One-step electrodeposition preparation of $NiCoSe_2$@Carbon cloth as flexible supercapacitor electrode material

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1.1. Materials preparation

$NiCl_2 \cdot 6H_2O$ (metals basis, purity ≥99.9%), $CoCl_2 \cdot 6H_2O$ (AR) , SeO_2 (AR, purity≥99%), LiCl (purity ≥99%) were obtained from aladdin.All chemicals and reagents in the study were used without any further purification.The solvent in the experiment was deionized water.

1.2 Characterization

The materials were characterized by scanning electron microscope (SEM, JSM-IT510) , X-ray diffraction (XRD, Rigaku D/MAX 2500PC), X-ray Photoelectron Spectroscopy (XPS, VG ESCALAB MKII spectrometer).

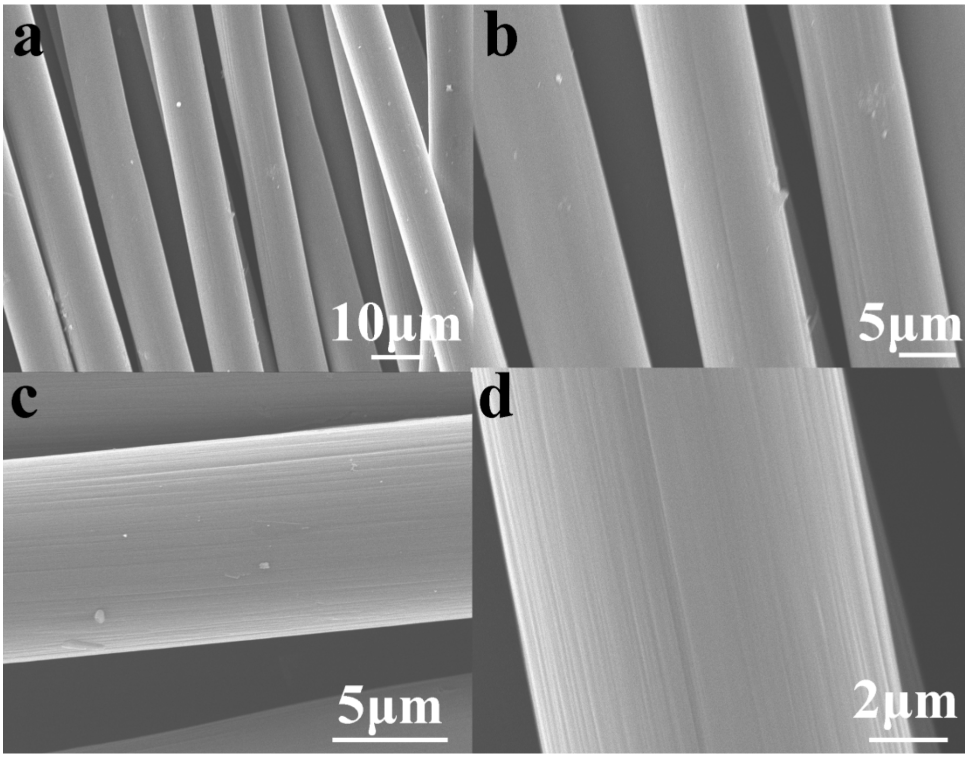

Figure S1. SEM of Carbon Cloth.

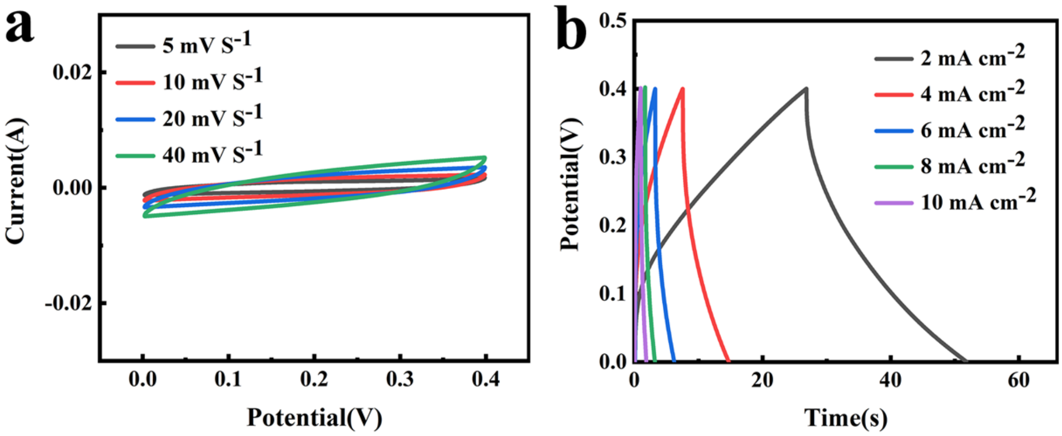

Figure S2. **CV and GCD** of Carbon Cloth.

