

## Supporting Information

### **Tentacles-like Core–Shell CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub> Bifunctional Electrocatalyst for Efficient Overall Alkaline Water Splitting**

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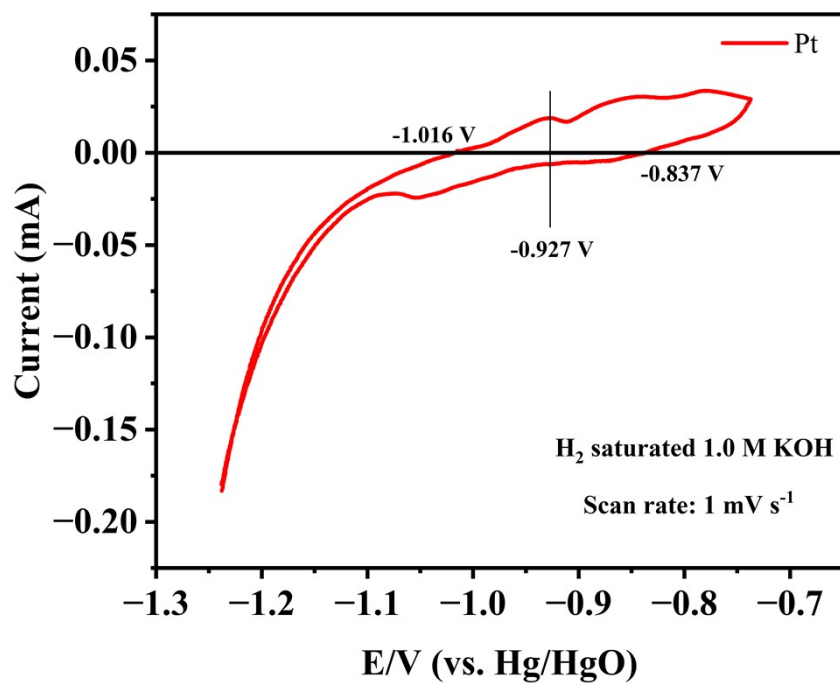
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China.*

