Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information

Sequential Partial Ion Exchange Synthesis of Composite $Ni_3S_2/Co_9S_8/NiSe$ Nanoarrays with Lavender-like Hierarchical Morphology

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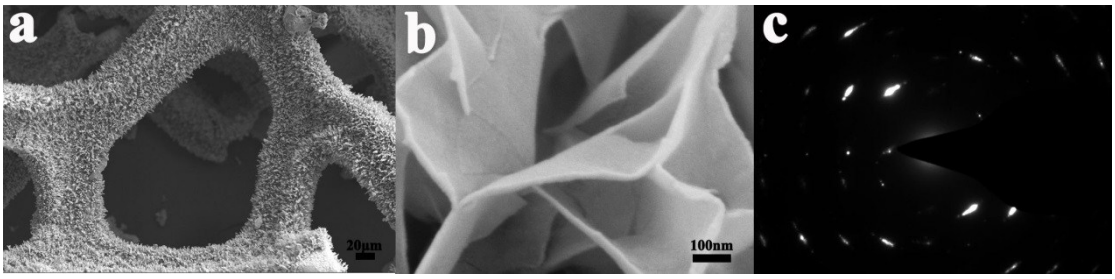

Figure S1. (a) Low-magnification skeleton of Ni@Ni_3S_2 (b) the high magnification of nanoflakes (c) SAED images of Ni@Ni_3S_2

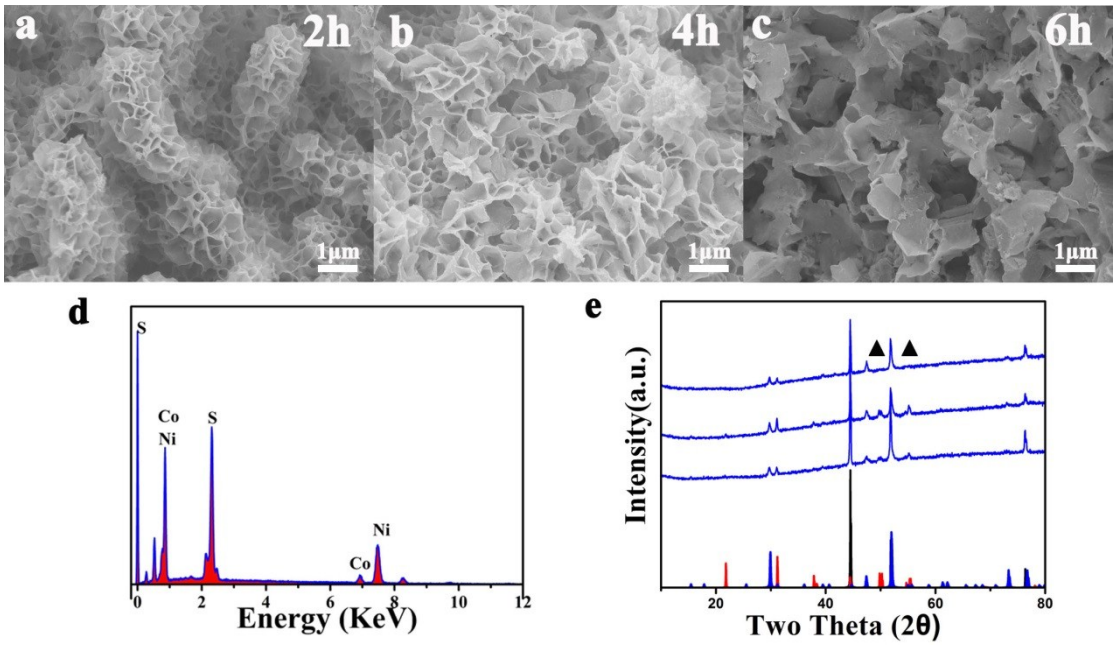

Figure S2. SEM images of Co-exchange progress at different reaction time from (a-c). (d) EDS results at the Co exchange reaction time of 2h. (e) XRD results at different reaction time.

