One-step coaxial electrodeposition of $Co_{0.85}Se$ on $CoNi_2S_4$ nanotube arrays for flexible solid-state asymmetric supercapacitors

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Figures and tables

$CoCl_2 \cdot 6H_2O/SeO_2$, (g)	Cycle number	Mass loading, (mg)
0.2855/0.111	15	8.4
0.2855/0.111	8	4.2
0.2855/0.111	4	2.1
0.2855/0.111	2	1.1
0.1428/0.0555	4	0.8~1.0
0.0714/0.0278	4	0.4
0.0714/0.0278	8	1.6

Table S1: The influence of precursor and the cycle number on the mass loading of the $Co_{0.85}Se$.

Element	Weight (%)	Atomic
C	14.70	0.43
O	8.33	0.17
Co	28.47	0.18
Se	48.50	0.21

Table S2. Element ratio from analyzing EDS spectrum of $Co_{0.85}Se$/GF

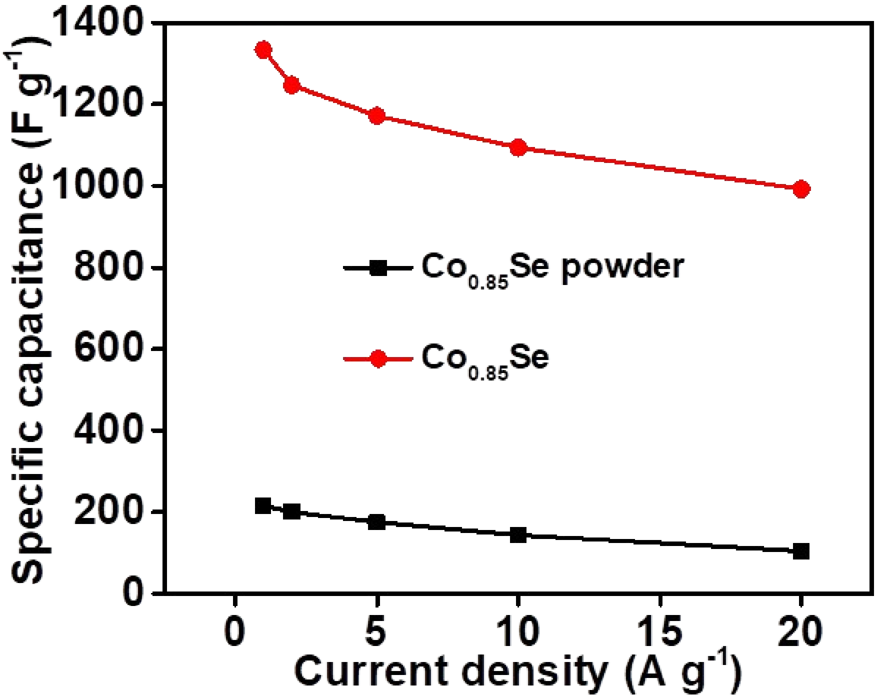

Figure S1. The discharge capacitance of $Co_{0.85}Se$/GF and $Co_{0.85}Se$ powder.

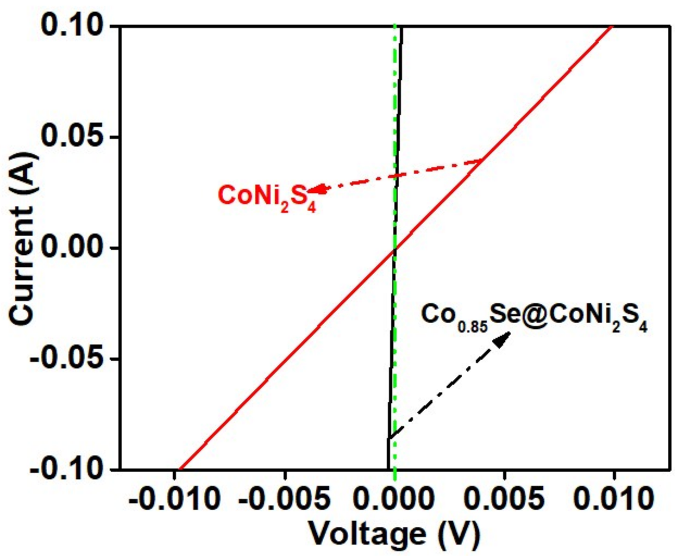

Figure S2.Typical *I-V* curve of $CoNi_2S_4$/GF and $Co_{0.85}Se@CoNi_2S_4$/GF.

