Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information

$NiSe_2/FeSe_2$ heterostructured nanoparticles supported on rGO for efficient catalyst towards water electrolysis

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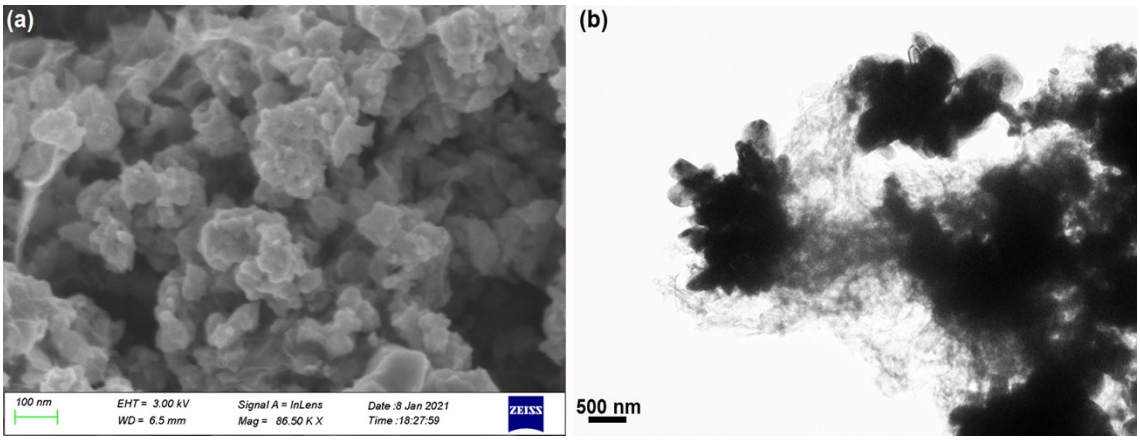

Figure S1. (a) FSEM and (b) TEM images of $FeSe_2$@rGO.

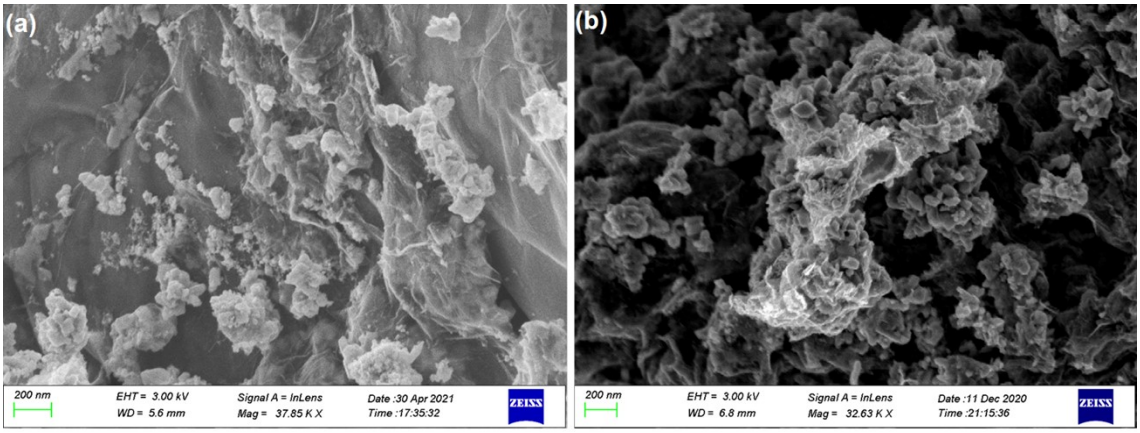

Figure S2. (a,b) FESEM images of $NiSe_2$@$FeSe_2$/rGO-2.

