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Supporting Information

Chain-like $NiCo_2O_4$ nanowires with exposed different reactive planes for high-performance supercapacitors

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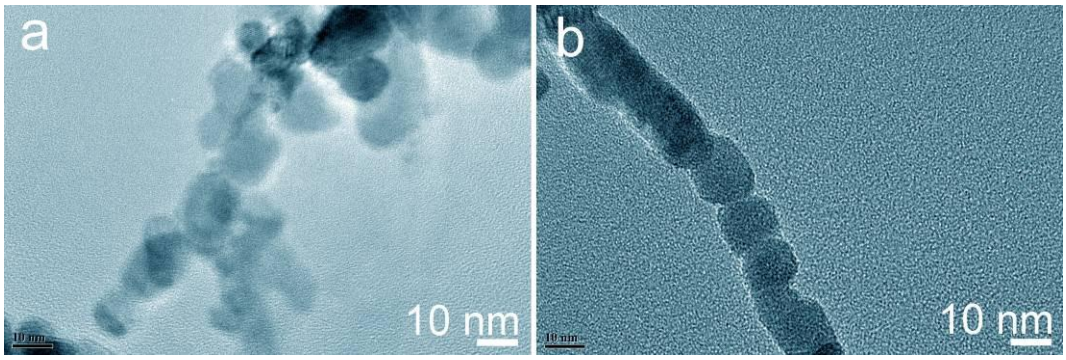

Figure S1. TEM images of the chain-like $NiCo_2O_4$ nanowires after cycling for 3000 cycles at a scan rate of 50 mV s^{-1}.

I. The synthesis of 3D $NiCo_2O_4$ micro-sphere constructed with radial mesoporous nanowires for supercapacitors

In a typical synthesis, 1 mmol of $NiCl_2 \cdot 6H_2O$, 2 mmol of $CoCl_2 \cdot 6H_2O$ and 4 mmol of urea are dissolved into a 50 mL of H_2O at room temperature to form a clear pink solution under vigorous magnetic stirring. After stirring for 30 min, as-obtained solution was transferred into a 60 mL polytetrafluoroethylene (PTFE) (Teflon)-lined autoclave and maintained at 100 °C for 24 h in an electric oven. After being cooled to room temperature naturally, the precipitate was collected and washed with deionized water and ethanol for several times by centrifugation, then dried at 60 °C overnight. In order to get crystallized mesoporous $NiCo_2O_4$ nanowire, the as-grown precursor $NiCo_2O_4$ micro-sphere were annealed in air at 300 °C for 120 min, temperature rising with a ramping rate of 1°C min^{-1}.

Figure S2a is the SEM image of as directly collected 3D micro-sphere $NiCo_2O_4$ after calcination at 300 ºC for 2 h, from which the diameter of the micro-spheres are estimated to be ~ 5 μm averagely. The micro-spheres are uniformly constructed with radial ultrafine nanowires, appearing like a dandelion. The inset in Figure S2a indicates that the $NiCo_2O_4$ nanowires are continuous with a roughness on the surface. Interestingly, the magnified images clearly show that mesopores are uniformly distributed throughout the whole surface of nanowires. The TEM image of $NiCo_2O_4$ nanowires after calcination is given in Figure S2b, which remarkably suggesting that the nanowires are mesopores $NiCo_2O_4$ nanowires with diameter ranging from 80-150 nm. The BET surface area of the mesoporous $NiCo_2O_4$ nanowires is determined by the N_2 adsorption/desorption measurement to be as high as 121.5 m^2/g.

The specific capacitances in mesopores $NiCo_2O_4$ nanowires were calculated by CD at different current densities, as shown in Figure S2c. The specific capacitance of the material is evaluated to be 865, 788, 714, 669, 649, and 605 F g^{-1} at current densities of 2, 4, 8, 12, 15, and 20 A g^{-1} respectively, as shown in Figure S2d. The value of specific capacitance measured here is much lower than that of the chain-like $NiCo_2O_4$ nanowires.