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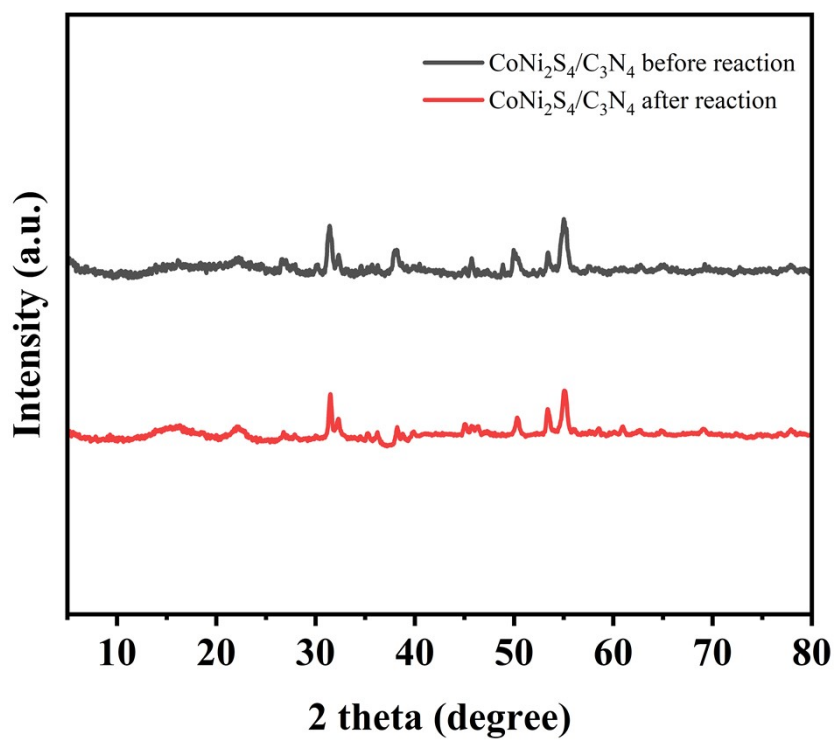
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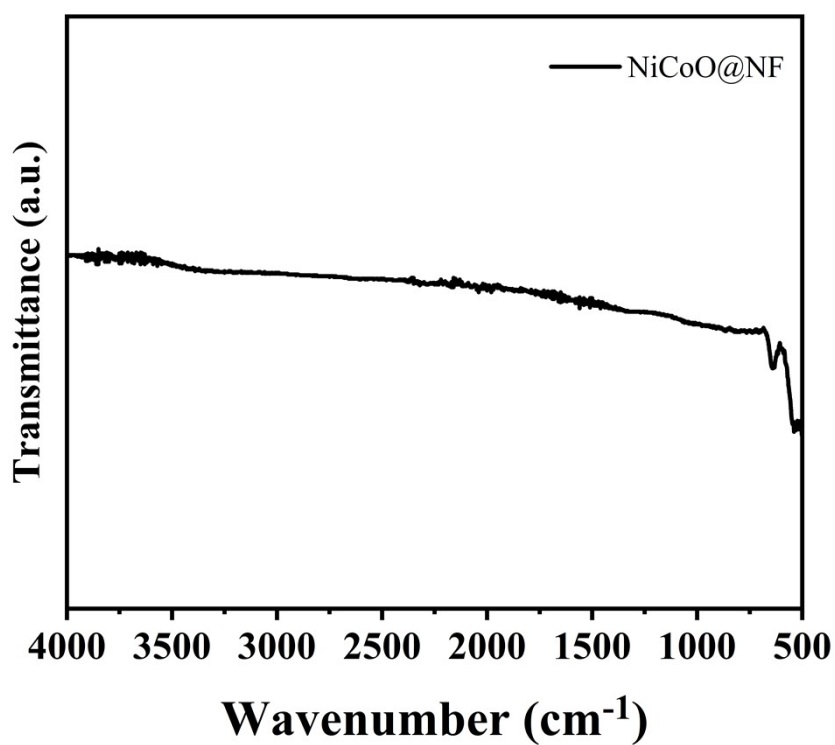
Figures and table



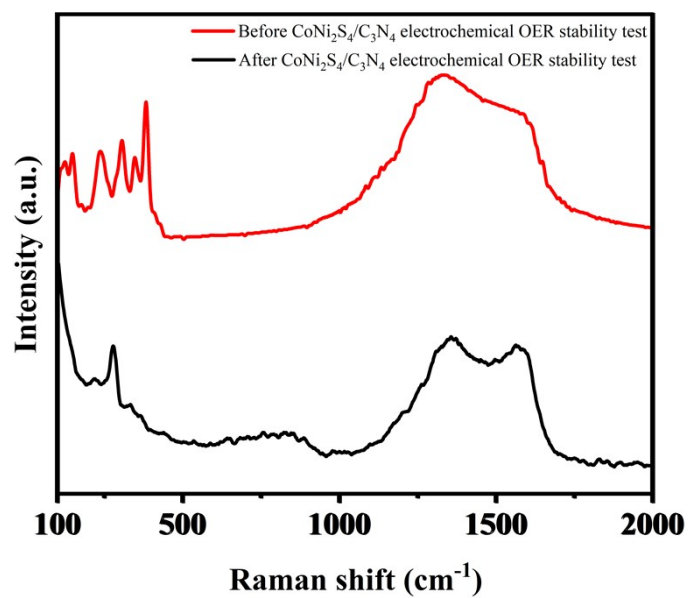
**Fig S1.** The CV curve at a scan rate of 1 mV s<sup>-1</sup> in in hydrogen-saturated 1.0 M KOH.



