Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Rapidly Engineering the Electronic Property and Morphological Structure of NiSe Nanowires for Oxygen Evolution Reaction

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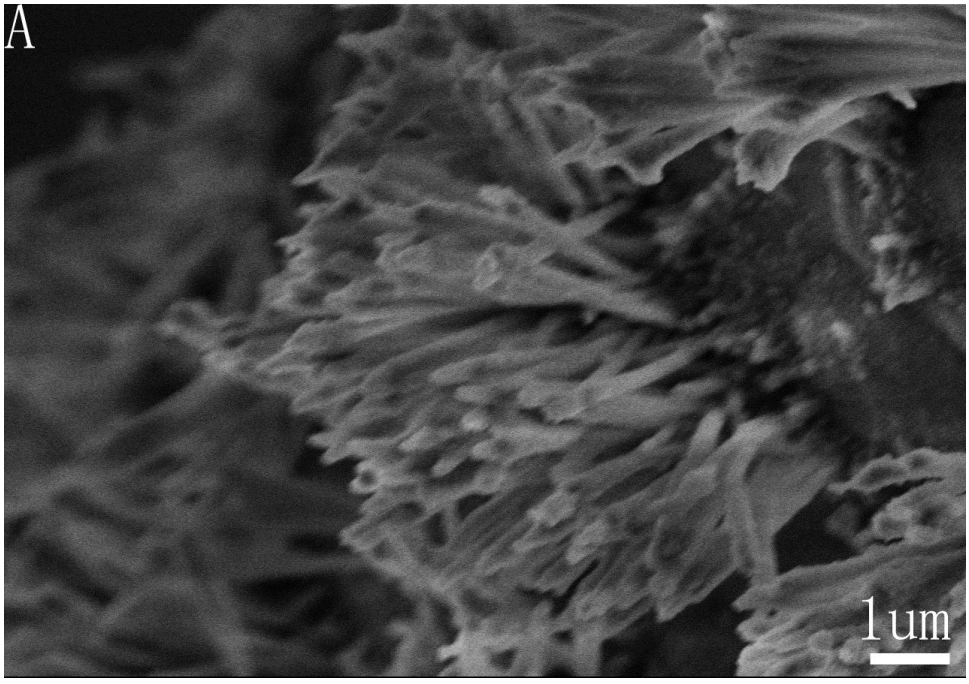

Figure S1. A) The SEM image of NiSe/NF.

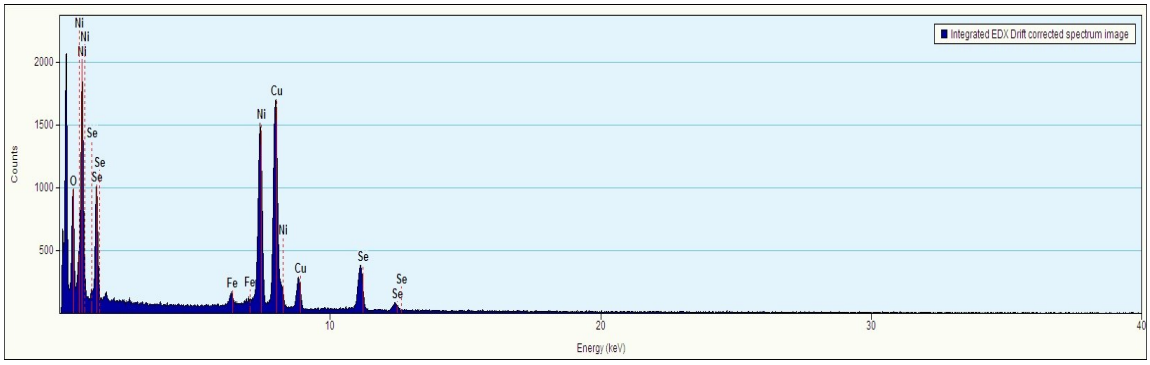

Figure S2. EDX profiles of $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF.

