

## Electronic Supplementary Information

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### **Unusual CoS<sub>2</sub> Ellipsoids with Anisotropic Tube-like Cavities and Their Application in Supercapacitors**

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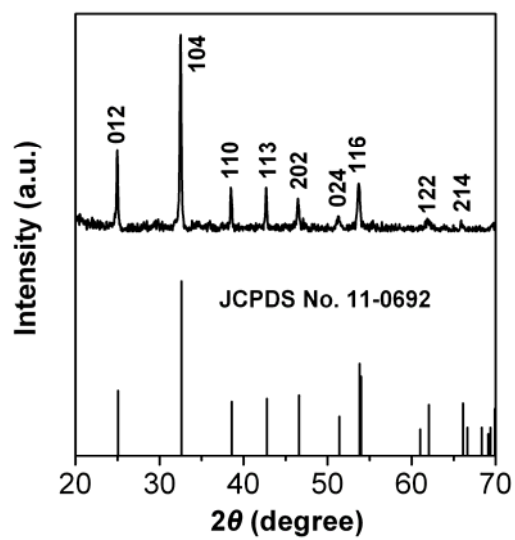
## Experimental Section

*Materials Synthesis.* In a typical synthesis, 0.25 g of cobalt acetate tetrahydrate ( $\text{Co}(\text{Ac})_2$ ;  $\text{Co}(\text{CH}_3\text{COO})_2 \cdot 4\text{H}_2\text{O}$ , Aldrich) and 0.5 g of polyvinyl-pyrrolidone (PVP; MW=58000, Reagent Chemicals) were first dissolved in 20 mL of polyethylene glycol (PEG; MW=400, Aldrich) at room temperature, followed by the addition of 0.25 g of urea ( $\text{CO}(\text{NH}_2)_2$ , Aldrich) under vigorous stirring. After stirring for 15 min, the mixture was transferred into a 60 ml Teflon-lined stainless steel autoclave and placed in an electric oven at 220 °C for 18 h. After that, the product was harvested, and washed with de-ionized water and ethanol several times by a centrifugation-redispersion process. Then the final product was dried in an oven at 60 °C for 24 h. To convert the carbonate into  $\text{CoS}_2$ , the as-synthesized  $\text{CoCO}_3$  was heated to 350 °C with a temperate ramp of 2 °C  $\text{min}^{-1}$  and kept at the same temperature for 6 h in a gas flow of 10%  $\text{H}_2\text{S}$  + 90%  $\text{N}_2$ .

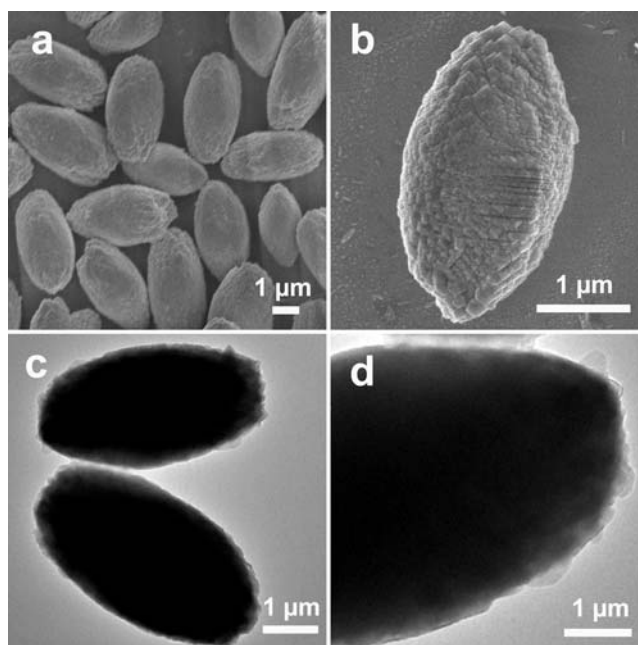
*Materials Characterization.* X-ray diffraction (XRD) patterns were collected on a Bruker D8 Advanced X-Ray Diffractometer with Ni filtered Cu  $\text{K}\alpha$  radiation ( $\lambda=1.5406 \text{ \AA}$ ) at a voltage of 40 kV and a current of 40 mA. Field-emission scanning electron microscopy (FESEM) images were acquired on a JEOL JSM 6700F microscope operated at 5 kV. Transmission electron microscopy (TEM) images were taken on JEOL 2010 and JEOL 2100F microscopes. Thermogravimetric analysis (TGA) was carried out under nitrogen flow with a temperature ramp of 10 °C  $\text{min}^{-1}$ . Nitrogen sorption measurement was performed on Autosorb 6B at liquid  $\text{N}_2$  temperature.

