

## Supporting Information

### **NiFe-LDH coated NiSe/Ni foam as a bifunctional electrocatalyst for overall water splitting**

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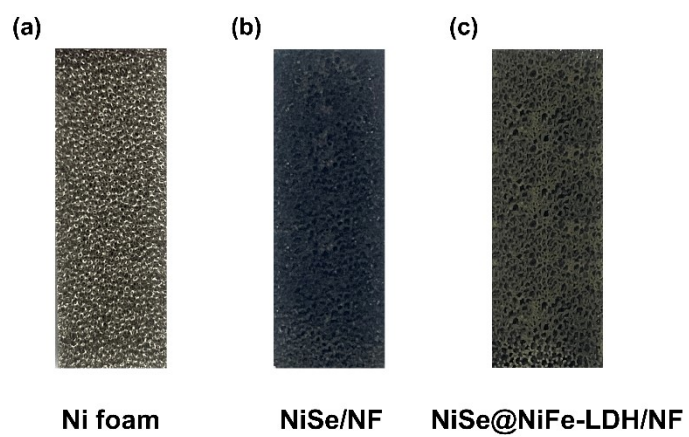


Fig. S1 Digital photos of (a) NF, (b) NiSe/NF, (c) NiSe@NiFe-LDH/NF

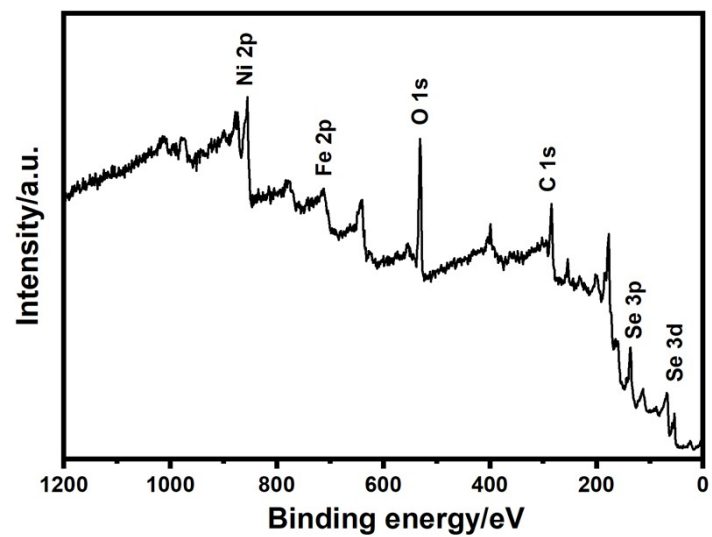


Fig. S2 XPS full spectrum of NiSe@NiFe-LDH/NF

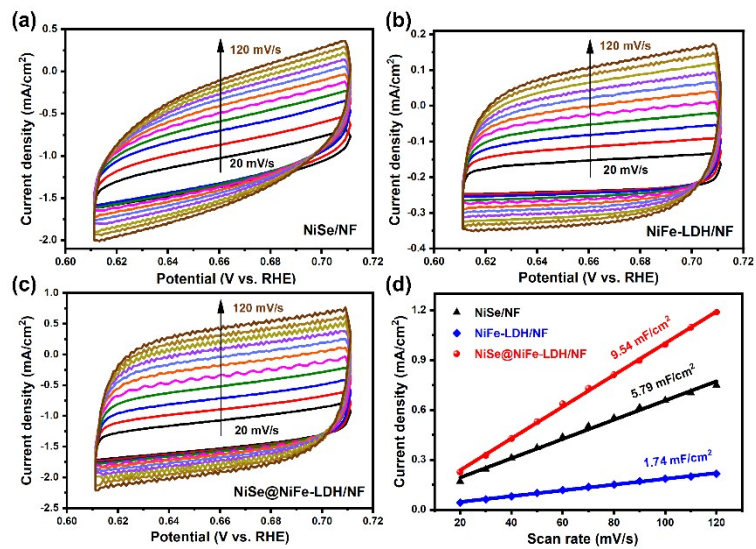


Fig. S3 CV curves at scan rates of 20, 30, 40, 50, 60, 70, 80, 90, 100, 110 and 120 mV·s<sup>-1</sup> of (a) NiSe/NF, (b) NiFe-LDH/NF and NiSe@NiFe-LDH/NF. (d) C<sub>dl</sub> of NiSe/NF, NiFe-LDH/NF and NiSe@NiFe-LDH/NF.