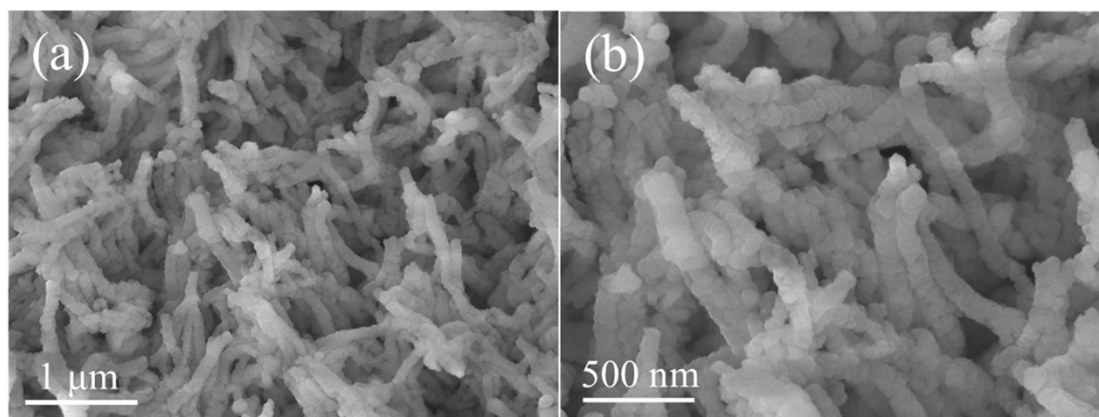
**Fig S2.** XRD characteristic peaks of CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub> before and after reaction.



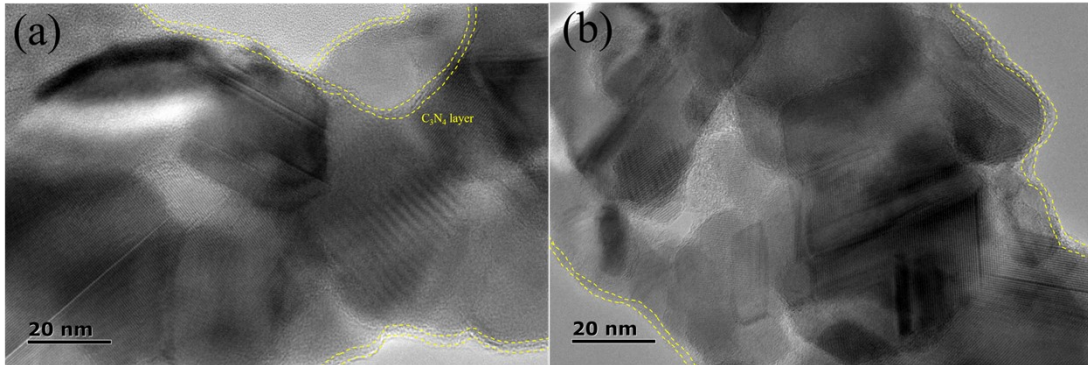
**Fig S3.** FT-IR spectrum of NiCoO@NF



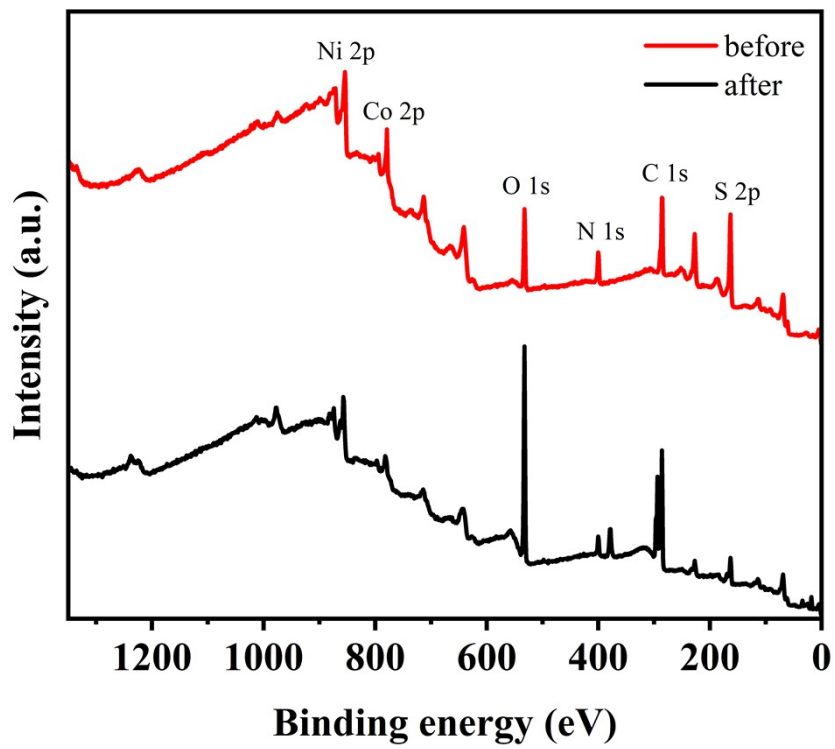
**Fig S4.** Raman spectra of CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub> after OER stability test.



