Tuning the morphology of Co_3O_4 on Ni foam for supercapacitor application

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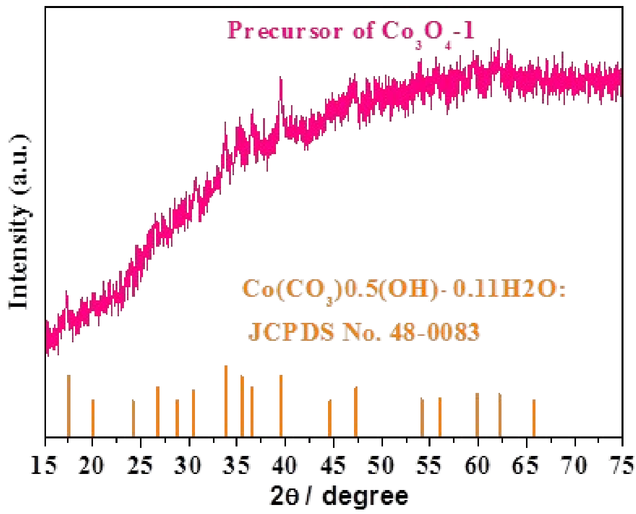

Figure S1 XRD pattern of the Co_3O_4-1 precursor (scratched from Ni foam after 6 h hydrothermal reaction).

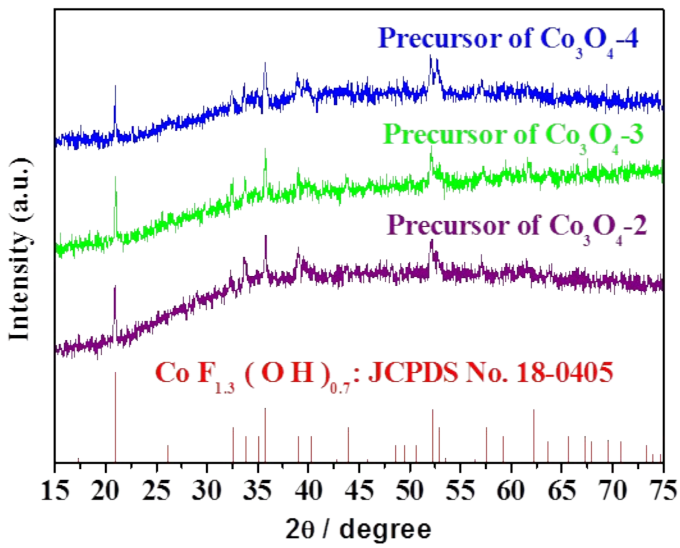

Figure S2 XRD patterns of the Co_3O_4-2, Co_3O_4-3, and Co_3O_4-4 precursors (scratched from Ni foam after 6 h hydrothermal reaction)

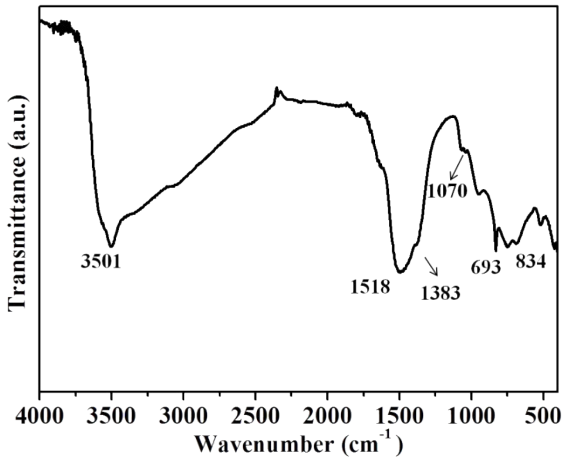

Figure S3 FTIR spectrum of the Co_3O_4-1 precursor

(scratched from Ni foam after 6 h hydrothermal reaction).