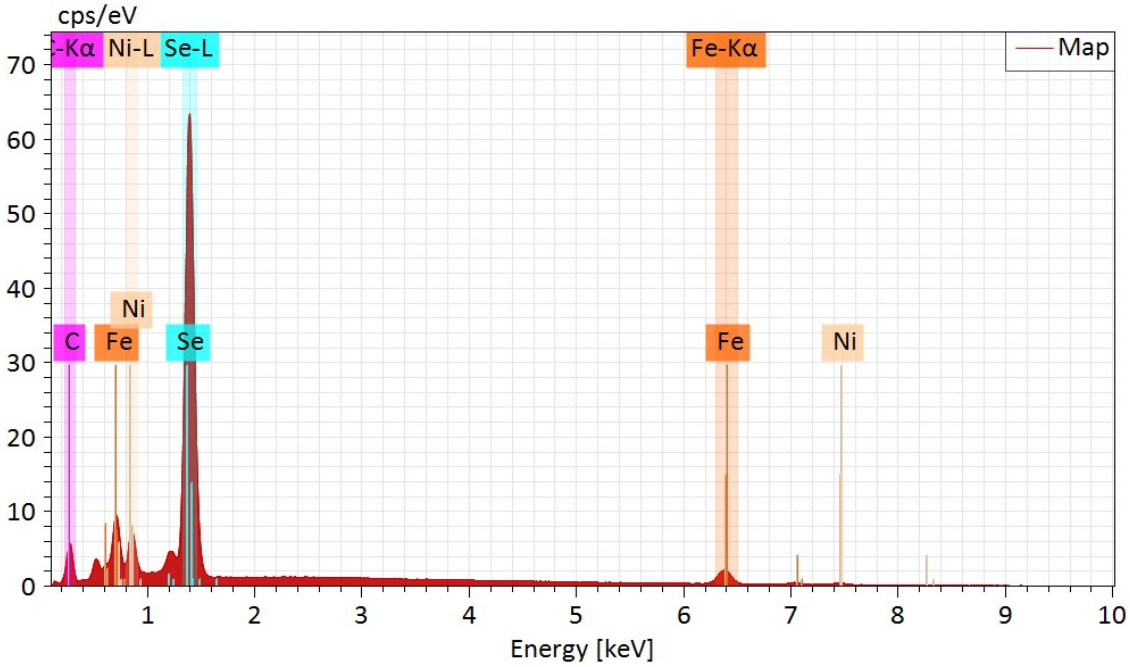

Figure S3. EDX spectrum of $NiSe_2$@$FeSe_2$/rGO-2.

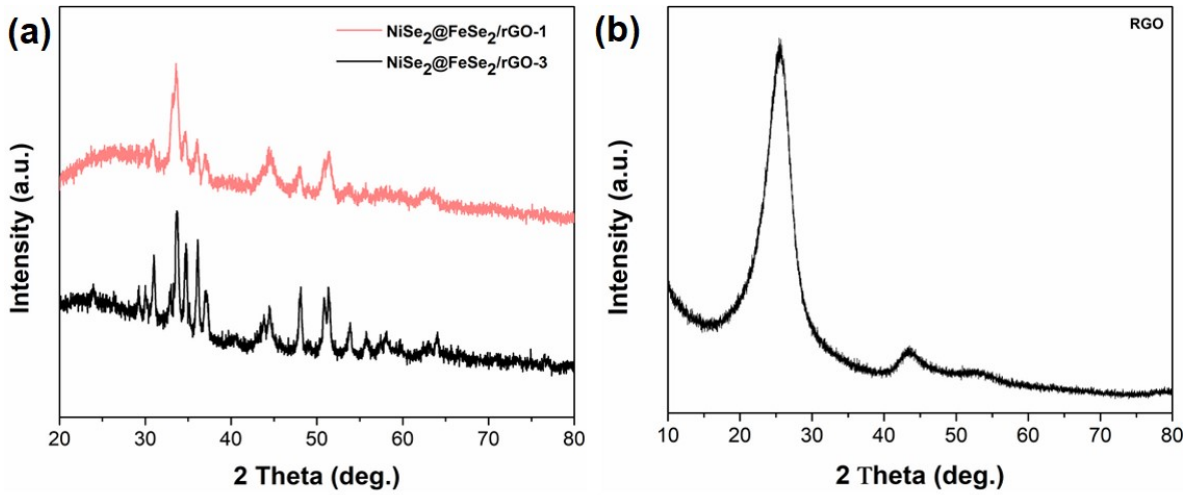

Figure S4. XRD patterns of (a) $NiSe_2$@$FeSe_2$/rGO-1, $NiSe_2$@$FeSe_2$/rGO-3 and (b) rGO.

