Electronic Supplementary Information

Hierarchical hollow, sea-urchin-like and porous $Ni_{0.5}Co_{0.5}Se_2$ as advanced battery material for hybrid supercapacitors

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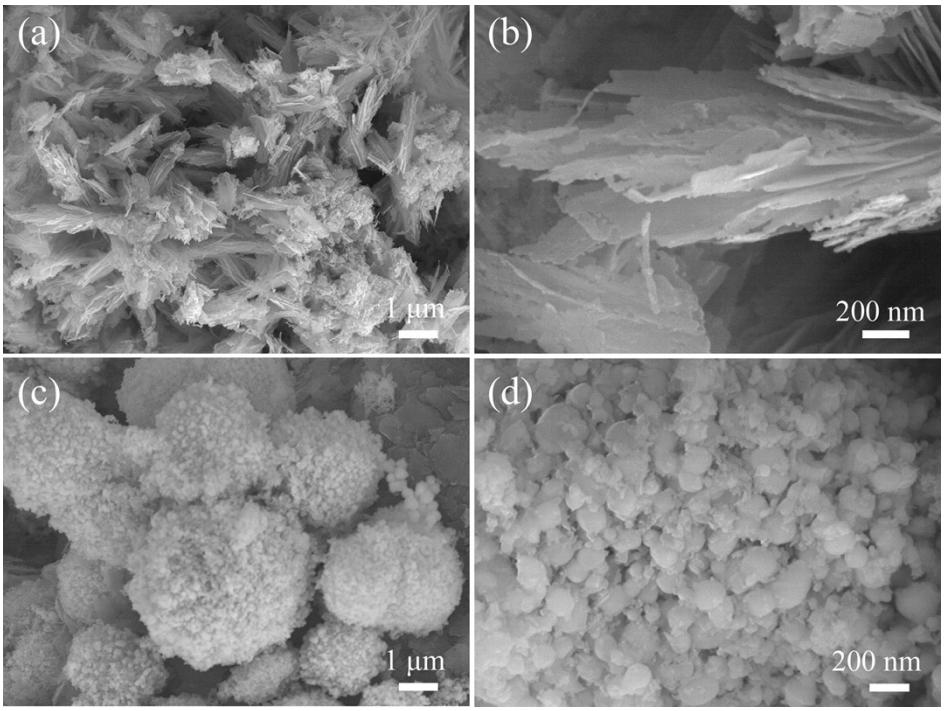

Fig. S1 SEM images of the (a,b) $CoSe_2$ and (c,d) $NiSe_2$.

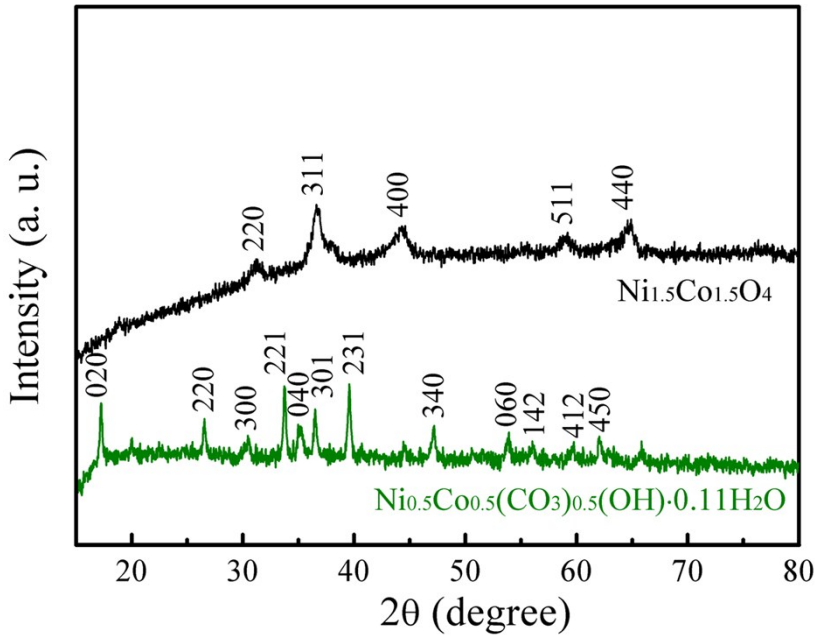

Fig. S2 XRD patterns of the $Ni_{0.5}Co_{0.5}(CO_3)_{0.5}OH$ precursor and the $Ni_{1.5}Co_{1.5}O_4$.