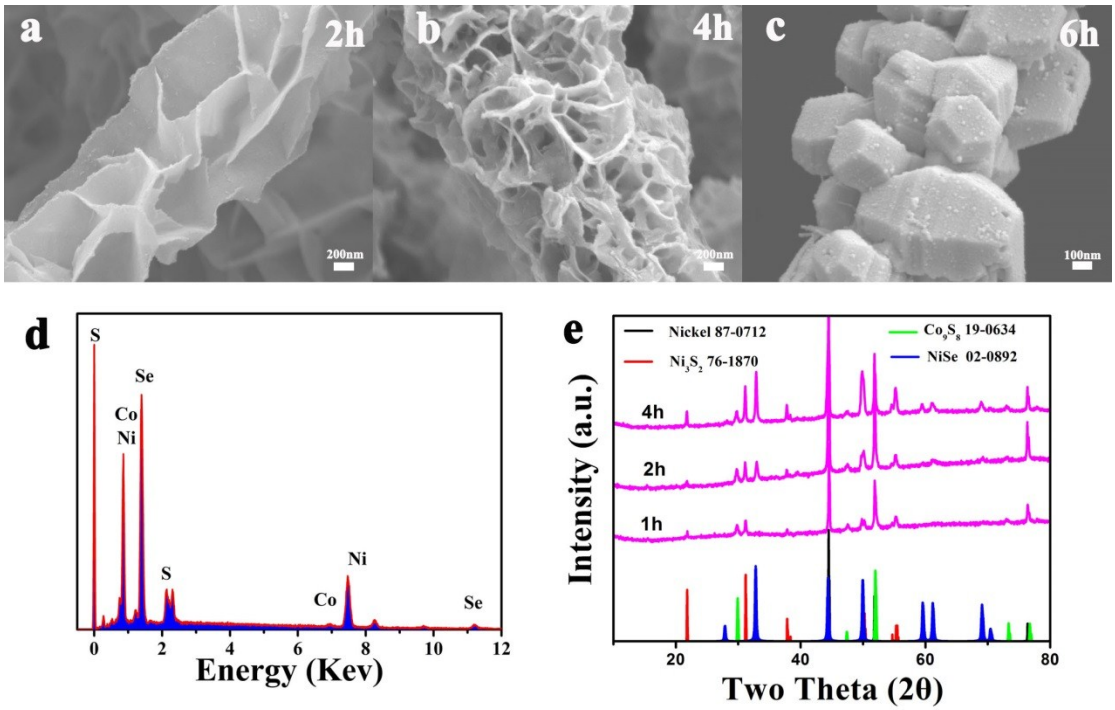

Figure S3. SEM images of Se-exchange progress at different reaction time from (a-c). (d) EDS results at the Se exchange reaction time of 2h. (e) XRD results at different Se exchange reaction time.

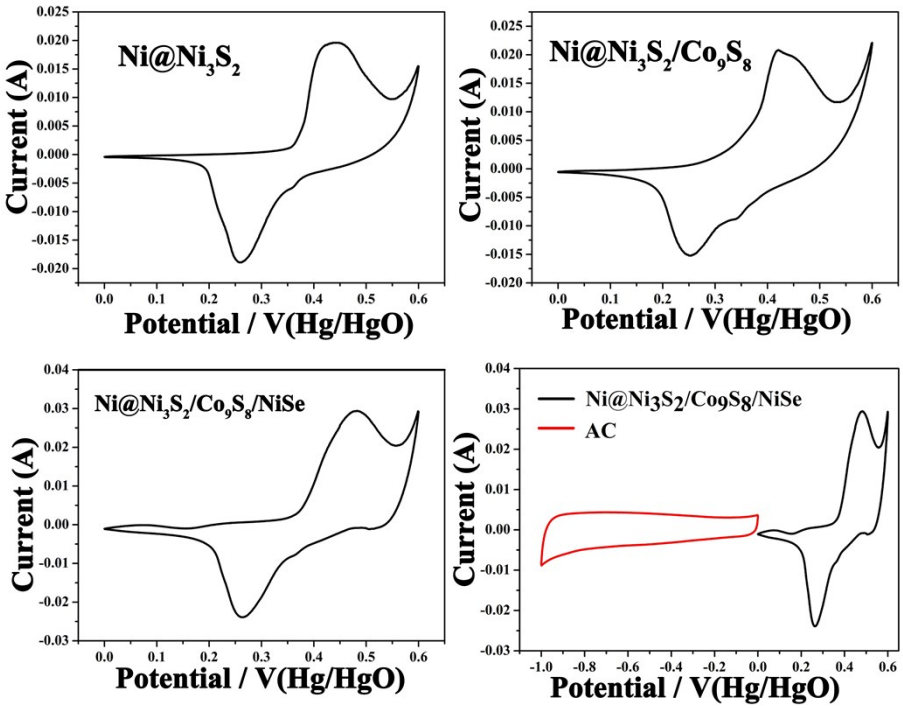

Figure S4. CV curves of (a) $Ni@Ni_3S_2$, (b) $Ni@Ni_3S_2/Co_9S_8$, (c) $Ni@Ni_3S_2/Co_9S_8/NiSe$ at scan rates of 5 mV s^{-1}in a three-electrode (d) CV curves of $Ni@Ni_3S_2/Co_9S_8/NiSe$ and AC electrodes measured at a scan rate of 5 mV s^{-1} in a three-electrode system