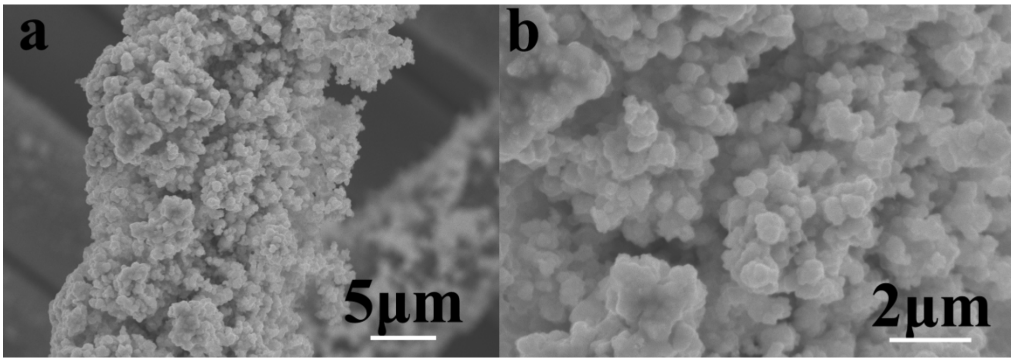

Figure S3. Electrodeposition at 30°C.

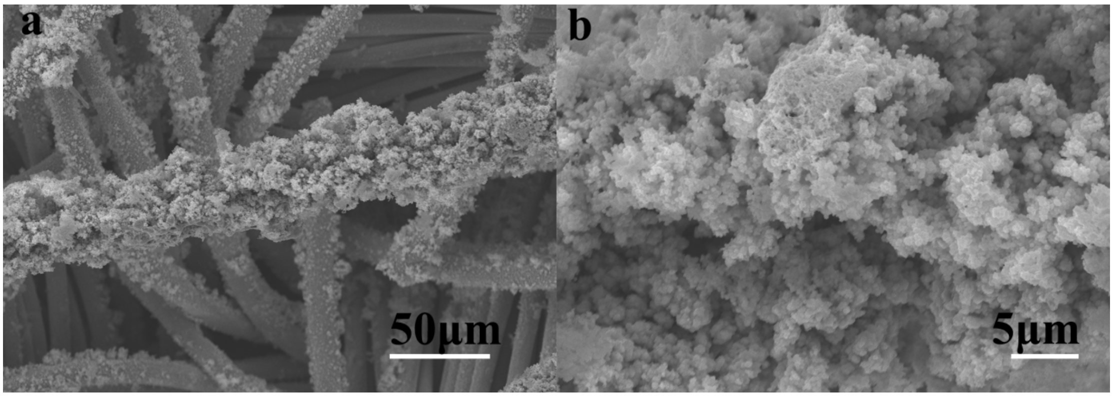

Figure S4. Electrodeposition at 50°C.

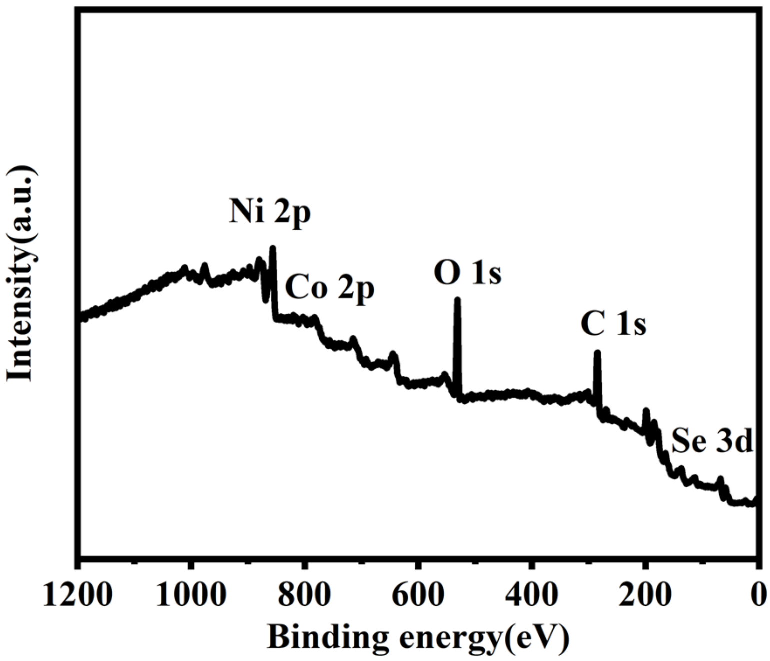

Figure S5. XPS patterns of $NiCoSe_2$@CC.