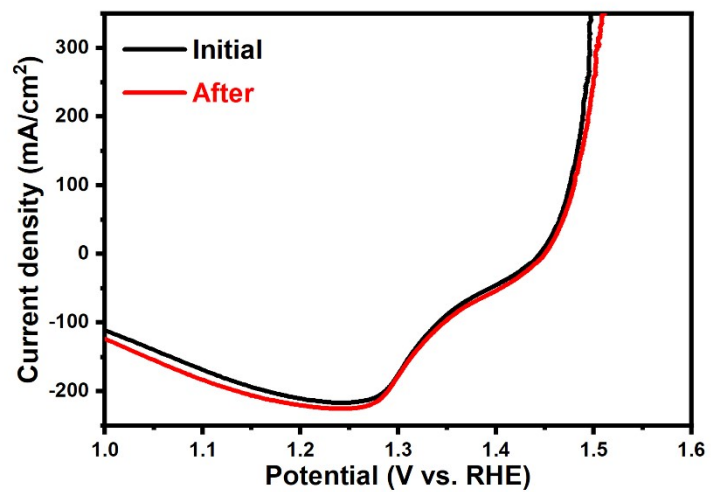


Fig. S4 CV curves of NiSe@NiFe-LDH/NF before and after stability testing for OER.

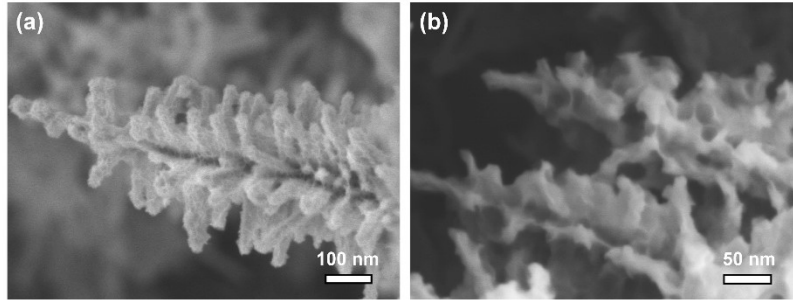


Fig. S5 SEM images of NiSe@NiFe-LDH/NF (a) before and (b) after stability test for OER.

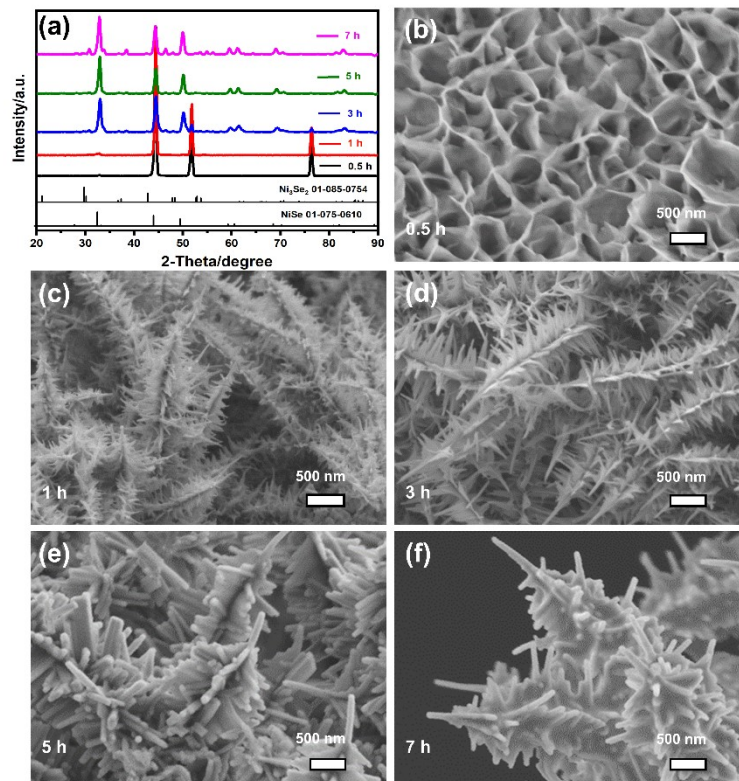


Fig. S6 (a) XRD patterns and (b-f) SEM images of NiSe/NF at different reaction times