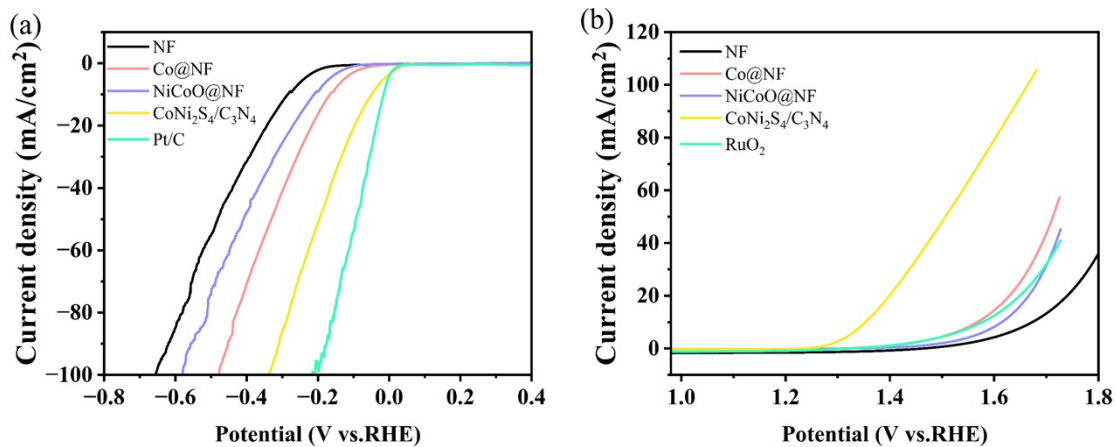
**Fig S5.** (a, b) The SEM images of CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub> material after cycling test.



**Fig S6.** TEM images of  $\text{CoNi}_2\text{S}_4/\text{C}_3\text{N}_4$ .

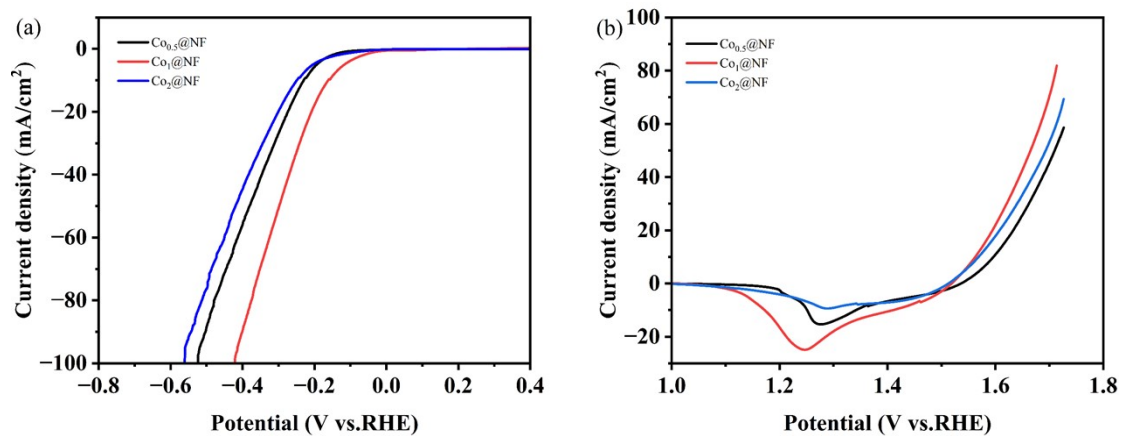


**Fig S7.** The XPS full spectra of  $\text{CoNi}_2\text{S}_4/\text{C}_3\text{N}_4$  materials before and after reaction.