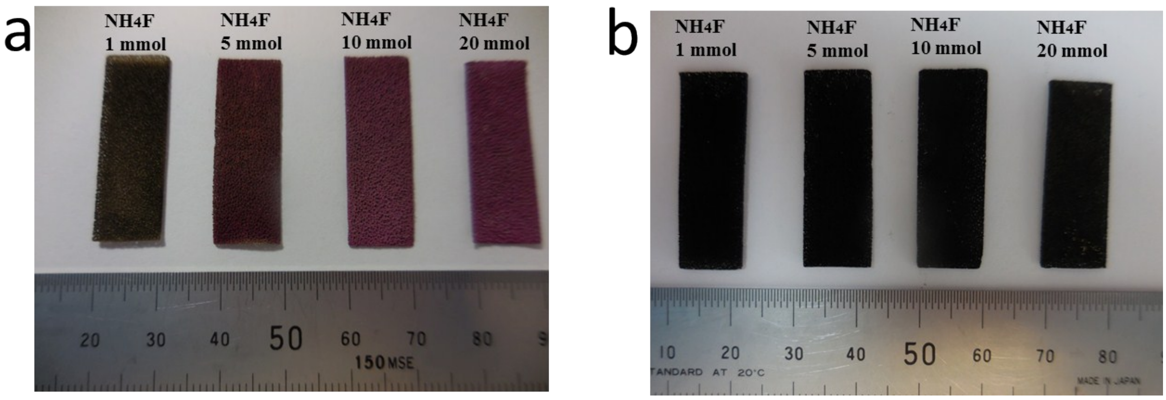

Figure S4 Optical images of precursors of Co_3O_4-1, Co_3O_4-2, Co_3O_4-3, and Co_3O_4-4 (left to right) (a); optical images of Co_3O_4-1, Co_3O_4-2, Co_3O_4-3, and Co_3O_4-4 (left to right) (b).

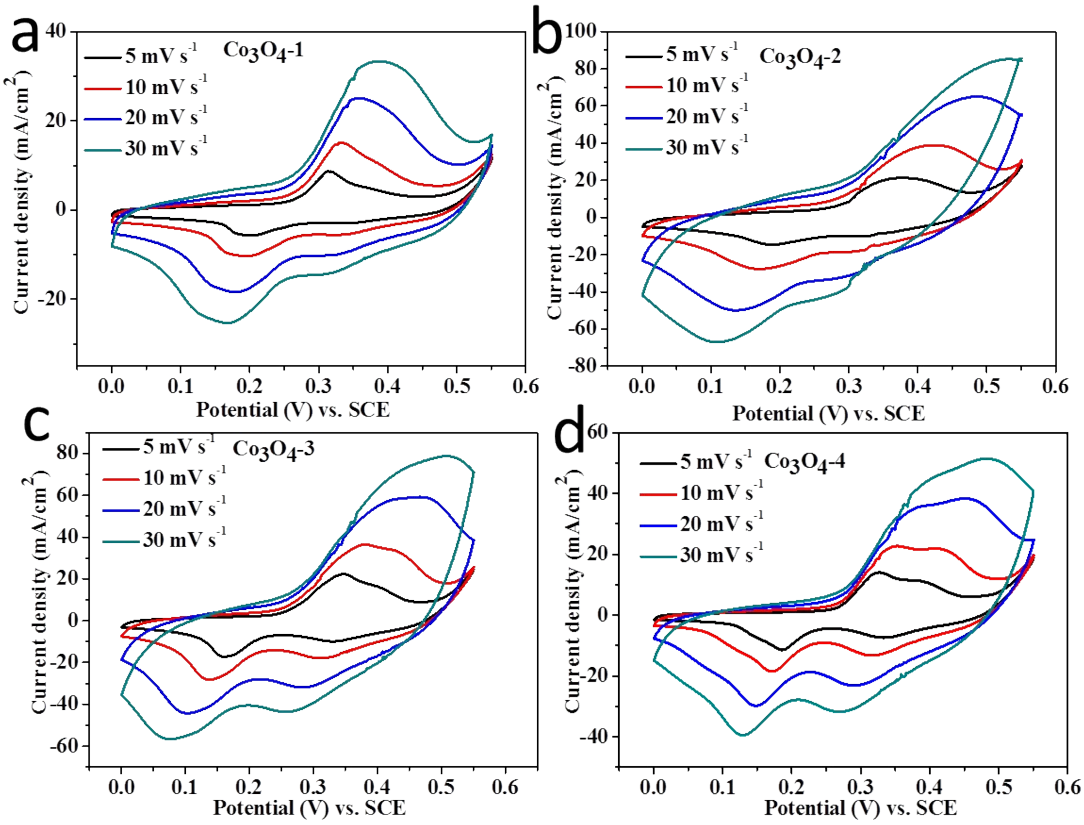

Figure S5 CV curves of Co_3O_4-1 (a), Co_3O_4-2 (b), Co_3O_4-3 (c), and Co_3O_4-4 (d) at various scan rates.