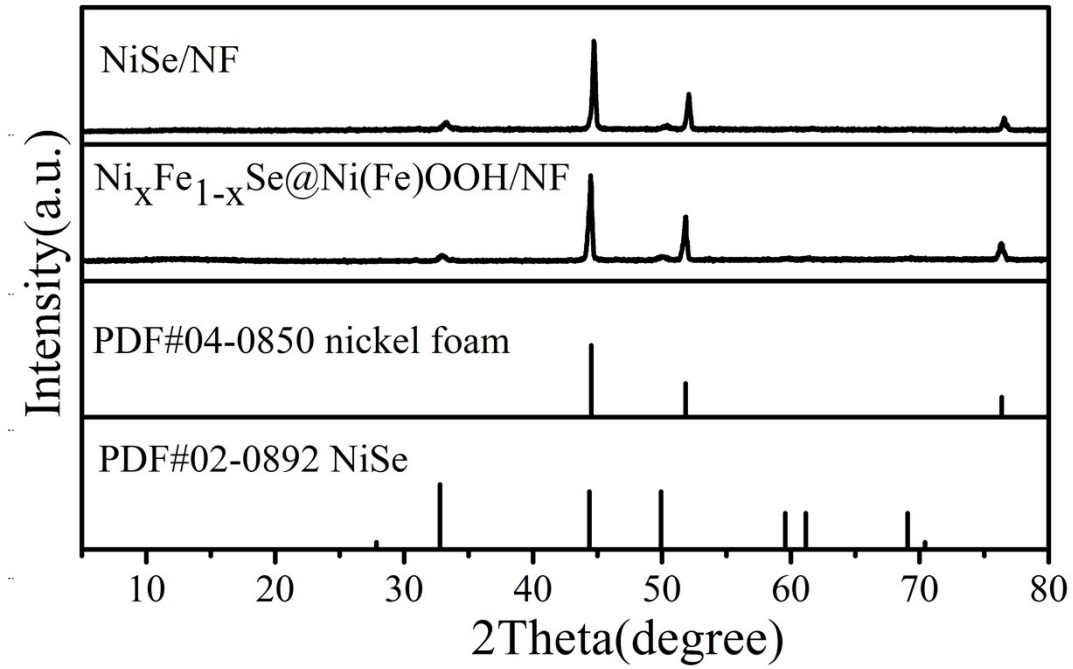

Figure S3. XRD patterns of NiSe/NF and $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF.

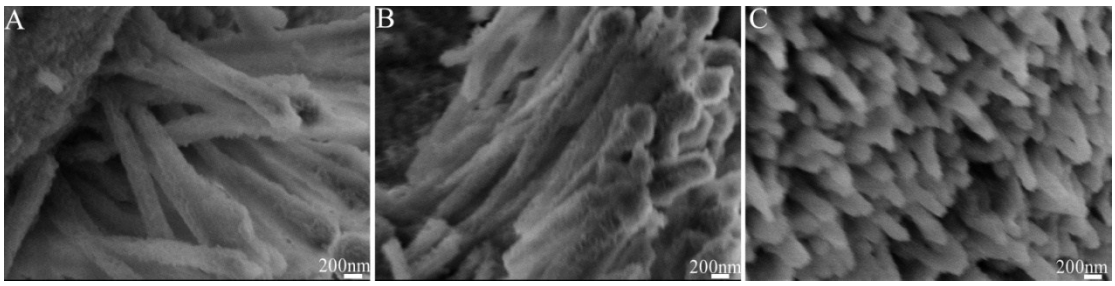

Figure S4. The SEM image of A) NiSe/NF, B) NiSe/NF reaction with water and C) NiSe/NF reaction with $CoCl_2 \cdot 6H_2O$.