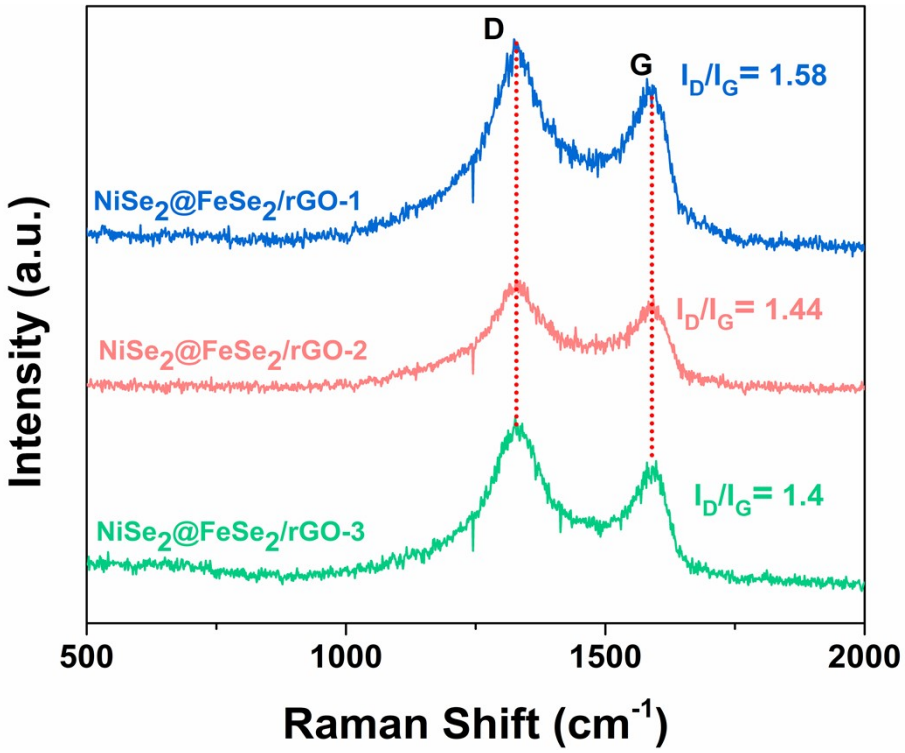

Figure S5. Raman spectra of different samples.

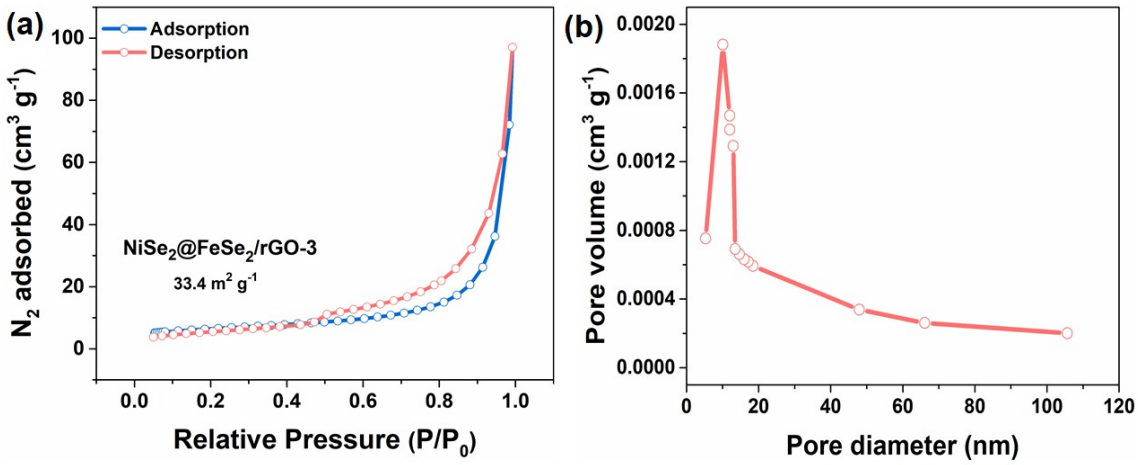

Figure S6. (a) N_2 sorption isotherm and (b) corresponding pore size distribution curve of $NiSe_2$@$FeSe_2$/rGO-3.

