Electronic Supplementary Information

High-Performance Nickel Cobalt Sulfides Materials *via* Low-Cost Preparation for Advanced Asymmetric Supercapacitors

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Table S1 Comparisons of electrochemical performance of the Ni-Co-S samples in our work and those in other papers on the nickel cobalt sulfides prepared using different preparation methods

Electrode materials	Preparation method	Specific capacitance	Rate capability	Cycling stability
Tube-like $NiCo_2S_4$[1]	Hydrothermal	1048 F g^{-1} at 3 A g^{-1}	50.1% (1-20 A g^{-1})	75.9% (5000 cycle at 10 A g^{-1})
$NiCo_2S_4$ nanotube arrays[2]	Hydrothermal	14.39 F cm^{-2} at 5 mA cm^{-2}	67.7% (5-150 mA c m^{-2})	92.0% (5000 cycle at 50 mA cm^{-2})
$NiCo_2S_4$ nanotube arrays[3]	Hydrothermal	738 F g^{-1} at 4 A g^{-1}	78% (4-32 A g^{-1})	93.4% (4250 cycle at 8 A g^{-1})
$Ni_xCo_{1-x}S_2$ particles[4]	Hydrothermal	1166 F g^{-1} at 1 A g^{-1}	47.9% (1-20 A g^{-1})	76.5%(1000 cycle at 5 A g^{-1})
$CoNi_2S_4$ nanoparticles[5]	Solvothermal	1169 F g^{-1} at 1 A g^{-1}	60.1% (1-5 A g^{-1})	49.03%(2000 cycle at 4 A g^{-1})
Hierarchically $Ni_{0.48}Co_{0.52}S_{1.097}$[6]	Solvothermal	1152 F g^{-1} at 0.5 A g^{-1}	69% (0.5-20 A g^{-1})	Not Reported
$NiCo_2S_4$ hollow nanoprisms[7]	Sacrificial template	895.2 F g^{-1} at 1 A g^{-1}	65.4% (1-20 A g^{-1})	85.7% (1500 cycle at 5 A g^{-1})
$NiCo_2S_4$ nanotubes[8]	Sacrificial template	1093 F g^{-1} at 0.2 A g^{-1}	50.3% (0.2-5 A g^{-1})	63% (1000 cycle at 1 A g^{-1})
$NiCo_2S_4$ hollow hexagonal nanoplates[9]	Sacrificial template	437 F g^{-1} at 1 A g^{-1}	53.2% (1-20 A g^{-1})	81% (1000 cycle at 2 A g^{-1})
Our work	**Coprecipitation**	**1259 F g^{-1} at 1 A g^{-1}**	**75.07% (1-50 A g^{-1})**	**90.0% (2000 cycle at 10 A g^{-1})**