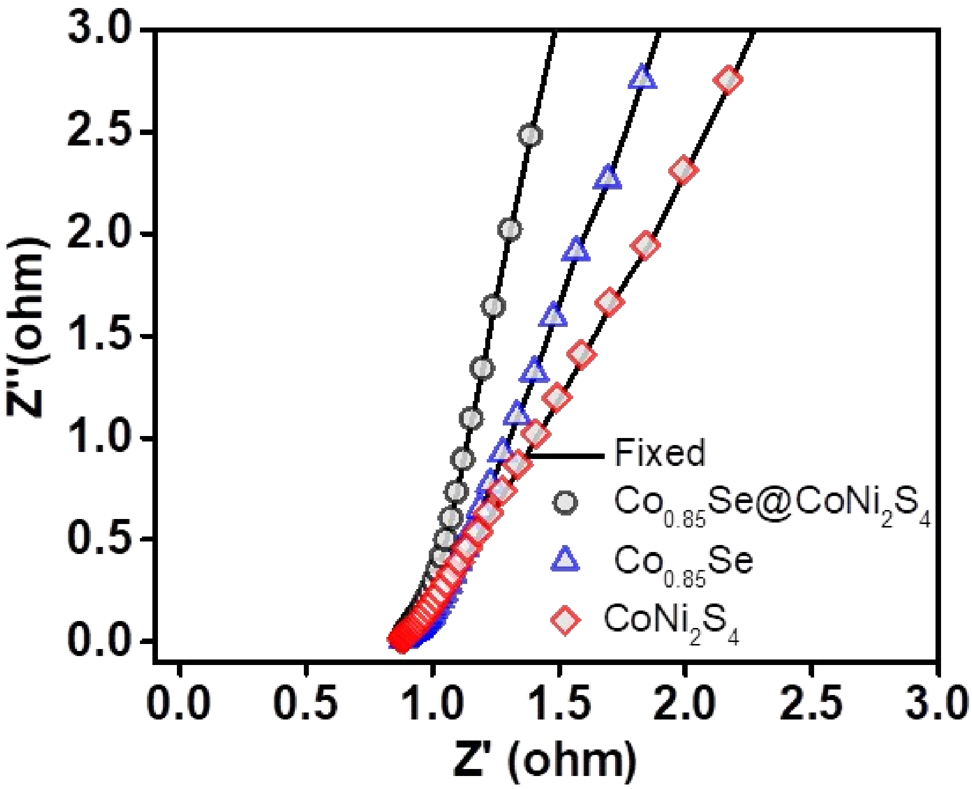

Figure S3. Nyquist plots of the $CoNi_2S_4$, $Co_{0.85}Se$, and $Co_{0.85}Se@CoNi_2S_4$ electrodes.