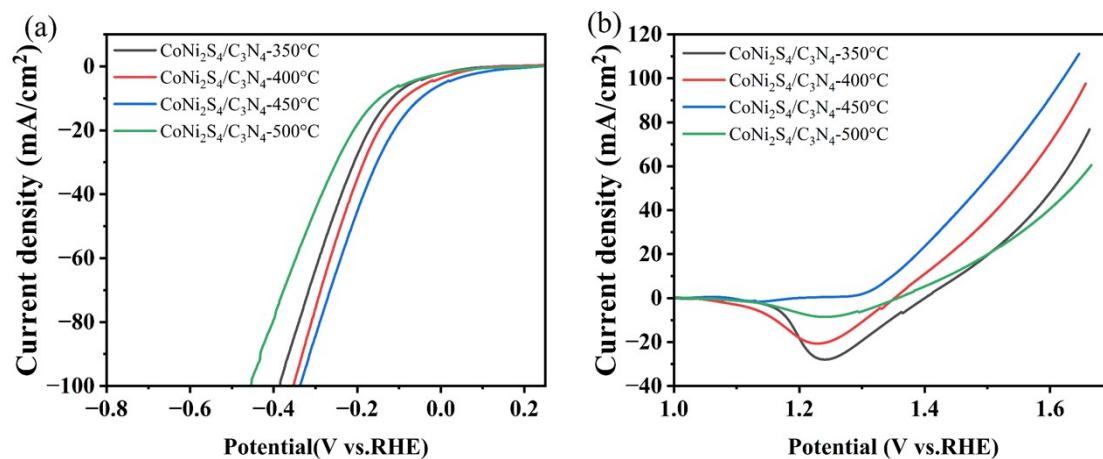
**Fig S8.** LSV performance curves (without IR compensation): (a) HER curves, (b)

OER curves.



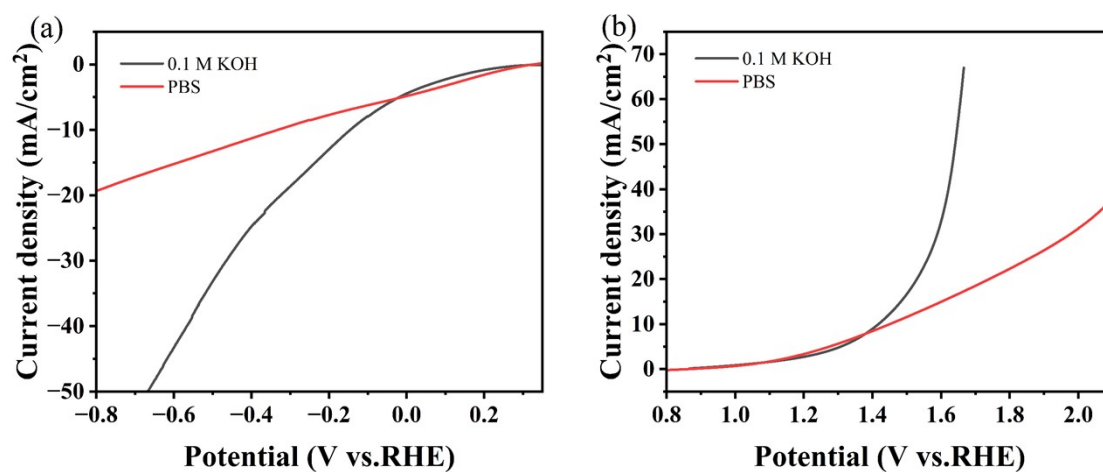
**Fig S9.** Performance of Co@NF LSVs with different Co contents: (a) HER curves, (b)

OER curves.