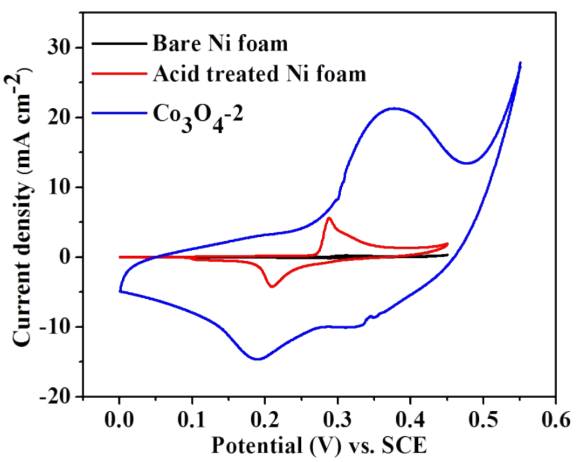

Figure S6 CV curves of bare Ni foam, 6 M hydrochloric acid treated Ni foam and Co_3O_4-2 at 5 mV s^{-1} scan rate.

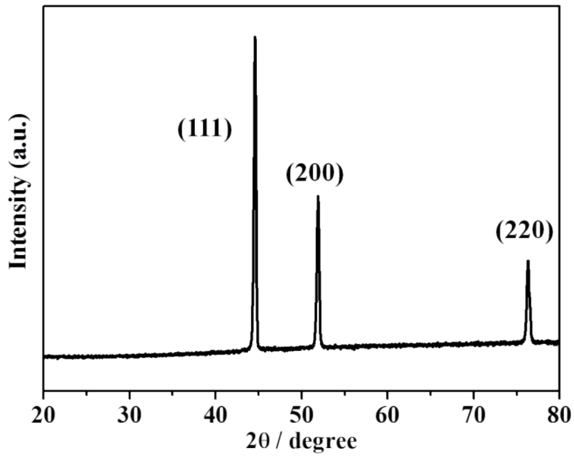

Figure S7 XRD patterns of 6 M hydrochloric acid treated Ni foam

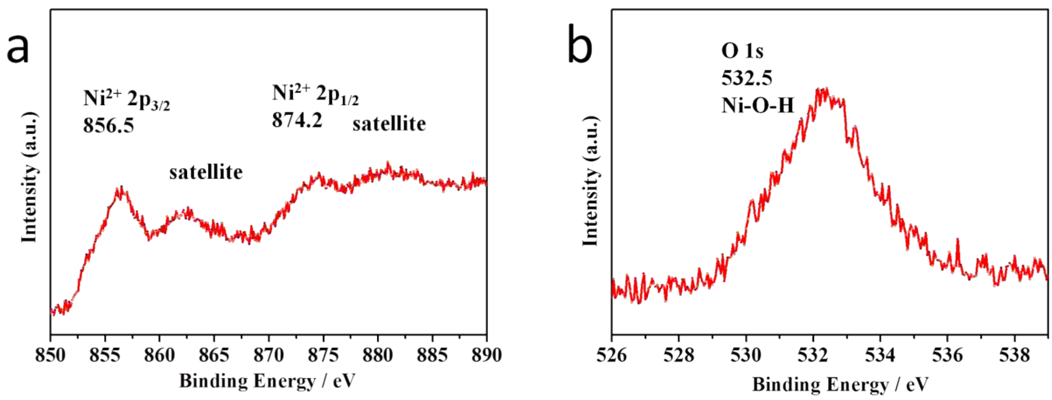

Figure S8 Ni 2p XPS spectra of 6 M hydrochloric acid treated Ni foam (a), O 1s XPS spectra of 6 M hydrochloric acid treated Ni foam (b).

