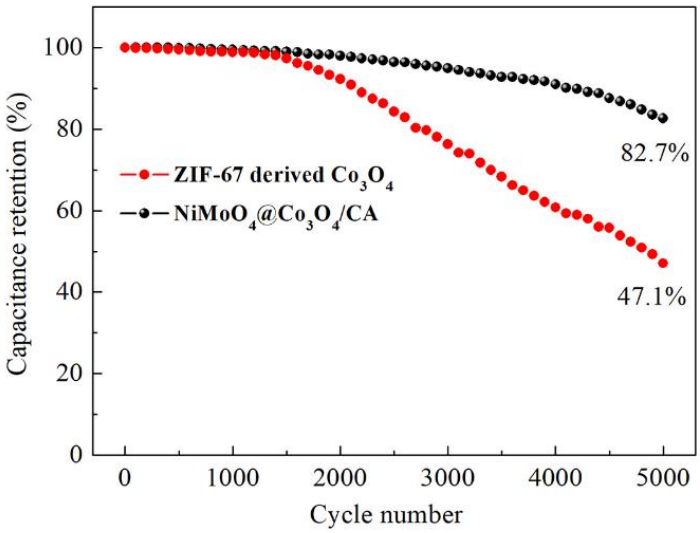

Figure S5: Cycle performance of ZIF-67 derived Co_3O_4/CA and $NiMoO_4$@Co_3O_4/CA at a current density of 0.5 A/g.

Figure S6: LED lighting photograph of the ASC device

References

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