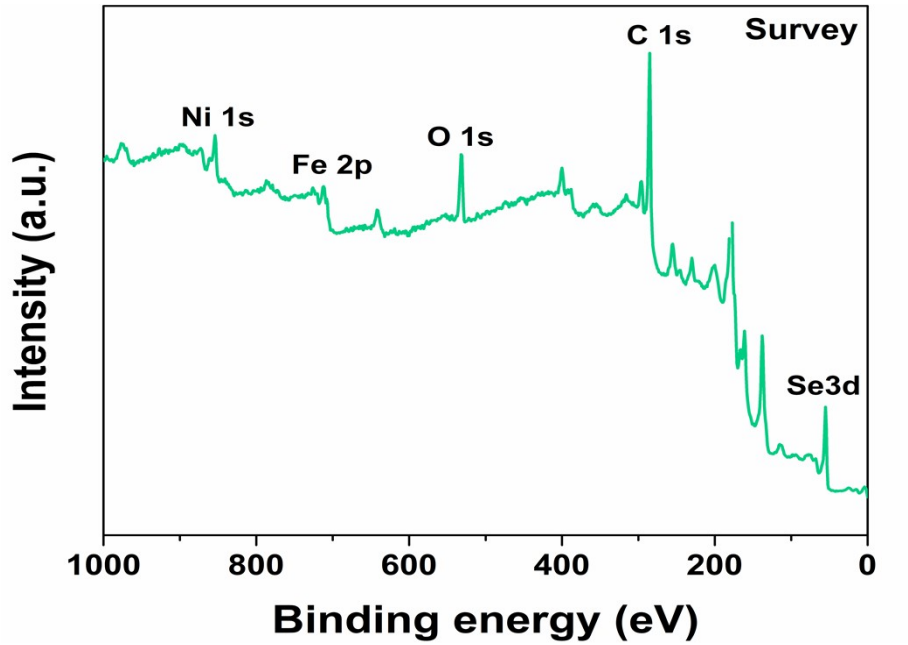

Figure S7. Survey spectrum of $NiSe_2$@$FeSe_2$/rGO-2.