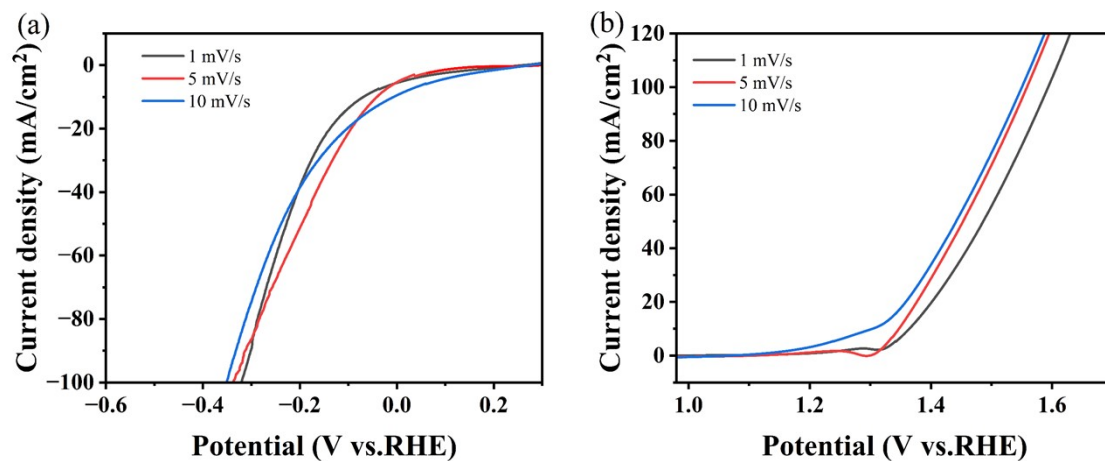


**Fig S10.** CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub> LSV performance at different thermal annealing temperatures:

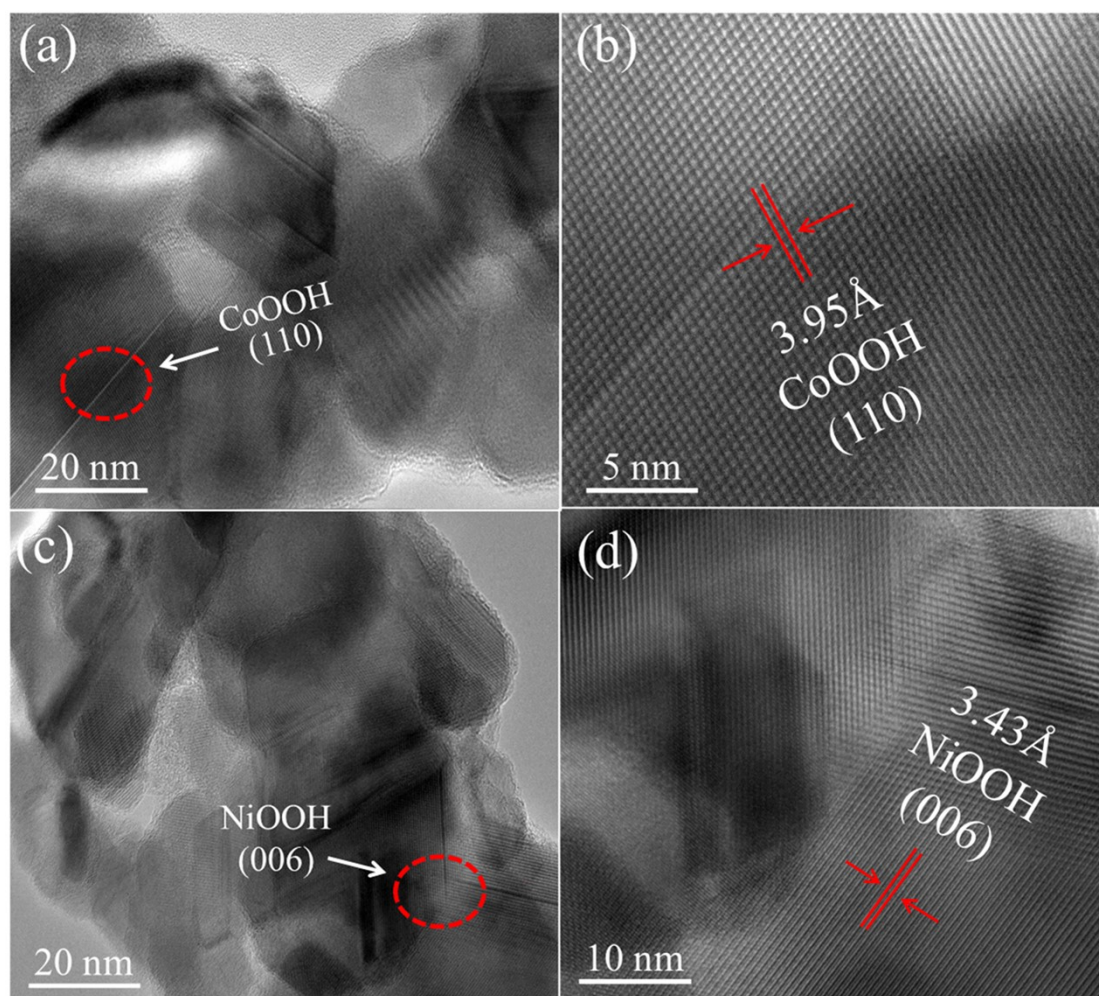
(a) HER curves, (b) OER curves.