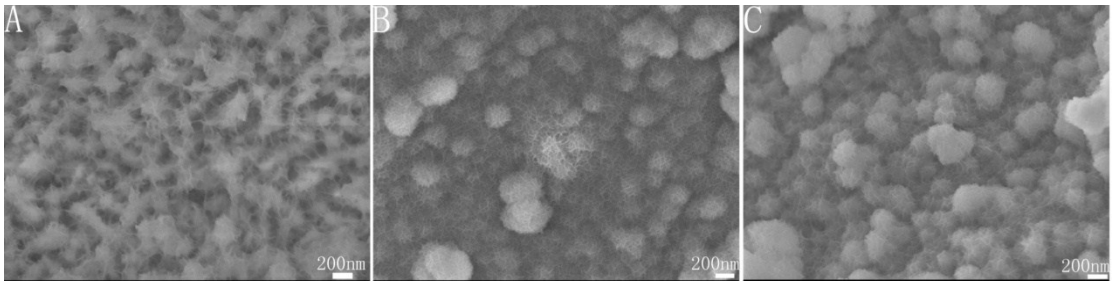

Figure S5. The SEM image of $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF with different reaction time. A)10s, B)30s and C)50s.

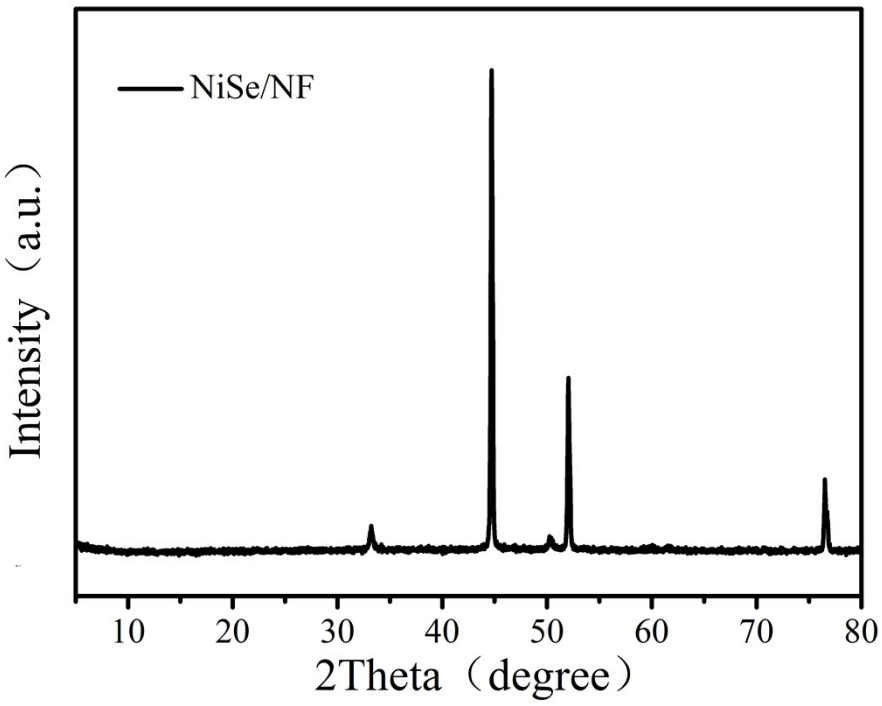

Figure S6. XRD patterns of NiSe/NF reaction with $CoCl_2$.