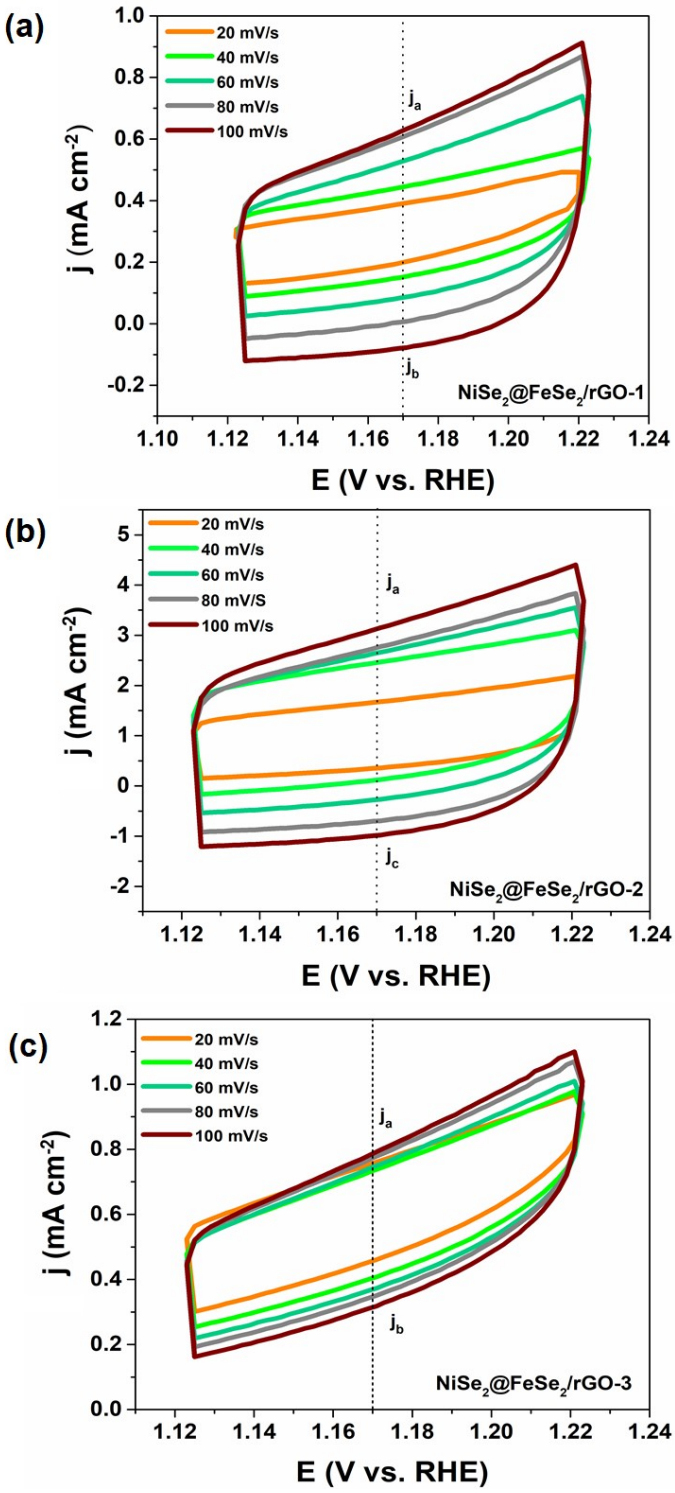

Figure S8. Cyclic voltammogram (CV) curves of (a) $NiSe_2@FeSe_2$/rGO-1 (b) $NiSe_2@FeSe_2$/rGO-2 and (c) $NiSe_2@FeSe_2$/rGO-3。

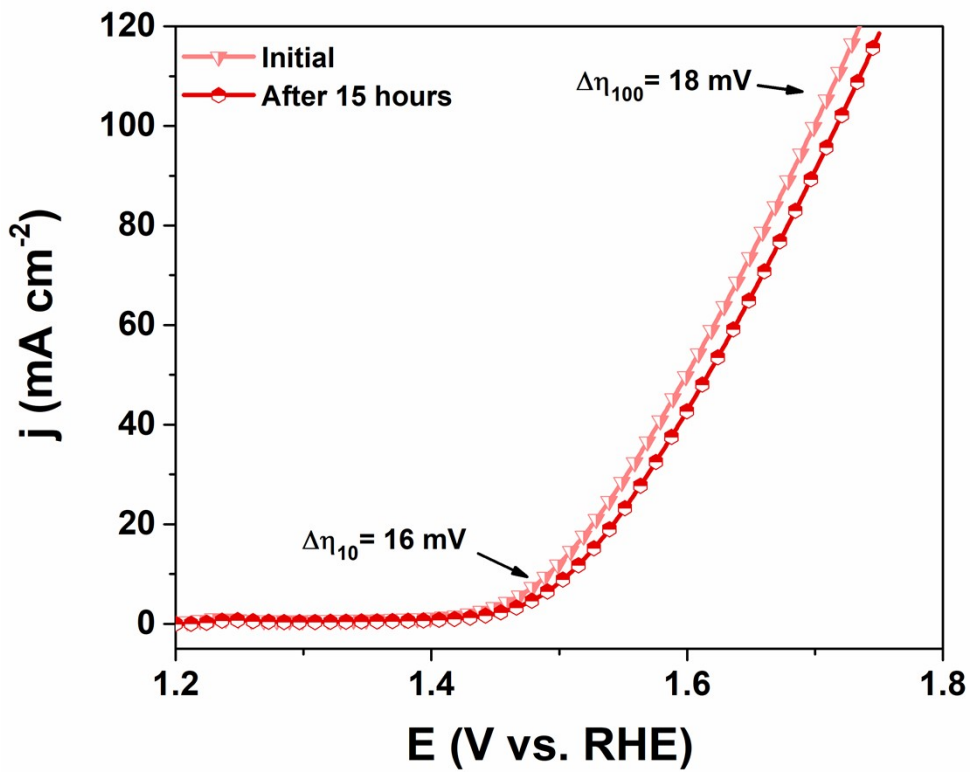

Figure S9. LSV curves of $NiSe_2$@$FeSe_2$/rGO-2 before and after chronoamperometric (i-t) measurements for OER.