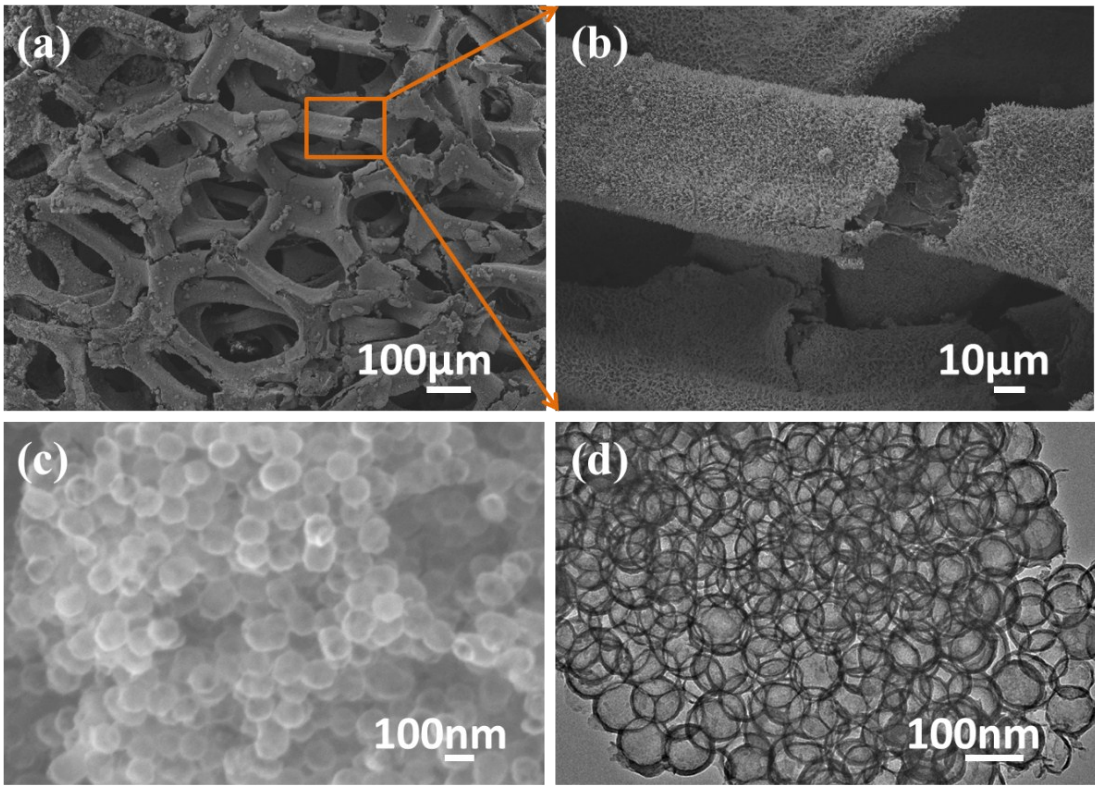

Figure S4**.** The SEM images of $CoNi_2S_4$ nanotubes (a, b) and the hollow carbon spheres (c). The TEM images of the hollow carbon spheres (d).

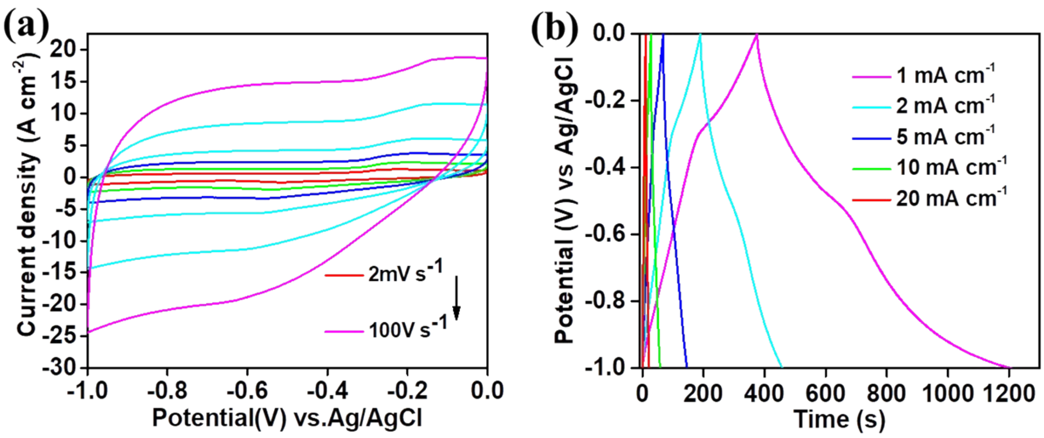

Figure S5. (a) CV curves and (b) GCD curves of hollow carbon spheres.