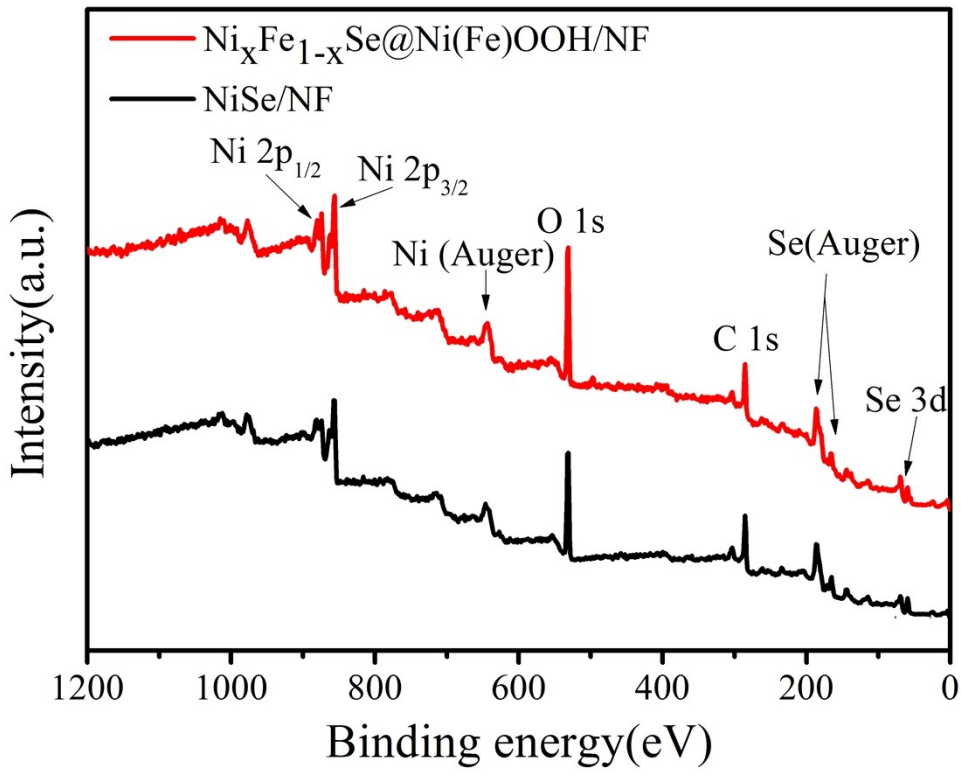

Figure S7. XPS survey spectrum for NiSe/NF and $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF

Atomic % / Electrocatalyst	C1s	O1s	Se3d	Ni2p	Fe2p1
NiSe/NF	38.83	36.06	7.54	17.56	
$Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF	31.62	40.4	9.88	16.89	1.21

Figure S8. Atomic% of elements of NiSe/NF and $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF

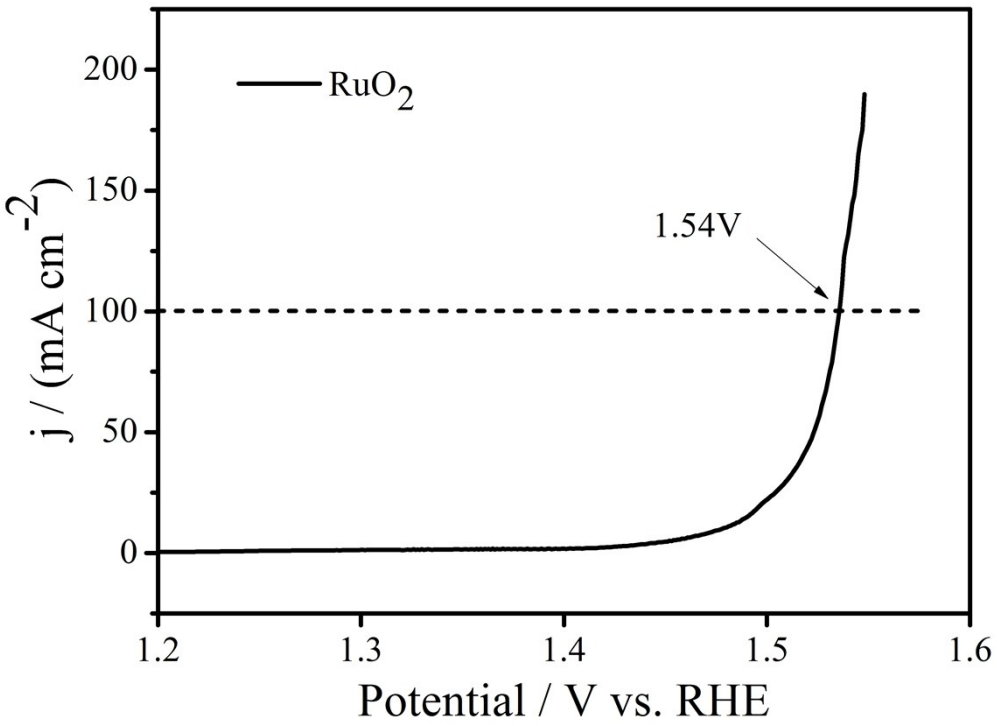

Figure S9. LSV curve for OER of commercial RuO_2 on nickel foam with the same loading.