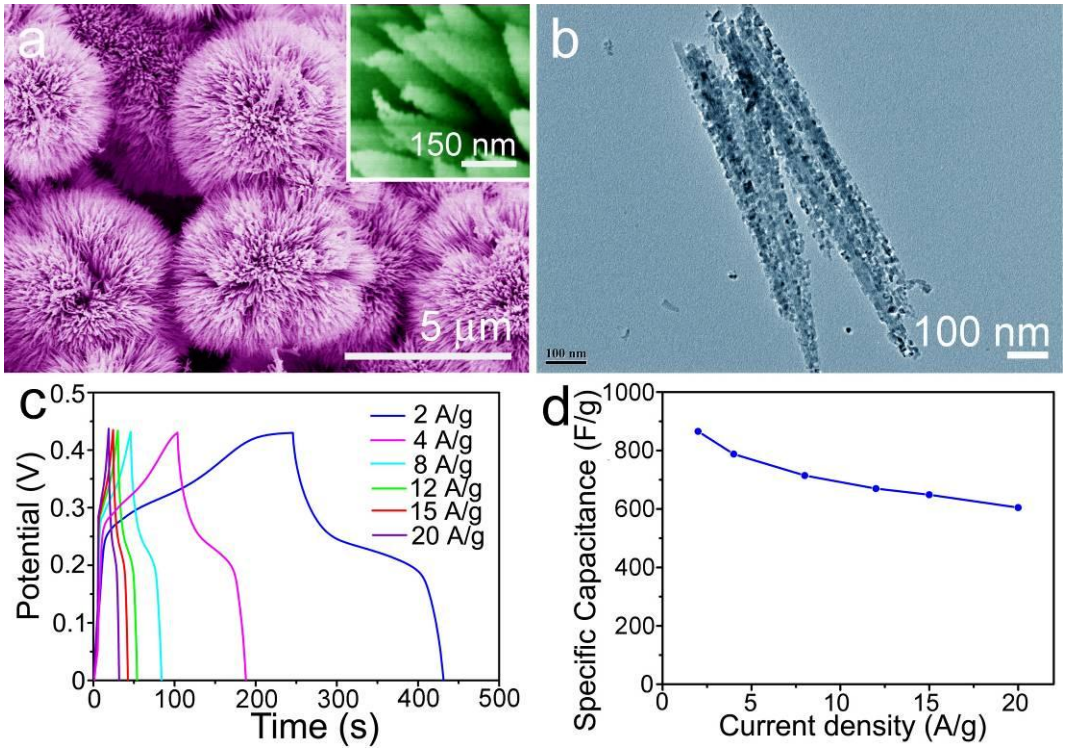

Figure S2. (a) SEM image of as synthesized $NiCo_2O_4$ micro-spheres after calcinations; inset SEM image of mesopores $NiCo_2O_4$ nanowires. (b) TEM images showing mesopores $NiCo_2O_4$ nanowires after calcination. (c) CD curves of mesopores $NiCo_2O_4$ nanowires at different current densities. (d) Specific capacitance of mesopores $NiCo_2O_4$ nanowires at different current densities.

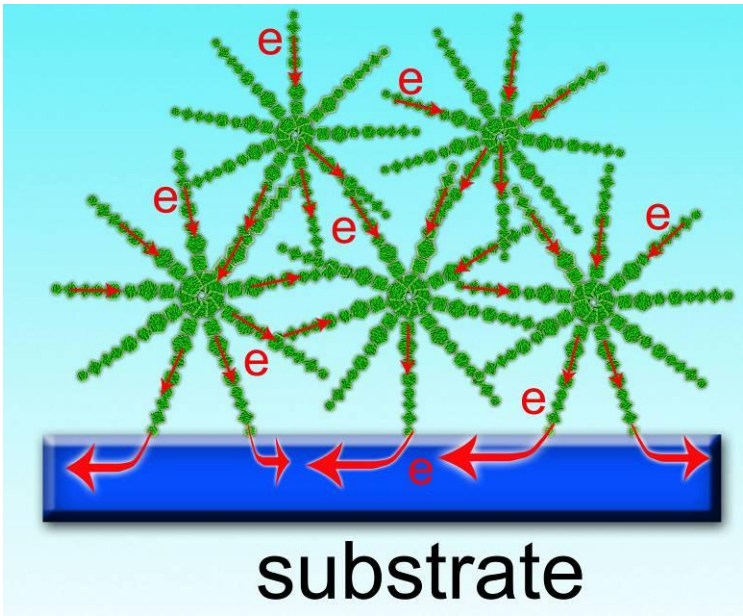

Figure S3. Schematic representation of the electron path on betweent chain-like $NiCo_2O_4$ nanowires and chain-like $NiCo_2O_4$ nanowires.