Grass-like $CuCo_2O_4$ Nanowire Arrays Supported on Nickel foam with High Capacitances and Desirable Cycling Performance

Huaiyuan Chen, Xiaohua Chen*, Ying Zeng, Shanliang Chen and Jiande Wang

College of Materials Science and Engineering, Hunan University, Hunan Province Key Laboratory for Spray Deposition Technology and Application, Changsha 410082, China

Synthesis of $CuCo_2O_4$ nanowire arrays on Ni foam.

All the reagents used were of analytical grade and purchased from Sinopharm Chemical Reagent Co. Ltd (Shanghai, China), and were used as received without any purification processes. The deionized water was Millipore Milli-Q grade with a resistivity larger than 18 MΩ cm^{-1}. The nickel nitrate, copper nitrate and Cobalt nitrate were obtained from Tianjin Chemical Reagent Co.

$CuCo_2O_4$ NWAs on Ni foam were prepared by a facile hydrothermal synthesis method. Ni foam (approximately 1.5cm×2cm) was carefully cleaned with a diluted HCl solution (1.2 mol) in an ultrasound bath for 0.5 h in order to remove the surface NiO layer, and then cleaned with acetone, deionized water and absolute ethanol for 0.5h. Stoichiometric amounts of $Cu(NO_3)_2 \cdot 3H_2O$ (0.241g), $Co(NO_3)_2 \cdot 6H_2O$ (0.482 g) and urea(0.24g) were dissolved in 40 ml of distilled water and stirred for 30 minutes. Then this resulting solution was transferred into a Teflon-lined stainless steel auto-clave liner, and meanwhile Ni foam substrates were immersed into the reaction solution. The liner was sealed in a stainless steel autoclave and maintained at 120℃ for 8 h and then cooled to room temperature. The samples were collected and washed carefully by distilled water and absolute alcohol several times. Finally, the samples were annealed at 400℃ in air for 6 h.

Corresponding author. Tel.: +86 73188821610; fax: +86 73188823554.E-mail addresses: xiaohuachen@hnu.edu.cn (X. Chen).

Electronic Supplementary Information (ESI†)

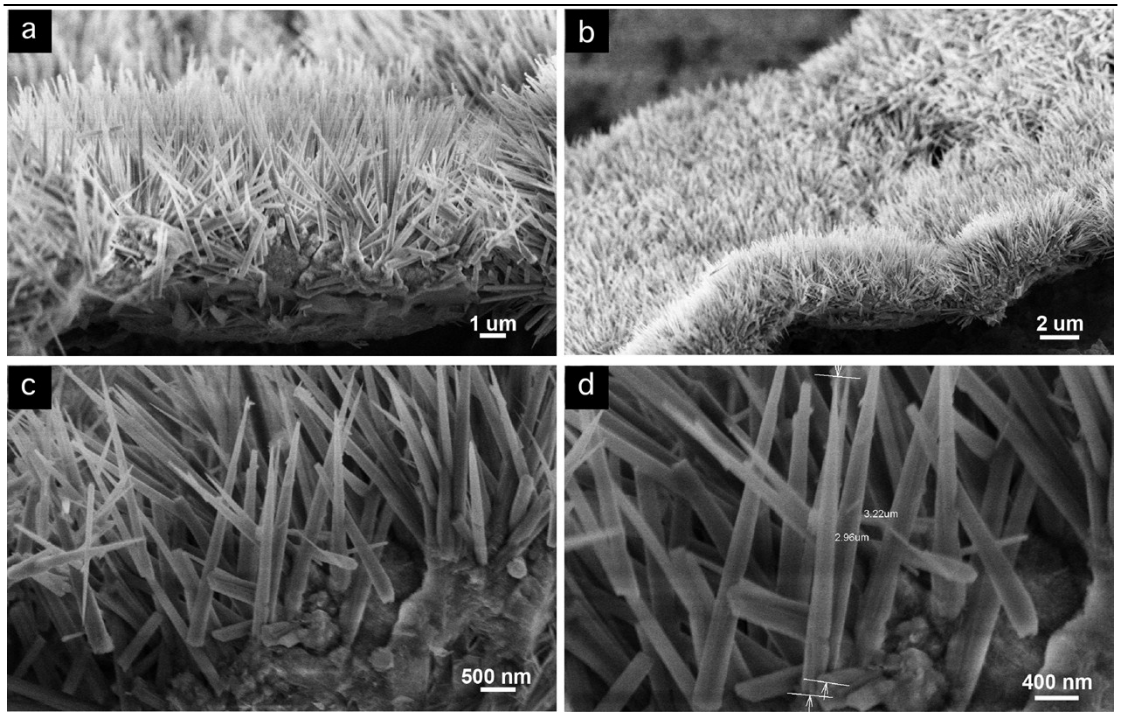

Figure. S1 (a) and (b) are the side view of the substance under SEM;(c) and (d) are the close view of the $CuCo_2O_4$ NWAs on Ni foam.