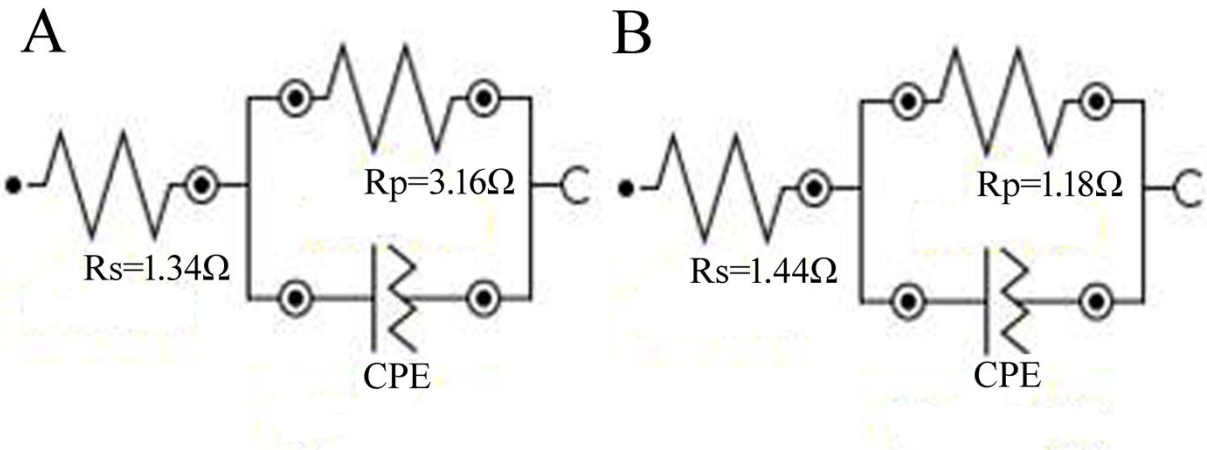

Figure S10. Electrochemical impedance spectroscopy (EIS) fitting results for A) NiSe/NFand B) $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/N (Rs: the series resistance including the solution resistance etc; Rp: charge-transfer resistance; CPE: constant-phase element.)

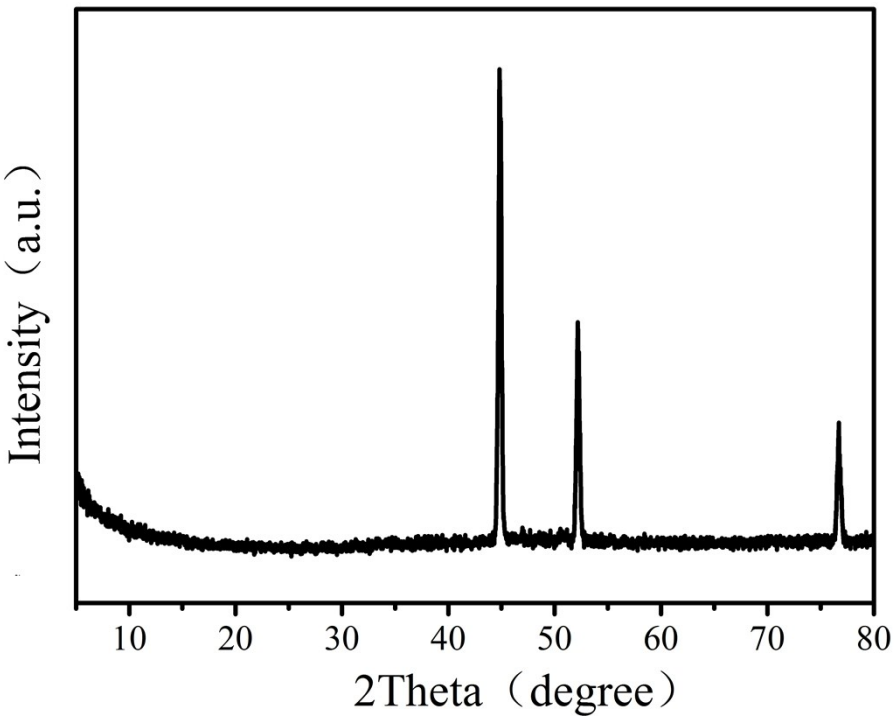

Figure S11. XRD patterns of NiSe/NF after the electrochemical stability measurements.