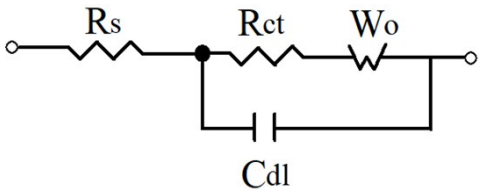

Fig. S3 The equivalent circuit model used to fit the EIS spectra, where R_s is the bulk solution resistance, R_{ct} is the charge-transfer resistance, C_{dl} is the double-layer capacitance, and W_o is the Warburg resistance.

Table S1. Comparison of the capacitive performance of the typical $Ni_{0.5}Co_{0.5}Se_2$ and other representative selenides electrode materials reported previously

Electrode materials	Morphology	Specific capacity	Specific current	Ref.
$Ni_{0.5}Co_{0.5}Se_2$	Hollow sea-urchin-like structure	524 C g^{-1} (1007 F g^{-1})	1 A g^{-1}	This work
$Ni_{0.5}Co_{0.5}Se$	Nanoparticles	449 C g^{-1} (863.46 F g^{-1})	1 A g^{-1}	1
Ni-Co-Se-3-3	Hollow nanoparticles	420.4 C g^{-1} (800.76 F g^{-1})	1 A g^{-1}	2
$NiCoSe_2$	Hollow sub-microspheres	450 C g^{-1} (750 F g^{-1})	3 A g^{-1}	3
$Ni_{0.34}Co_{0.66}Se_2$	$Ni_{0.34}Co_{0.66}Se_2$ nanorod arrays	1.305 C cm^{-2} (2.61 F cm^{-2})	4 mA cm^{-2}	4
$(Ni,Co)_{0.85}Se$	Nanotubes on CFC	1.165 C cm^{-2} (2.33 F cm^{-2})	4 mA cm^{-2}	5
Ni_3Se_2	Cauliflower-like nanostructures on fabric	430.56 C g^{-1} (956.8 F g^{-1})	2 A g^{-1}	6
$NiSe@MoSe_2$	Uniform vertical nanosheet arrays	461.52 C g^{-1} (769.2 F g^{-1})	1 A g^{-1}	7
$Ni_{0.85}Se@MoSe_2$	Ultrathin nanosheet arrays	387 C g^{-1} (774 F g^{-1})	1 A g^{-1}	8
$NiSe_2$	Cube-like single crystals	417.6 C g^{-1} (1044 F g^{-1})	3 A g^{-1}	9
$CoSe_2$	3D hierarchical architectures	0.2656 C cm^{-2} (0.332 F cm^{-2})	1 mA cm^{-2}	10
$CoSe_2$	Porous nanosheet	356.95 C g^{-1} (713.9 F g^{-1})	1 mA cm^{-2}	11
$Co_{0.85}Se$	Petal-like nanosheets	176.4 C g^{-1} (294 F g^{-1})	0.5 A g^{-1}	12
$Co_{0.85}Se$	Hollow nanotubes	119 C g^{-1} (238 F g^{-1})	1 A g^{-1}	13
CuSe	2D nanosheets film	125.4 C g^{-1} (209 F g^{-1})	0.2 A g^{-1}	14
$FeSe_2$	Hierarchical snowflake structure	304 C g^{-1} (304 F g^{-1})	0.5 A g^{-1}	15
$GeSe_2$	3D hierarchical nanostructures	180 C g^{-1} (300 F g^{-1})	1 A g^{-1}	16
SnSe	2D nanostructures	98.04 C g^{-1} (228 F g^{-1})	0.5 A g^{-1}	17

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