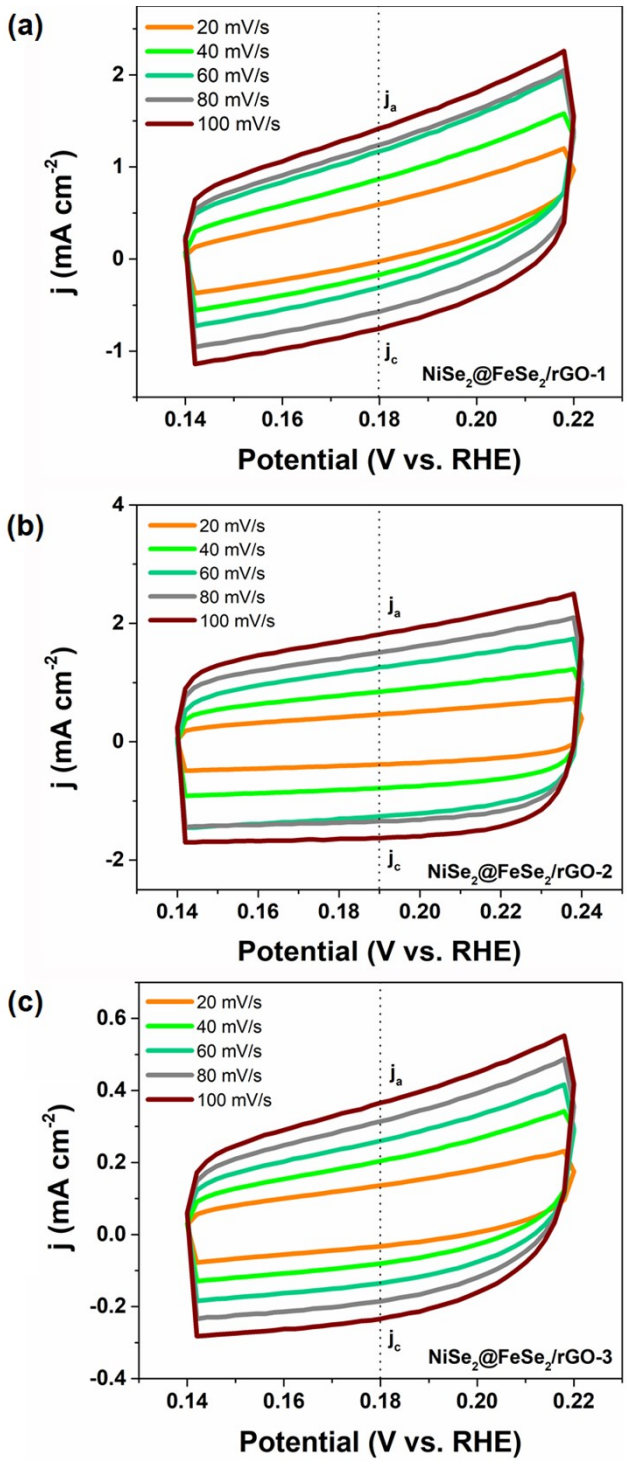

Figure S10. Cyclic voltammogram curves of (a) $NiSe_2$@$FeSe_2$/rGO-1 (b) $NiSe_2$@$FeSe_2$/rGO-3 and (c) $NiSe_2$@$FeSe_2$/rGO-2.