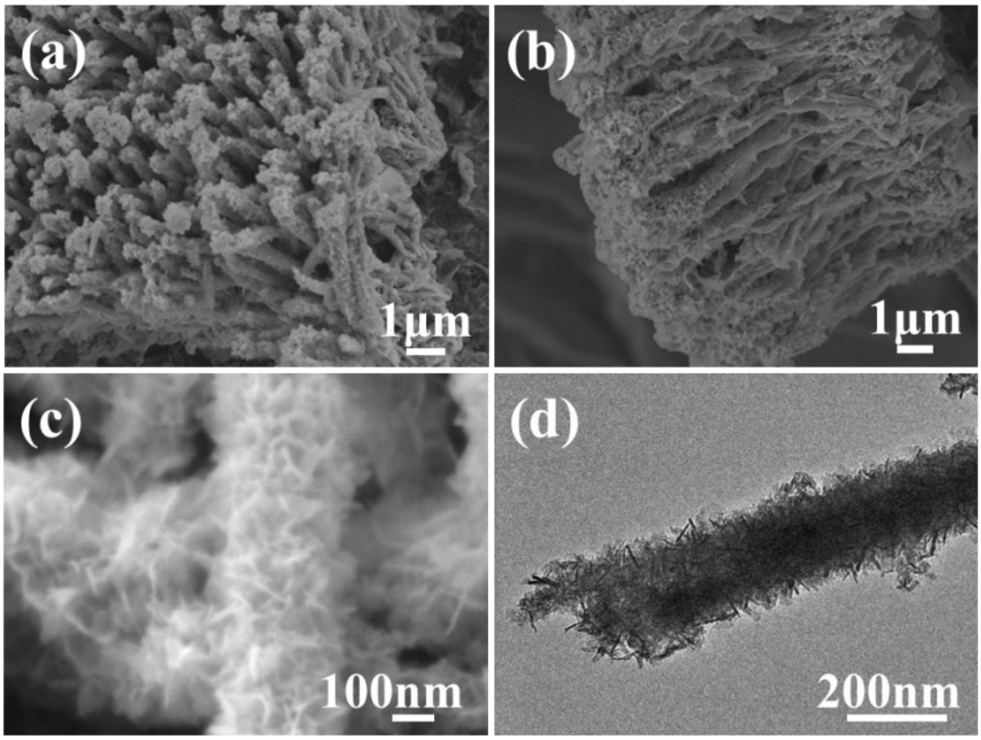

Figure S6. The SEM images (a, b, and c) and the TEM images (d) of core-shell $Co_{0.85}Se@CoNi_2S_4$ arrays after 10 000 cycles CV test.