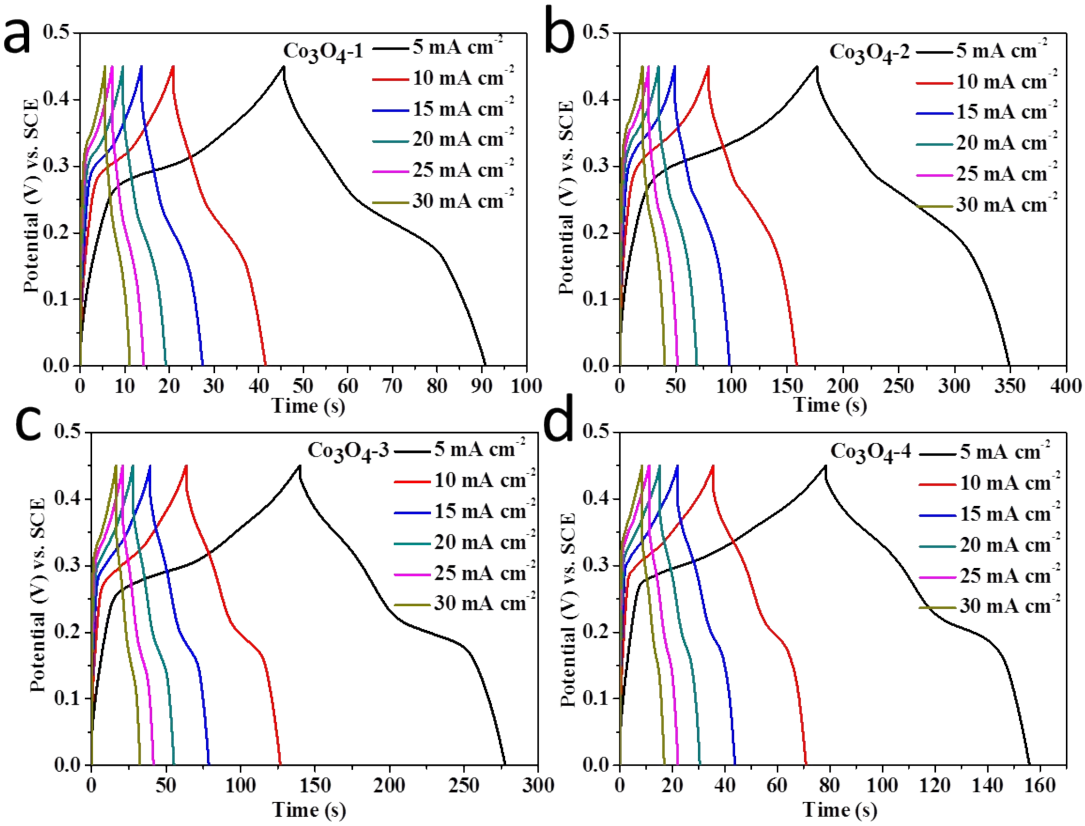

Figure S9 Charge and discharge curves of Co_3O_4-1 (a), Co_3O_4-2 (b), Co_3O_4-3 (c), and Co_3O_4-4 (d) at various current densities.

Table S1 Comparison of values for the specific area capacitance in previously reported works on supercapacitors with values for the four Co_3O_4 materials presented here.

Material	Specific area capacitance ($F\ cm^{-2}$)	Reference
Co_3O_4	0.68 (4.2 mA/cm^2)	S1
Co_3O_4@NiO	1.35 (6 mA/cm^2)	
Co_3O_4	0.135 (11.25 mA/cm^2)	S2
Co_3O_4@MnO_2	0.56 (11.25 mA/cm^2)	
CoO	0.285 (5 mA/cm^2)	S3
CoO@PPy	2.51 (5 mA/cm^2)	
Co_3O_4	0.79 (5 mV/s)	S4
Co_3O_4@$NiCo_2O_4$	2.04 (5 mV/s)	
$NiCo_2O_4$	0.84 (2 mA/cm^2)	S5

$NiCo_2O_4@NiCo_2O_4$	1.55 (2 mA/cm^2)	
MnO_2	0.101 (8.5 mA/cm^2)	S6
$MnO_2@NiO$	0.35 (8.5 mA/cm^2)	
$NiCo_2O_4$	1.5 (8.5 mA/cm^2)	S7
$NiCo_2O_4@MnO_2$	2.54(8.5 mA/cm^2)	
Co_3O_4-1	0.5 (5 mA/cm^2)	This work
Co_3O_4-2	1.92 (5 mA/cm^2)	This work
Co_3O_4-3	1.53 (5 mA/cm^2)	This work
Co_3O_4-4	0.87 (5 mA/cm^2)	This work