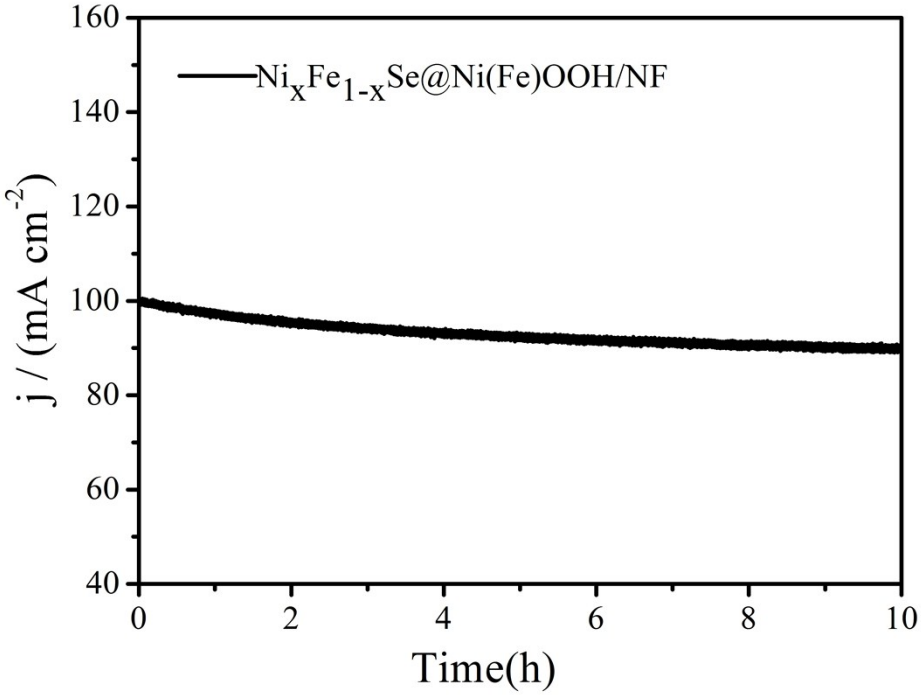

Figure S12. Amperometric i-t curve of $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF for OER at current density of 100mA cm^{-2}

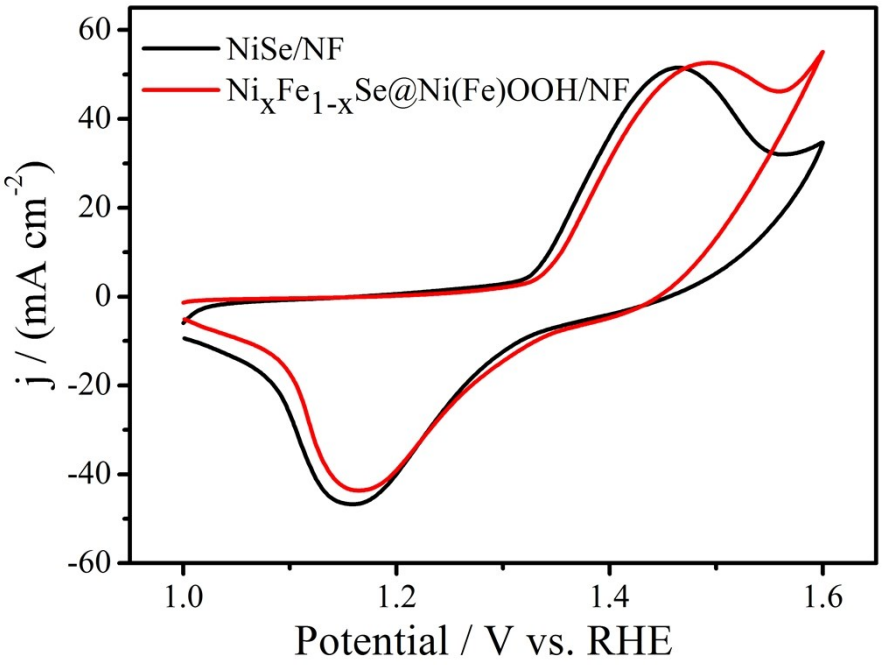

Figure S13. CV curves of NiSe/NF and $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF at the 2mV from -0.55V to 0.55V.