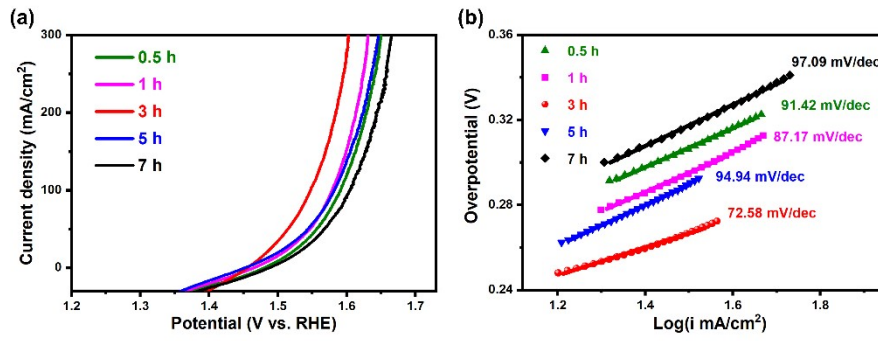


Fig. S7 (a) CV curves and (b) Tafel plots of NiSe/NF at different reaction times



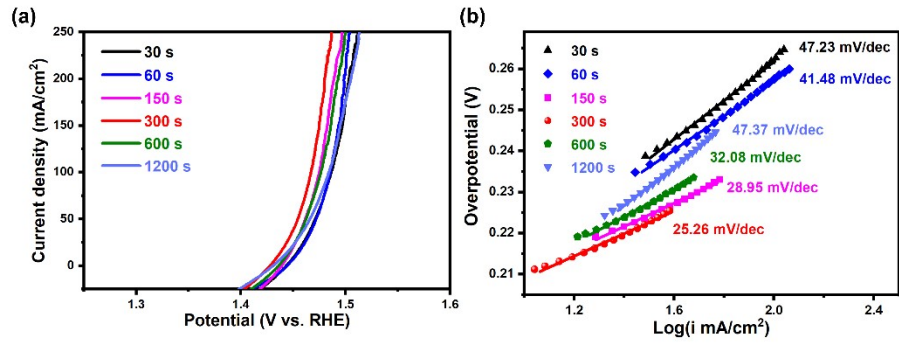


Fig. S8 (a) CV curves and (b) Tafel plots of NiSe@NiFe-LDH/NF at different electrodeposition time.

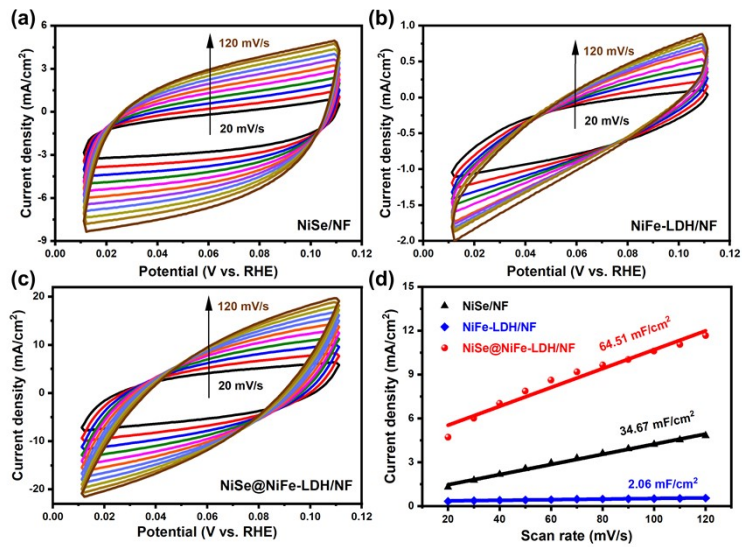


Fig. S9 CV curves at scan rates of 20, 30, 40, 50, 60, 70, 80, 90, 100, 110 and 120  $\text{mV}\cdot\text{s}^{-1}$  of (a) NiSe/NF, (b) NiFe-LDH/NF and NiSe@NiFe-LDH/NF. (d)  $C_{dl}$  of NiSe/NF, NiFe-LDH/NF and NiSe@NiFe-LDH/NF.

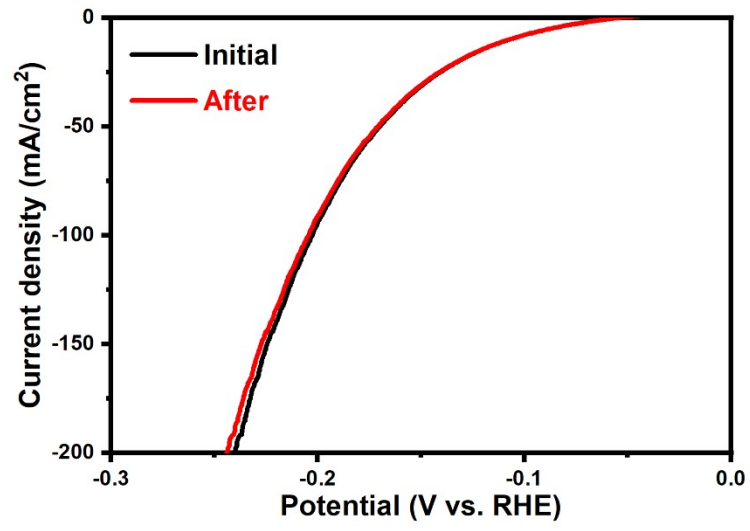


Fig. S10 CV curves of NiSe@NiFe-LDH/NF before and after stability testing for HER.