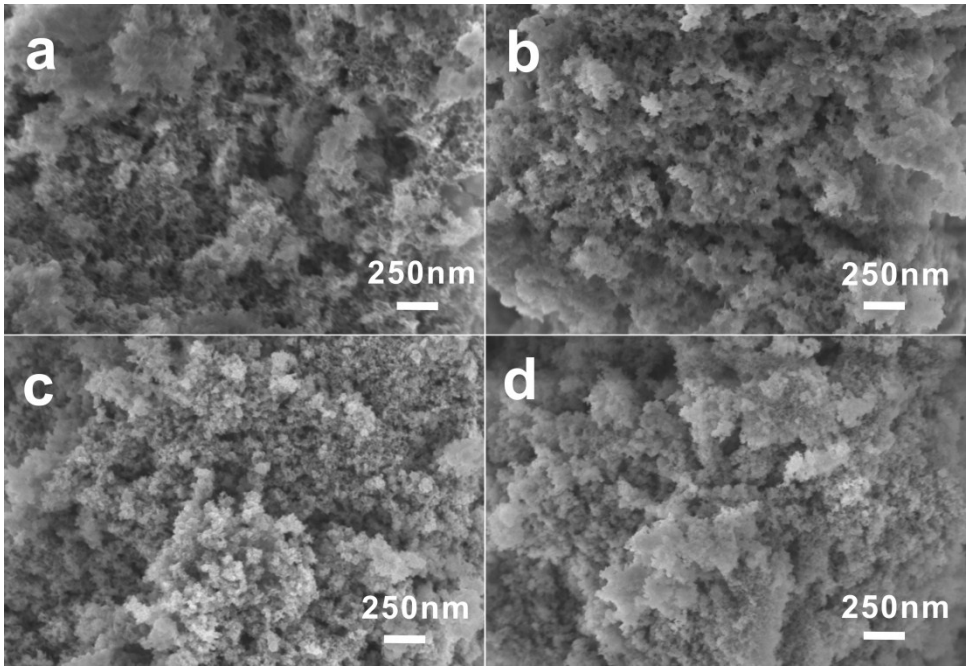

Fig.S1 SEM images of the as-prepared NCS samples. (a) NCS-1 ;(b) NCS-2 ;(c) NCS-3;(d) NCS-5.

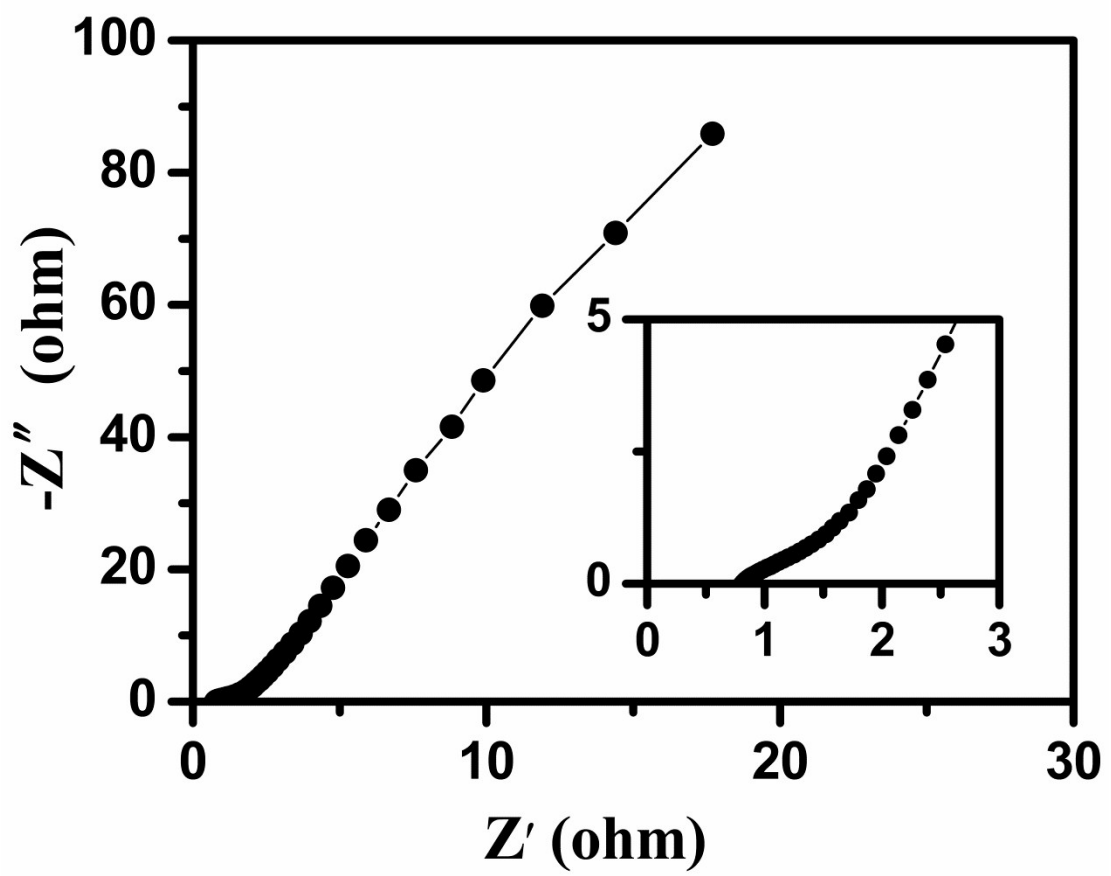

Fig.S2 Nyquist plots of the NCS-4 sample measured at amplitude of 5 mV in the frequency region of 100 kHz to 0.01 Hz in the three-electrode cell.