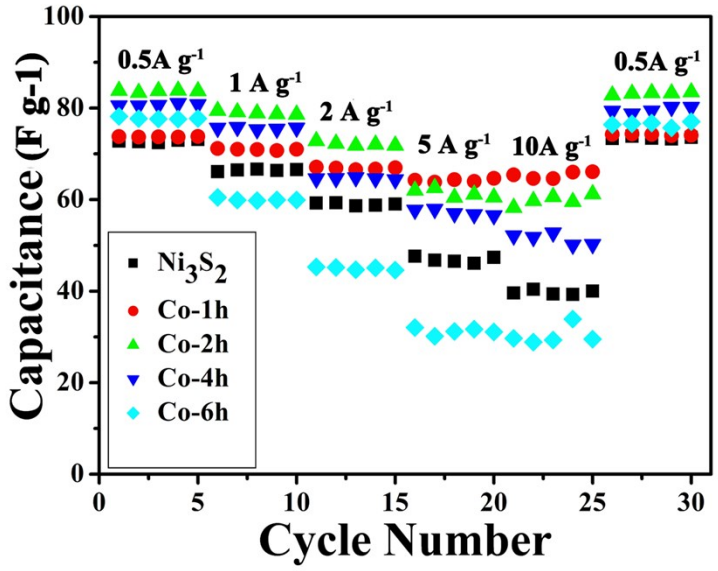

Figure S5. Rate performance of under different reaction time during Co exchange progress at the different current density.

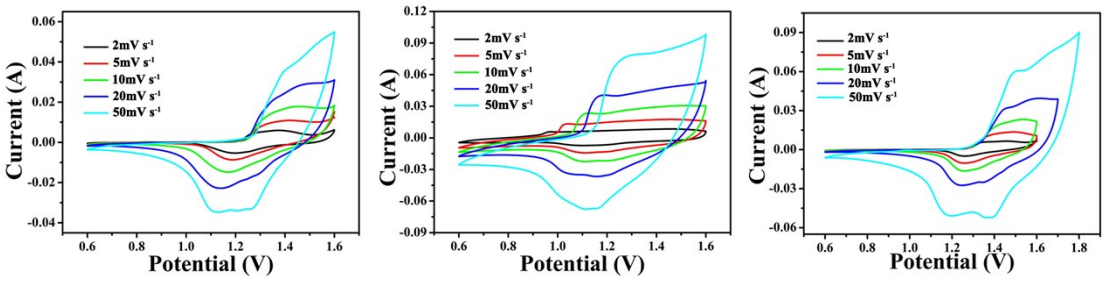

Figure S6. (a) CV curve of Ni@Ni_3S_2 at different scan speed. (b) CV curve of Ni@Ni_3S_2/Co_9S_8 at different scan speed

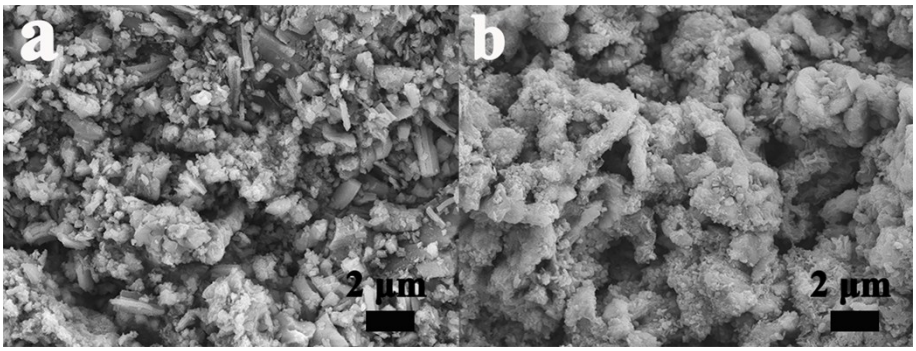

Figure S7. SEM images after 2000th cycles (a) SEM image of Ni@Ni_3S_2 (b) SEM images of Ni@Ni_3S_2/Co_9S_8/NiSe

Table S1: Comparison of related materials about the power density at maximum energy density

Devices	**Energy density**	**Power density**	**Source**
Ni_3S_2//AC	17.5 Wh kg^{-1}	301 W kg^{-1}	*Journal of Power Sources*, 2016, **320**, 13-19.
Ni_3S_2@CoS//AC	28.24 Wh kg^{-1}	134.46 W kg^{-1}	*Phys. Chem. Chem. Phys*., 2015,**17**, 16434-16442.
AB-$NiCo_2S_4$ //AC	24.7 Wh kg^{-1}	428 W kg^{-1}	*Electrochimica Acta*, 2015, **186**, 562-571.
$NiCo_2O_4$//AC	22.8	160	*J. Mater. Chem. A*, 2015, **3**, 12452-12460.
$NiCo_2O_4$@Ni_3S_2//AC	1.89 mW h cm^{-3}	5.81 W cm^{-3}	*Nanoscale*, 2016, **8**, 10686-10694.
Co3S4/NiS//AC	4.18 Wh m^{-2}	160 W m^{-2}	*RSC Adv.*, 2016, **6**, 97482-97490.
$Ni(HCO_3)_2$ //FexCy/C	24.96 Wh kg^{-1}	87.75 W kg^{-1}	*Electrochimica Acta,* 2015, **180**, 330–338.
Ni@Ni_3S_2/Co_9S_8/NiSe //AC	**31.99 Wh kg^{-1}**	**105.10 W kg^{-1}**	**This work**