*Electrochemical Measurements.* The working electrode was prepared by mixing 70 wt% of electroactive material ( $\text{CoS}_2$ ), 20 wt% of carbon black (super-P), and 10 wt% of polyvinylidene difluoride (PVDF, Aldrich). This mixture was then pressed onto the Ni foam electrode and dried at 80 °C. The electrolyte used was a 2M KOH aqueous solution. The capacitive performance of the

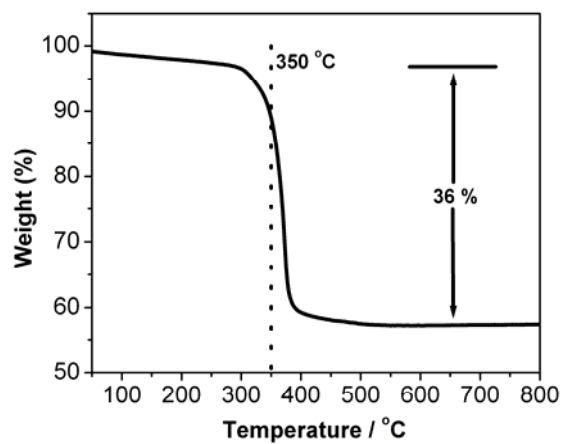
samples was evaluated on a CHI 660C electrochemical workstation using cyclic voltammetry and chronopotentiometry tests with a three-electrode cell where Pt foil serves as the counter electrode and a standard calomel electrode (SCE) as the reference electrode.



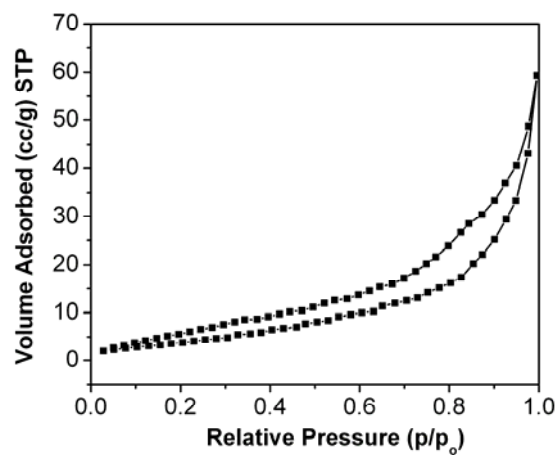
**Figure S1.** XRD pattern of CoCO<sub>3</sub> ellipsoids.



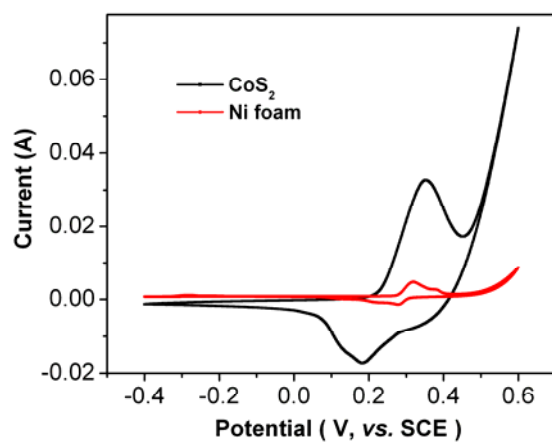
**Figure S2.** (a, b) FESEM and (c, d) TEM images of CoCO<sub>3</sub> ellipsoids.



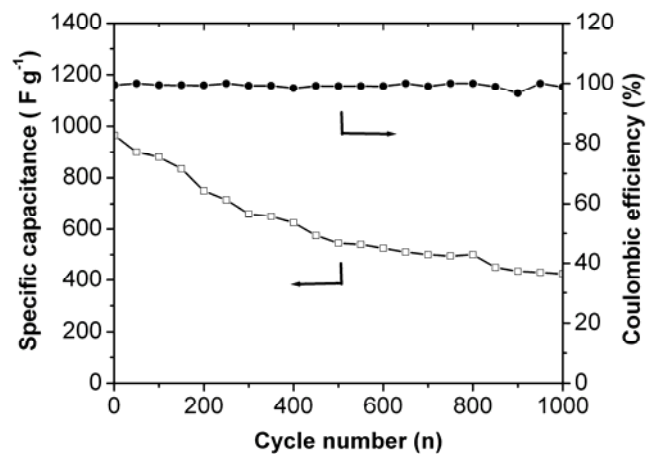
**Figure S3.** TGA curve of the CoCO<sub>3</sub> ellipsoids in N<sub>2</sub> with a temperature ramp of 10 °C min<sup>-1</sup>.



**Figure S4.** N<sub>2</sub> adsorption-desorption isotherms of CoS<sub>2</sub> ellipsoids with anisotropic tube-like cavities.



**Figure S5.** The cyclic voltammograms of Ni foam with and without loading of CoS<sub>2</sub> ellipsoids at a scan rate of 5 mV s<sup>-1</sup>.



**Figure S6.** Specific capacitance and Coulombic efficiency of CoS<sub>2</sub> ellipsoids with anisotropic tube-like cavities in an aqueous KOH (2 M) electrolyte as a function of cycle number at current density of 2.5 A g<sup>-1</sup>.