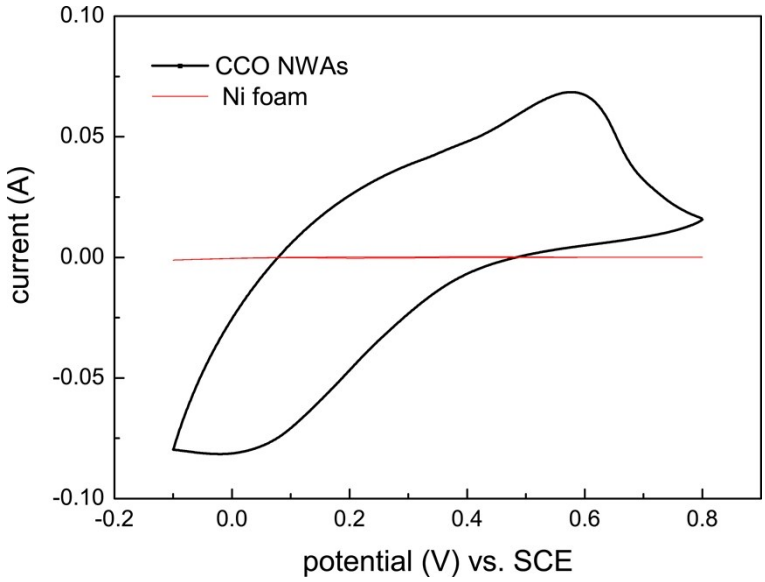

Figure. S2 CV curves of the $CuCo_2O_4$ NWAs on Ni foam and bare Ni foam electrodes obtained at a scan rate of 50 mV s^{-1}

Electronic Supplementary Information (ESI†)

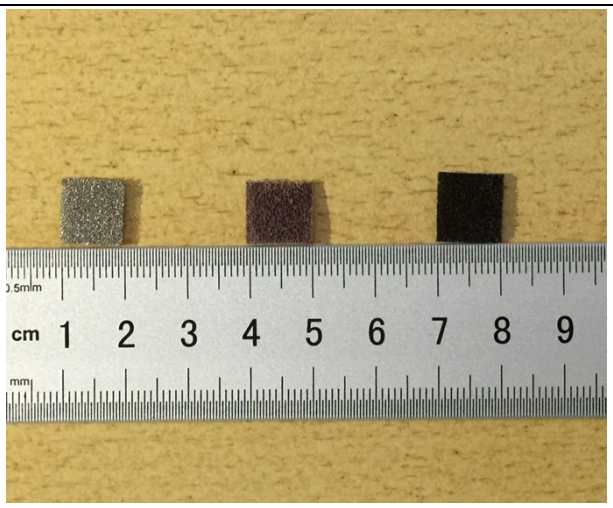

Figure. S3 Photograph of the device before hydrothermal synthesis, after hydrothermal synthesis and after annealed.

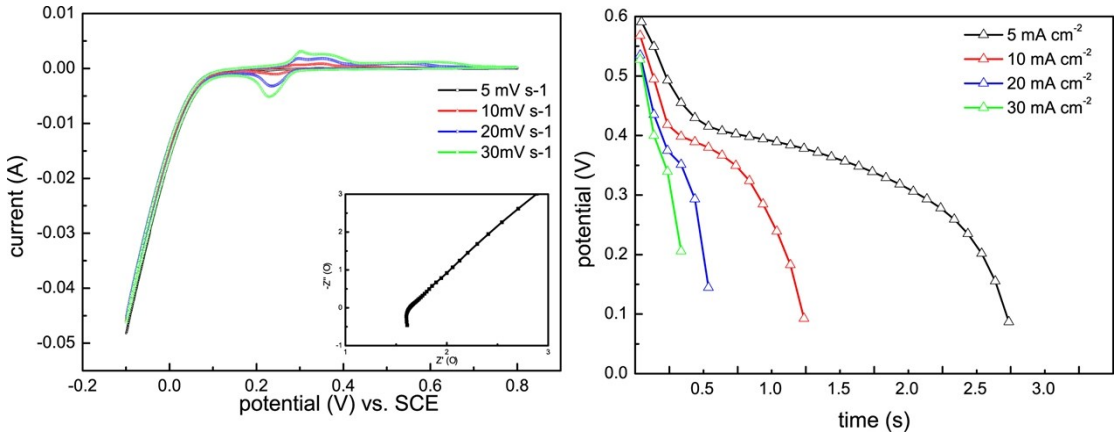

Figure. S4 Electrochemical characterization of Ni foam: (a) CV curves at different scan rates and electrochemical impedance spectra (EIS) of the Ni foam (inset), (b) galvanostatic charge/discharge curves at different current densities.

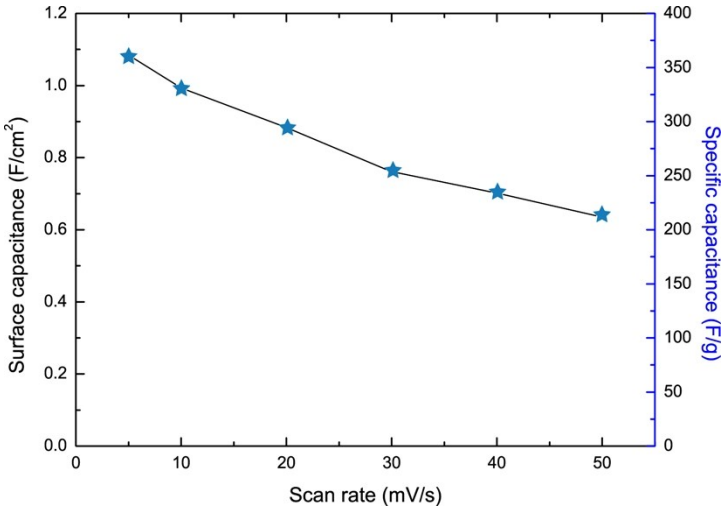

Figure. S5 The Current density dependence of the specific capacitance calculated from the cyclic voltammogram curves.