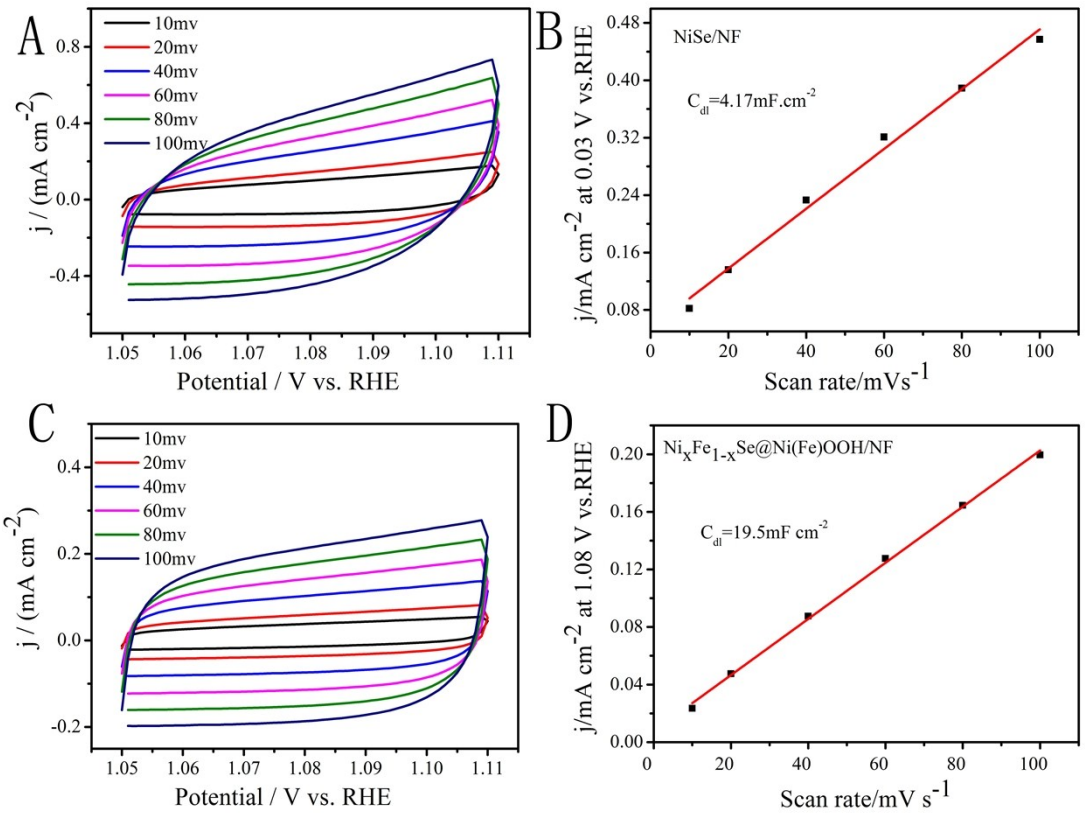

Figure S14. Cyclic voltammetry curves of A) NiSe/NF and C) $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF. The capacitive current measured at 1.08V vsRHE was plotted as a function of scan rate B) NiSe/NF and D) $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF.

