Supporting Information

Anion-exchange Reaction Synthesized $CoNi_2S_4$ Nanowires for Superior Electrochemical Performances

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Calculation methods:

The specific capacitance (F g^{-1}) and the areal capacitance (F cm^{-2}) in the three-electrode Configuration are calculated from the discharge curves according to the following equations:

$$C_s = \frac{I \times \Delta t}{m \times \Delta V} \qquad C_a = \frac{I \times \Delta t}{S \times \Delta V} \qquad \textbf{(1)}$$

where I, Δt, m, S and ΔV are designated as the discharge current density, the total discharge time, the mass of active materials, the geometrical area of the electrode and the discharge potential range, Respectively.

The electrochemical performance of the Ni-Co sulfide NWAs array/nickel foam electrode was also measured using a two-electrode experimental setup. The Ni-Co sulfide NWAs array loaded nickel foam (1×1 cm^2) directly acted as the electrode. two symmetry electrodes were immersed into a beaker containing 3 M KOH solution with a distance of 15 mm between the centers.

The specifc capacitance, energy density (E) and power density (P) derived from galvanostatic tests can be calculated according to the following equations:

$$C = 4 \times \frac{I \times \Delta t}{m \times \Delta V} \quad \textbf{(2)}$$

$$E = \frac{1}{8} C \Delta V^2 \quad \textbf{(3)}$$

$$P = \frac{E}{\Delta t} \quad \textbf{(4)}$$

Figure:

Figure S1 Typical FESEM images of Ni−Co sulfide nanowire synthesized at different concentration of Na_2S solution (a) and (b) 0 M; (c) and (d) 0.04 M.

Figure S2 Typical FESEM images of Ni−Co sulfide nanowire synthesized at reaction temperature (a) and (b) 80℃; (c) and (d) 160 ℃.

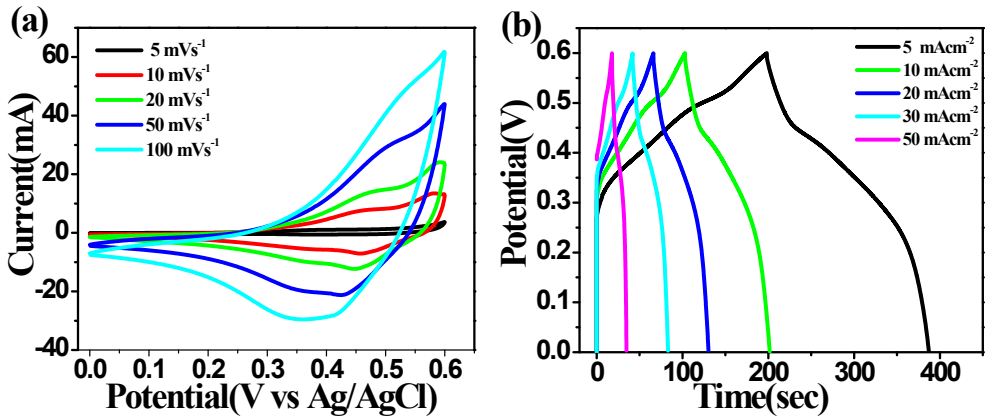

Figure S3. The detailed (a) CV curves at various sweep rates and (b) GCD curves at various current densities of Ni-Co oxide nanowire arrays.

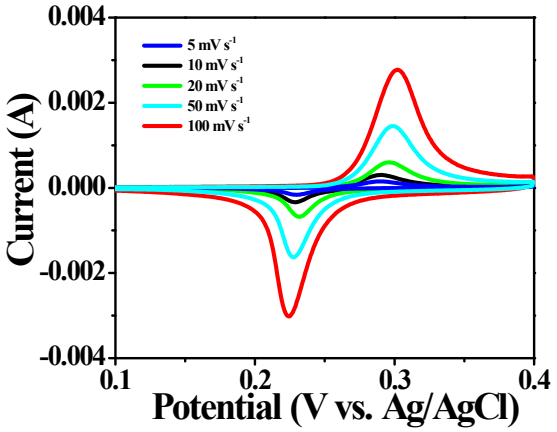

Figure S4. CV curves of the bare Ni foam at a sweep rate of 5-100 mV s^{-1}.

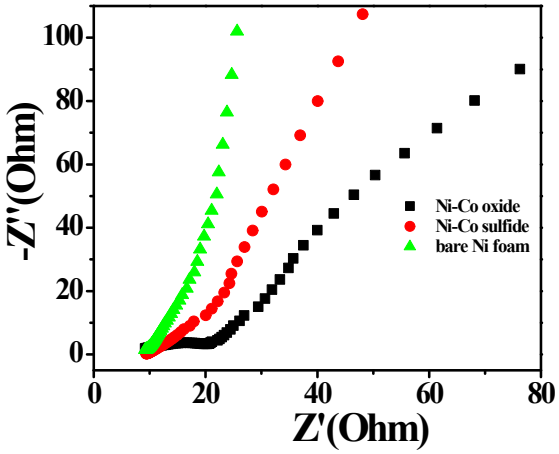

Figure S5 Impedance Nyquist plots of the Ni−Co oxide and sulfide nanowire arrays. grown on Ni foam at open circuit potential.

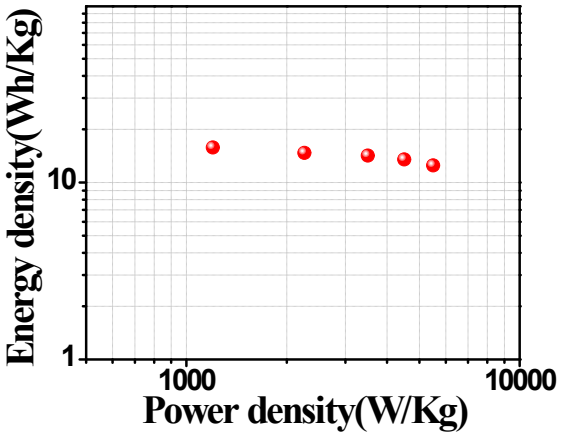

Figure S6 the Ragone plot showing energy vs. power density.