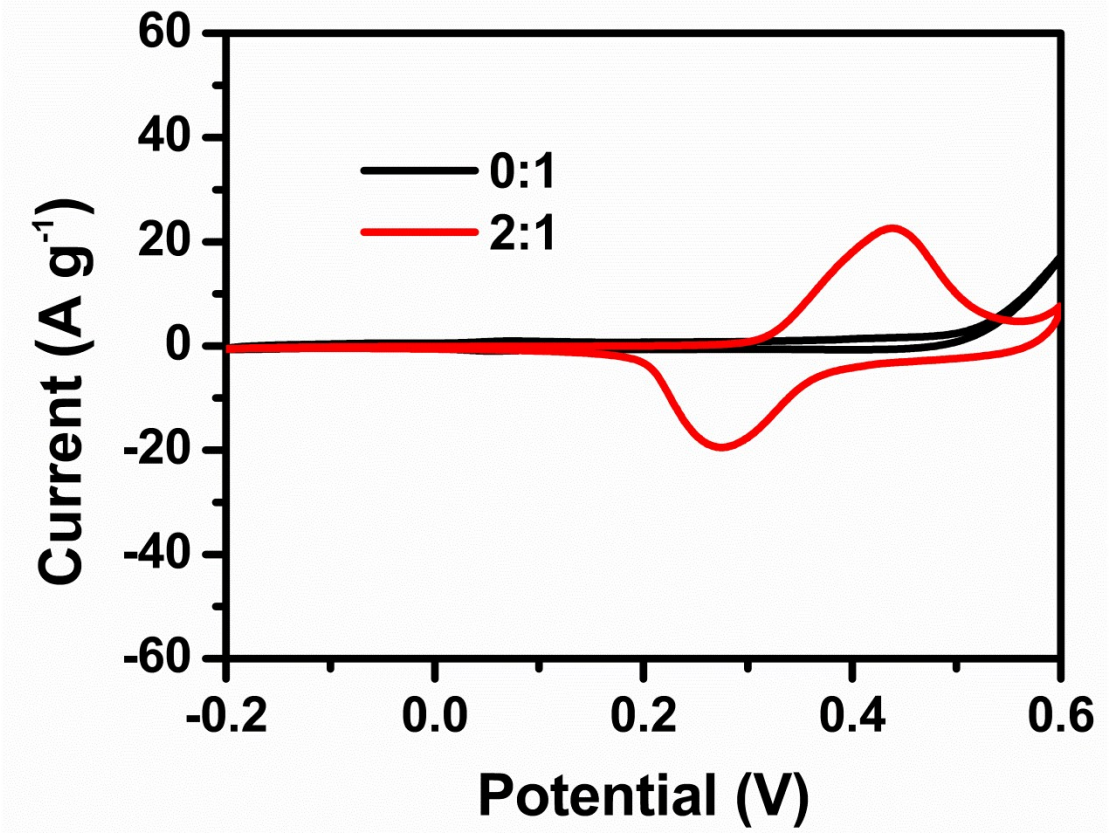

Fig.S3 The CV curves of the pure Co-S phase and the NCS-4 sample at 5 mV s^{-1} in three-electrode cell.

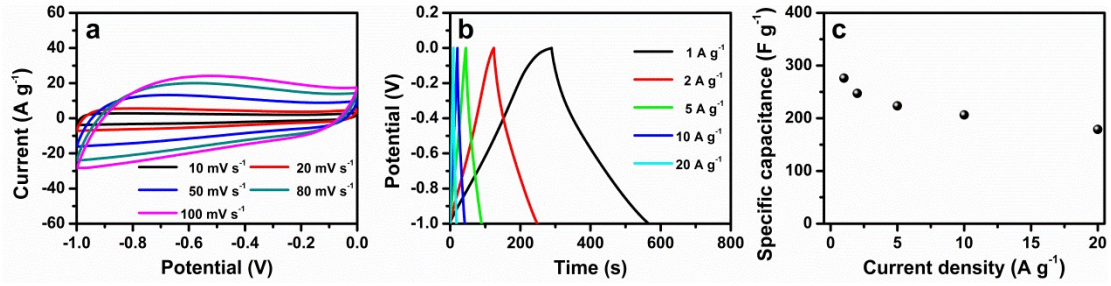

Fig.S4 Electrochemical evaluation of the activated carbon. (a) the CV curves under different scan rates; (b) the GCD curves under different current densities; (c) the specific capacitance versus different current densities.