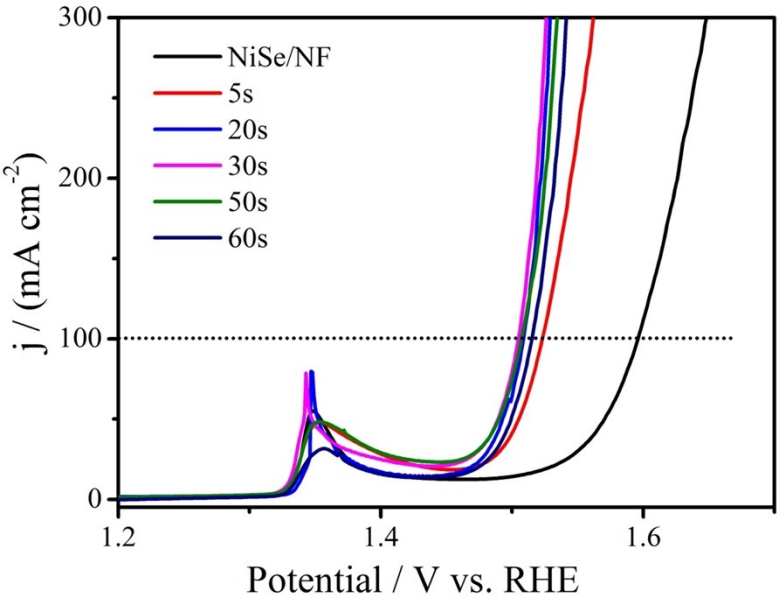

Figure S15.LSV curves for OER of NiSe/NF and $Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF with different reaction time.

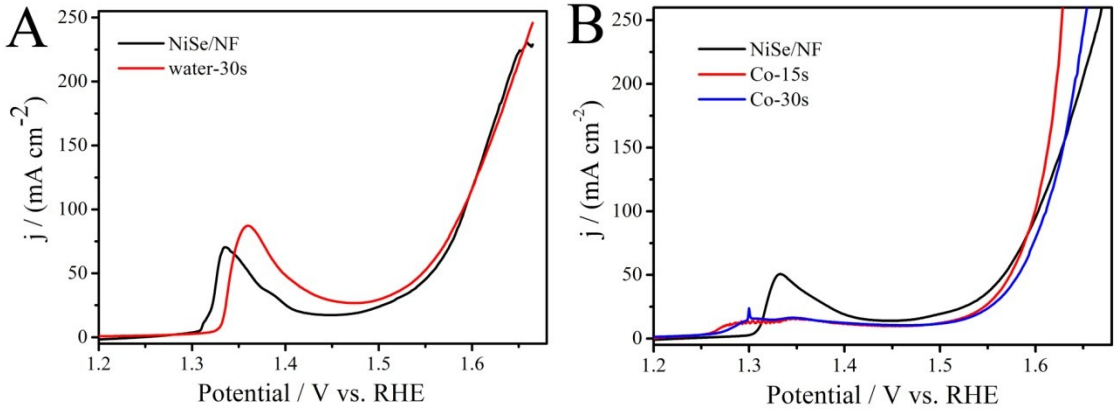

Figure S16. LSV curves for OER of NiSe/NF and NiSe/NF reaction with A) water and B) $CoCl_2$ aqueous solution.

Table S1. Comparison of OER activity of the NiSe/NF with recently reported catalyst.

Electrocatalyst	Electrolyte solution	Current density (mA cm^{-1})	Overpotential at the corresponding density (mA cm^{-1})	Tafel slope	Reference
$Ni_xFe_{1-x}Se$@Ni(Fe)OOH/NF	1M KOH	50	230	58	This work
		100	260		
NiSe/NF	1M KOH	20	270	64	Ref.S1
Co_1Mn_1CH/NF	1M KOH	30	294	-	Ref.S2
Fe-NiSe/FeNi foam	1M KOH	50	245	65	Ref.S3
NiSe-NiO_x/NF	1M KOH	10	243	128	Ref.S4
NiFe LDH/NF	1M KOH	10	240	-	Ref.S5
$FeSe_2$/NF	1M KOH	10	245	-	Ref.S6
Fe-CoOOH/G	1M KOH	10	330	37	Ref.S7
FeOOH/CeO_2 HLNTs-NF	1M KOH	31.3	250	92.3	Ref.S8
3D GN/CoAl-NS	1M KOH	10	252	36	Ref.S9
Co-B_i NS/G	1M KOH	10	290	53	Ref.S10

Reference

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