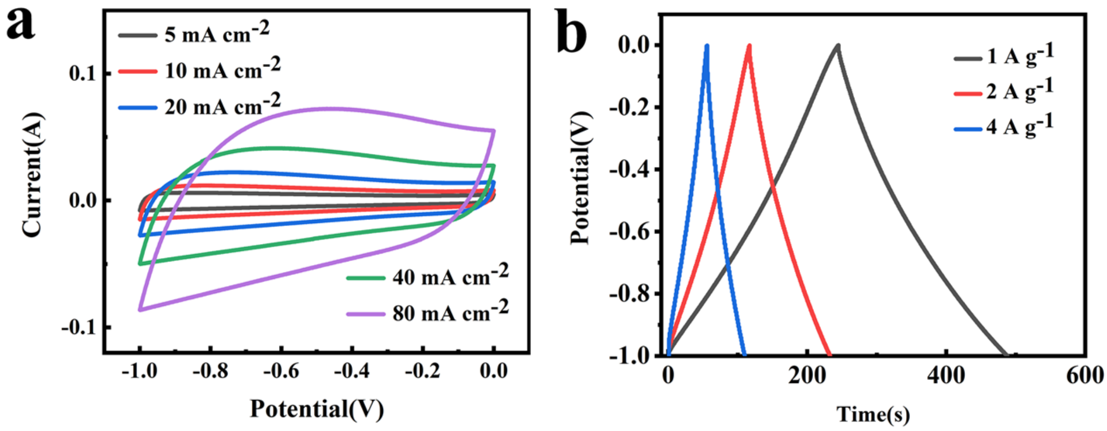

Figure S6. CV andGCD of the AC@CC.

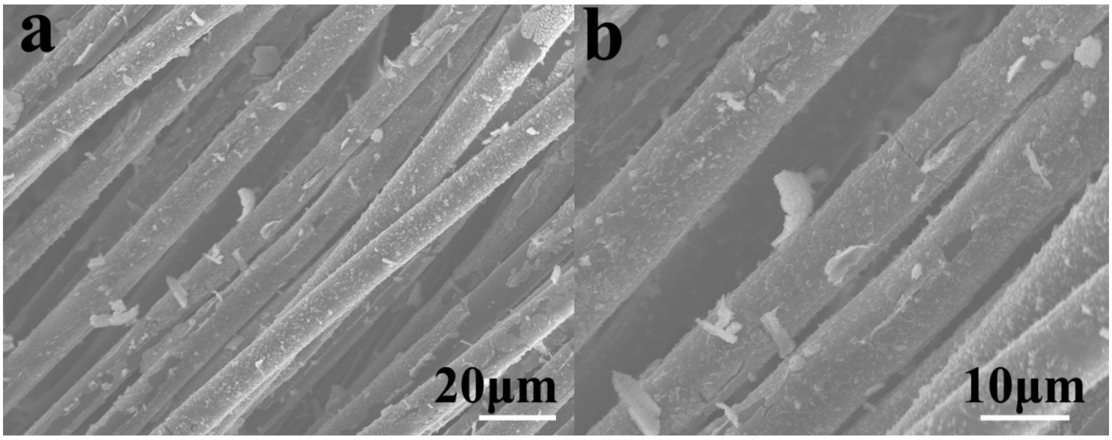

Figure S7. **SEM of the $NiCoSe_2$**@CC after the cycle.

The specific capacity (C_s,mF cm^{-2}) and specific capacitance (C_m, F g^{-1}) of the materials was calculated from the GCD curves using Eq. S1 and Eq. S2, as follow:

$$C_s = \frac{I \times \Delta t}{s \times \Delta V} \quad \text{(S1)}$$

$$C_m = \frac{I \times \Delta t}{m \times \Delta V} \quad \text{(S2)}$$

where I is the discharge current density (A g^{-1}); m represents the mass of active materials grown on CC for three-electrode configurations (g); Δt is the discharge time (s); and ΔV is the potential window (V).

In order to achieve the optimum mass ratio of as-prepared positive electrode to AC negative electrodes, we examined the charge balance using the given equation, $q^+ = q^-$. The mass of the positive electrode and negative electrode was tuned according to the following Eq. S3 and Eq. S4:

$$Q = C \times \Delta V \times m \quad \text{(S3)}$$

$$\frac{m^+}{m^-} = \frac{C_- \times \Delta V_-}{C_+ \times \Delta V_+} \quad \text{(S4)}$$

Where C is the specific capacity (investigated through the three-electrode system); + and – represents positive and negative electrodes.

The energy density (E, Wh kg^{-1}) and power density (P, W kg^{-1}) of the ASCs were investigated by Eq. S5 and Eq. S6, respectively, as follows:

$$E = \frac{C_m \times \Delta V^2}{2 \times 3.6} \quad \text{(S5)}$$

$$P = \frac{3600 \times E}{\Delta t} \quad \text{(S6)}$$