**Fig S11.** LSV curves of CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub> with different pH: (a) HER and (b) OER.



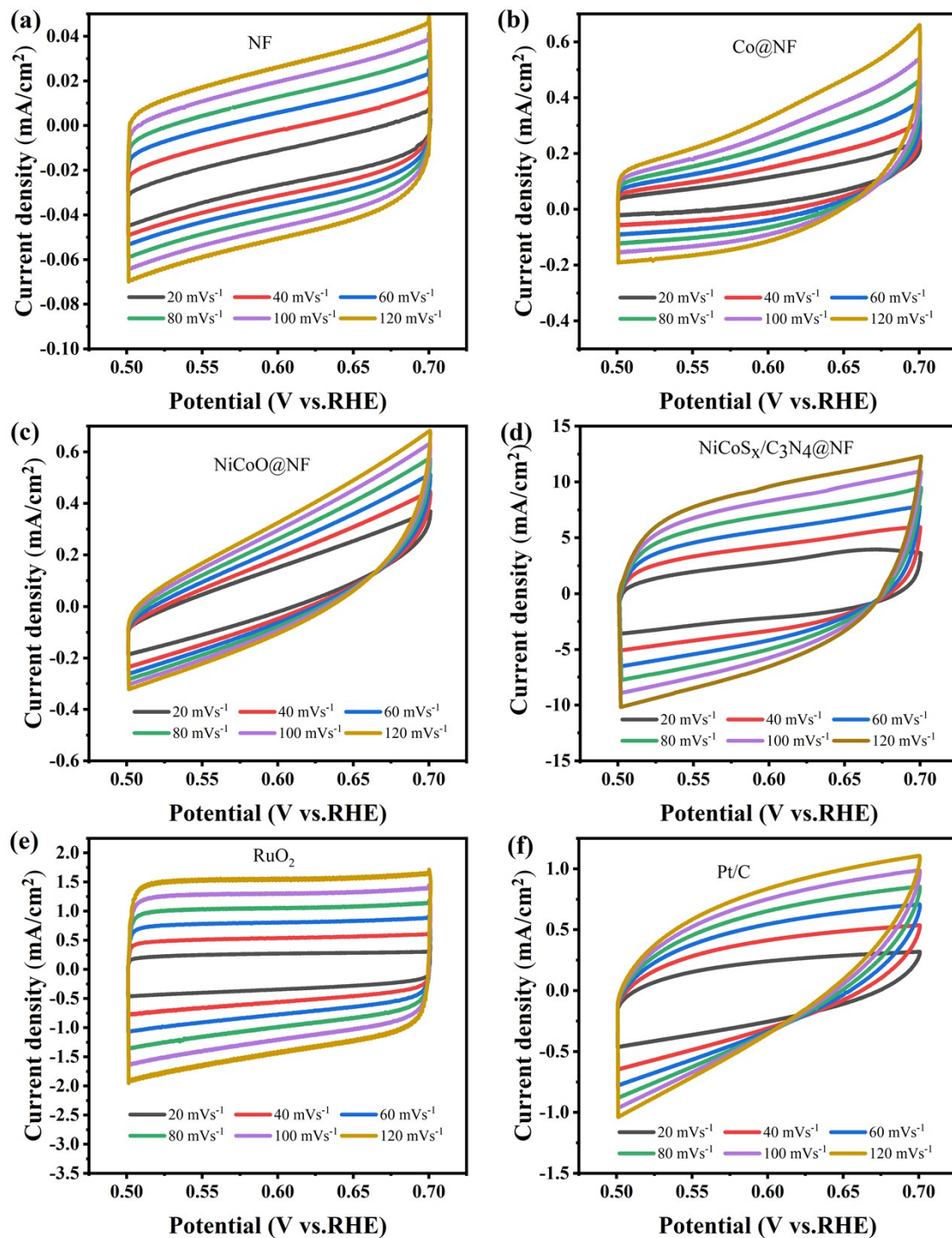
**Fig S12.** LSV curves of of  $\text{CoNi}_2\text{S}_4/\text{C}_3\text{N}_4$  with different scanning rates: (a) HER and (b) OER.