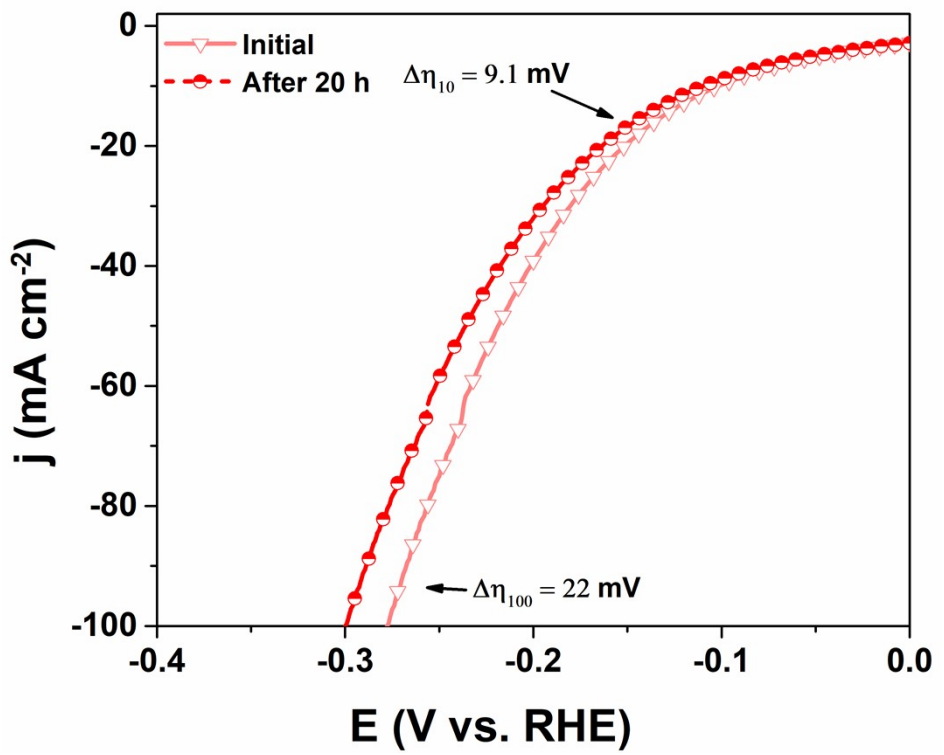

Figure S11. LSV curves of of $NiSe_2$@$FeSe_2$/rGO-2 recorded before and after chronoamperometric (i-t) measurements for HER.

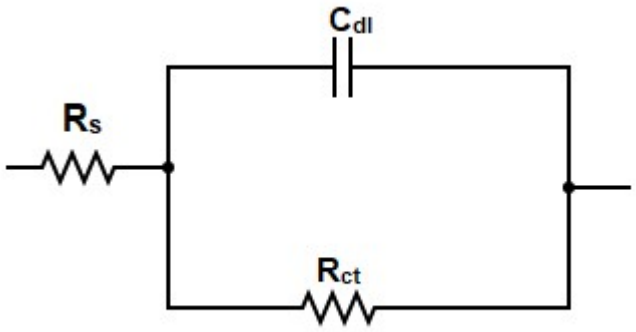

Figure S12. Equivalent circuit employed to calculate R_{ct}.

Table S1. Comparison of OER performances with previously reported catalysts.

Catalysts	Current density j (mA cm^{-2})	Overpotential η (mV)	Refs.
$NiSe_2$@$FeSe_2$/rGO	10	260	**This work**
$Ni_{0.85}Se$/GS	10	302	[S1]
Ti@$Ni_{0.85}Se$	30	270	[S2]
NiSe-$Ni_{0.85}Se$/CP	10	300	[S3]
$FeNi_3$@NC	10	277	[S4]
$Co_{0.95}Cr_{0.05}Fe_2O_4$	10	293.3	[S5]
Co_3O_4	10	297	[S6]
NiSe@NiOOH/NF	50	332	[S7]
$NiCo_2S_4$/RGO	10	366	[S8]
Co-Mo-B	10	320	[S9]
β-$Ni(OH)_2$	10	340	[S10]
$Fe_{0.08}Ni_{0.77}Se$	10	245	[S11]

Table S2. Comparison of HER performances with previously reported catalysts.

Catalysts	Current density j (mA cm^{-2})	Overpotential η (mV)	Refs.
$NiSe_2$@$FeSe_2$/rGO	10	101	**This work**
$Ni_{0.85}Se$/GS	10	200	[S1]
Ti@$Ni_{0.85}Se$	30	120	[S2]
NiSe-$Ni_{0.85}Se$/CP	10	101	[S3]
$Fe_{0.08}Ni_{0.77}Se/CNT_3$	10	108	[S11]
Ni_2Fe_2N/Ni_3Fe	10	74	[S12]
SnS_2-MoS_2	10	240	[S13]
2D i-WC–G	10	120	[S14]
Co@CNF	10	196	[S15]
Ni1Co1-P	10	169	[S16]
Mo_2C@NC@MoS_X	10	249	[S17]

Table S3 Comparison of overall watersplitting performances with previously reported catalysts.

catalysts	current density j (mA cm^{-2})	overall water splitting performance (V)	Refs.
$NiSe_2$@$FeSe_2$/rGO	10	1.57	**This work**
$Ni_{0.85}Se$/GS	10	1.7	[S1]
Ti@$Ni_{0.85}Se$	10	1.66	[S2]
NiSe-$Ni_{0.85}Se$/CP	10	1.62	[S3]
$Fe_{0.08}Ni_{0.77}Se/CNT_3$	10	1.53	[S11]
$NiMoP_2$	10	1.5	[S18]
NiS/Ni_2P/CC	10	1.67	[S19]
α-$Co(OH)_2$	10	1.72	[S20]
α-NiOOH	10	1.66	[S21]
Ni-Fe-P	10	1.486	[S22]
MoO_2	30	1.65	[S23]

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