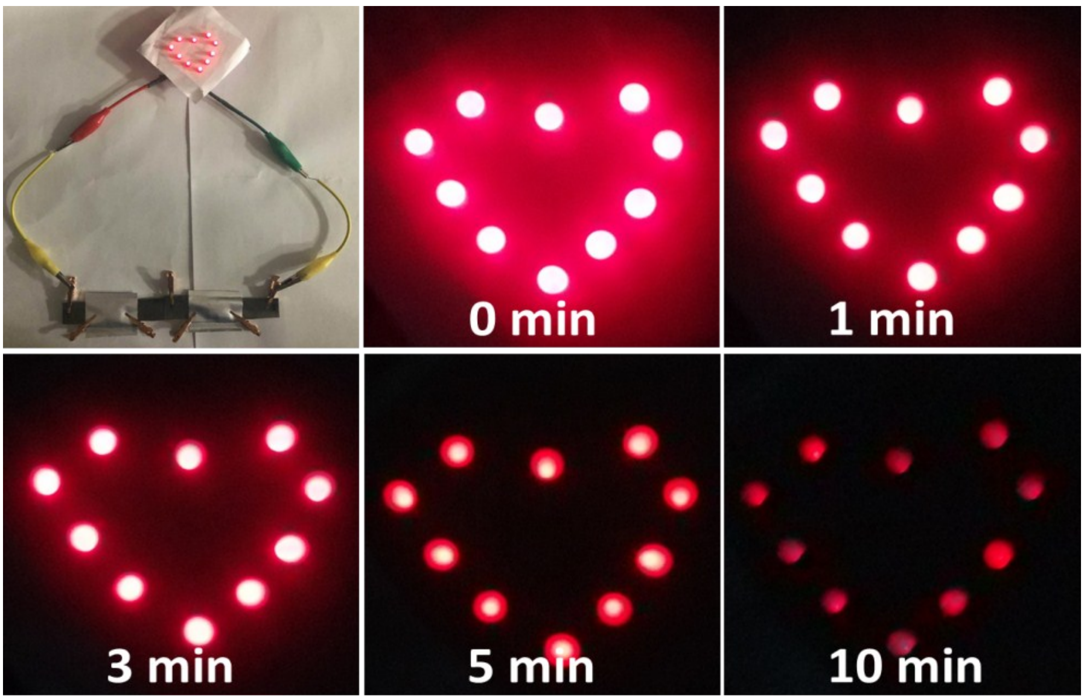

Figure S7. The brightness of LED in various durations for two 1×1cm2 device in series after charging for seconds (d).

Table S3. Electrochemical properties for $Co_{0.85}Se$@ $CoNi_2S_4$ of this work in comparison with those Ni- and/or Co-based electrodes with core/shell hybrid structures in earlier reports.

Material	Morphology	Capacitance	Current density	Electrolyte	Reference
$Co_{0.85}Se$@ $NiCo_2S_4$	**Core-Shell**	**3.62 F cm^{-2}**	**5 mA cm^{-2}**	**1 M KOH**	**This work**
		3.16 F cm^{-2}	**10 mA cm^{-2}**		
		2.65 F cm^{-2}	**20 mA cm^{-2}**		
NiO/Ni_3S_2	Cliff-like	2.28 F cm^{-2}	2 mA cm^{-2}	6 M KOH	1
$NiMoO_4$@Ni-CoS	Core-Shell	2.27 F cm^{-2}	5 mA cm^{-2}	3 M KOH	2
$NiCo_2O_4$@$NiMoO_4$	Core-shell	2.92 F cm^{-2}	2 mA cm^{-2}	3 M KOH	3
$NiCo_2S_4$@NiO	Core-shell	12.2 F cm^{-2}	1 mA cm^{-2}	3 M KOH	4
$NiCo_2O_4$@MnO_2	Core-shell	2.24 F cm^{-2}	2 mA cm^{-2}	1 M NaOH	5
$NiCo_2S_4$@PPy	Core-shell	9.78 F cm^{-2}	5 mA cm^{-2}	3 M KOH	6
Co_3O_4@MnO_2	Core-shell	0.56 F cm^{-2}	11.25 mA cm^{-2}	1 M LiOH	7
Co_3O_4@RuO_2	Core-Shell	0.67 F cm^{-2}	10 mA cm^{-2}	3 M KOH	8
$NiCo_2O_4$@$NiCo_2O_4$	Core-Shell	1.55 F cm^{-2}	2 mA cm^{-2}	2 M KOH	9
Co_3O_4-NiO	Core-Shell	1.35 F cm^{-2}	6 mA cm^{-2}	2 M KOH	10
Fe_3O_4@SnO_2	Core-Shell	7.01 mF cm^{-2}	0.2 mA cm^{-2}	1 M Na_2SO_3	11
MnO_2@NiO	Core-Shell	0.35 F cm^{-2}	9.5 mA cm^{-2}	1.5 M LiOH	12
$NiCo_2S_4$@ $NiCo_2S_4$	Core-Shell	1.948 F cm^{-2}	1 mA cm^{-2}	6 M KOH	13
$NiCo_2O_4$@Ni_3S_2	Core-Shell	3 F cm^{-2}	5 mA cm^{-2}	6 M KOH	14
$NiCo_2S_4$@CoS_x	Core-Shell	4.74 F cm^{-2}	5 mA cm^{-2}	1 M KOH	15
ZnO@Ni_3S_2	Core-Shell	2.29 F cm^{-2}	3 mA cm^{-2}	1 M NaOH	16
Co_3O_4@$NiCo_2O_4$	Core-Shell	2.04 F cm^{-2}	5 mA cm^{-2}	2 M KOH	17
$Co_xNi_{1-x}(OH)/NiCo_2S_4$	Nanotube array	2.86 F cm^{-2}	4 mA cm^{-2}	1 M KOH	18
		5.25 F cm^{-2}	1 mA cm^{-2}		
		4.43 F cm^{-2}	2 mA cm^{-2}		

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