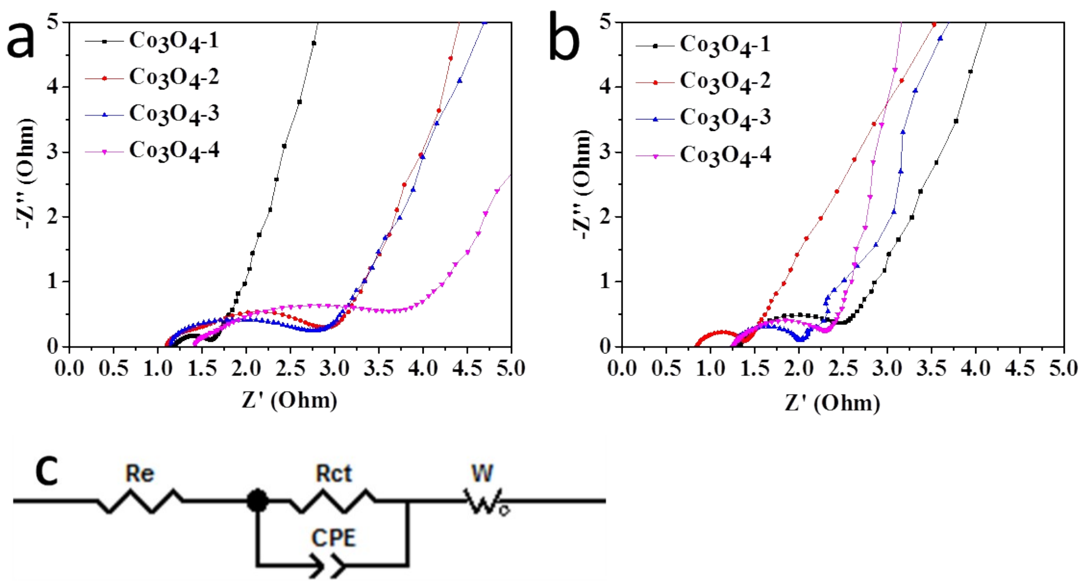

Figure S10 Electrochemical impedance spectroscopy plots of Co_3O_4-1, Co_3O_4-2, Co_3O_4-3, and Co_3O_4-4 before cycling (a), after 3000 cycles (b), and equivalent circuit (c).

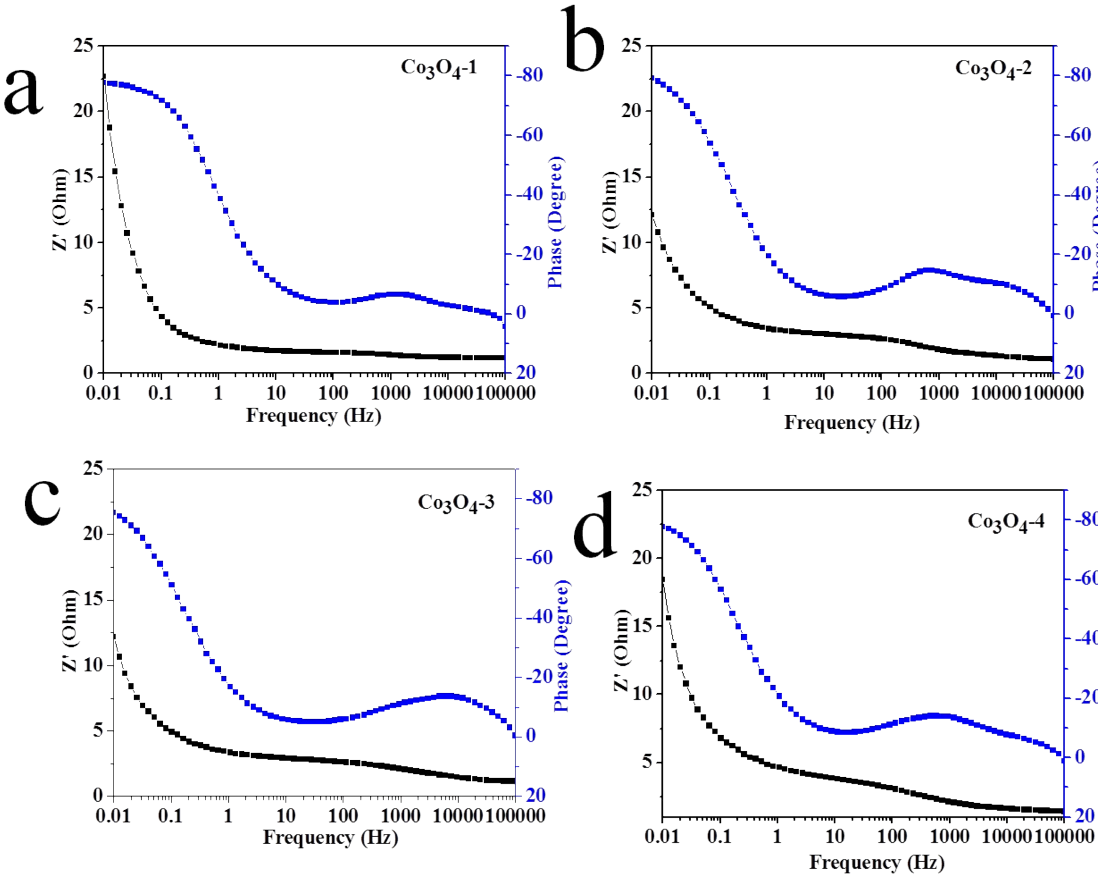

Figure S11 Bode plots of Co_3O_4-1, Co_3O_4-2, Co_3O_4-3, and Co_3O_4-4.

References:

S1 X. Xia, J. Tu, Y. Zhang, X. Wang, C. Gu, X. B. Zhao and H. J. Fan, *ACS Nano*, 2012, 6, 5531-5538.

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