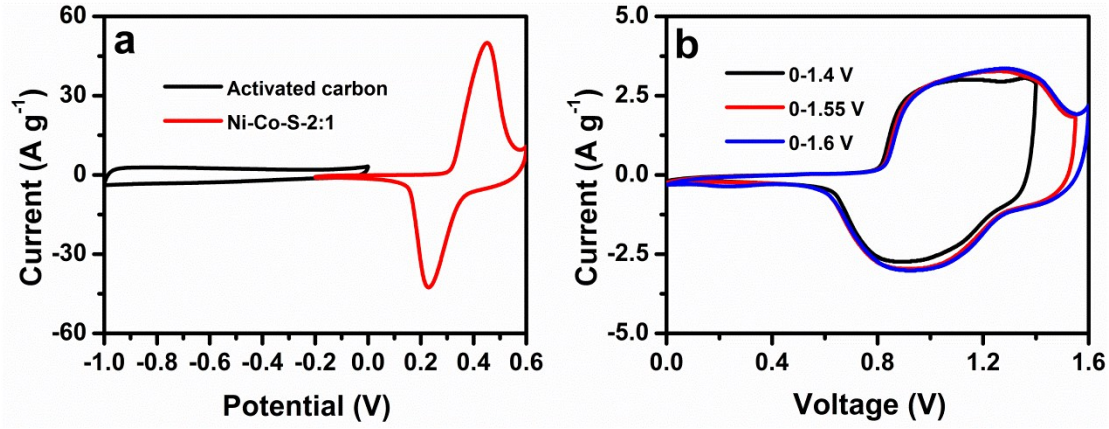

Fig.S5 The voltage window evaluation of the asymmetric supercapacitor. (a) The CV curves of the activated carbon and NCS-4 at 10 mV s^{-1} respectively measured in three-electrode cell; (b) the CV curves of the NCS-4//AC asymmetric supercapacitors under different voltages.

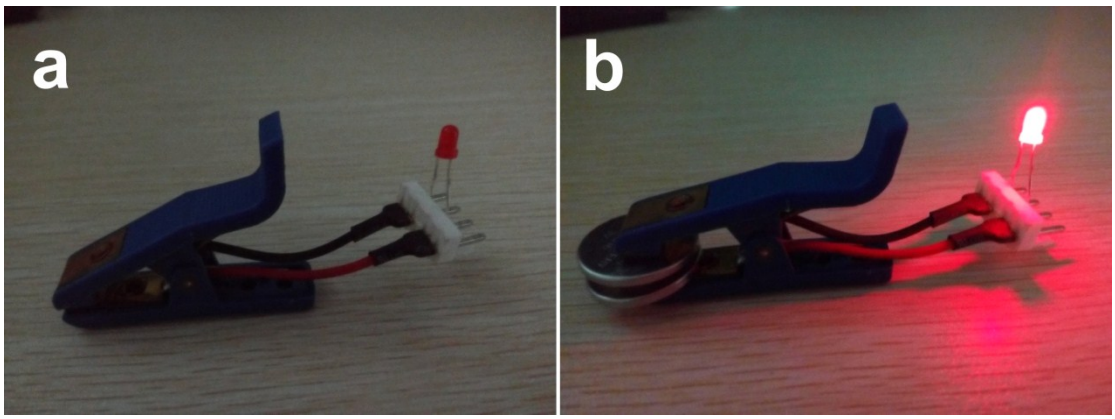

Fig.S6 A photographs of the NCS-4//AC asymmetric supercapacitors powered a red LED. (a) Disconnection; (b) Connection.

References

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