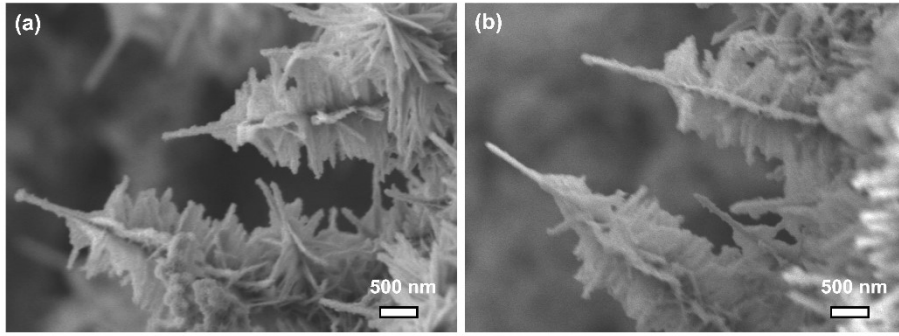


Fig. S11 SEM images of NiSe@NiFe-LDH/NF (a) before and (b) after stability test for HER.

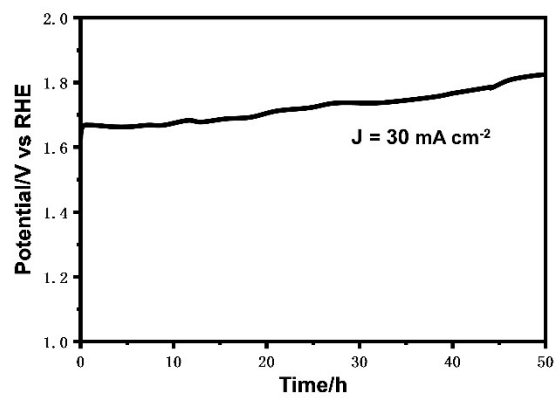


Fig. S12 Chronoamperometric durability test recorded for NiSe /NF//NiSe /NF pairs.

**Table. S1** Comparison of the electrocatalytic performance of NiSe@NiFe-LDH/NF with other recently reported catalysts

Electrocatalysts	Electrolyte	$\eta_{\text{OER}}$ (mV)@ j (mA cm <sup>-2</sup> )	$\eta_{\text{HER}}$ (mV)@ j (mA cm <sup>-2</sup> )	Potential (V) @ j (mA cm <sup>-2</sup> )	Reference
NiFe-LDH@NiCoP/NF	1 M KOH	220@10	120 @ 10	1.57 @ 10	1
Ni <sub>3</sub> Se <sub>2</sub> /NF	1 M KOH	353 @100	203@10 279 @100	1.612 @ 10	2
(Ni, Fe)Se@NiFe-LDH/NF	1 M KOH	253@100			3
Co <sub>9</sub> S <sub>8</sub> @NiCo-LDH/NF	1 M KOH	168@10	278@30	1.63@10	4
NiFe-LDH@Mo-NiS-NiS <sub>2</sub> /NF	1 M KOH	261@50	120@10	1.63@10	5
FeNi@FeNi/NF	1 M KOH	193@10; 231@20; 306@50	127@10, 173@20, and 253@50	1.652@10, 1.73@10	6
Ni <sub>3</sub> S <sub>2</sub> @Cu-NiCo-LDH/NF	1 M KOH	119@10; 218@100	156@10, 304@100	1.75@100	7
H-CoS <sub>x</sub> @NiFe-LDH/NF	1 M KOH	95@10	250@10	1.98@300	8
MoNi/NiMoOx@NiFe LDH	1 M KOH	278@100	134@100	1.64@100	9
Ni(OH) <sub>2</sub> -Ni <sup>iv</sup> acFe-LDHs/NF	1 M KOH	330@100	116@10	1.582@100	10
NiSe@NiFe-LDH/NF	1 M KOH	209@10; 241@100	93@10, 213@100	1.570@10	This work

## Reference

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