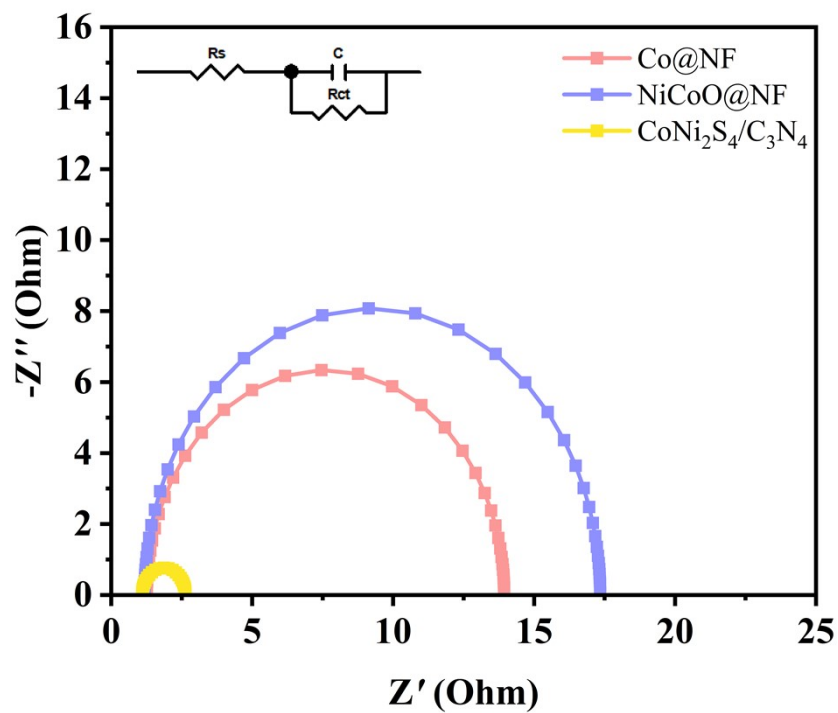
**Fig S13.** (a-d) The HRTEM images and local magnification of  $\text{CoNi}_2\text{S}_4/\text{C}_3\text{N}_4$  after

OER.

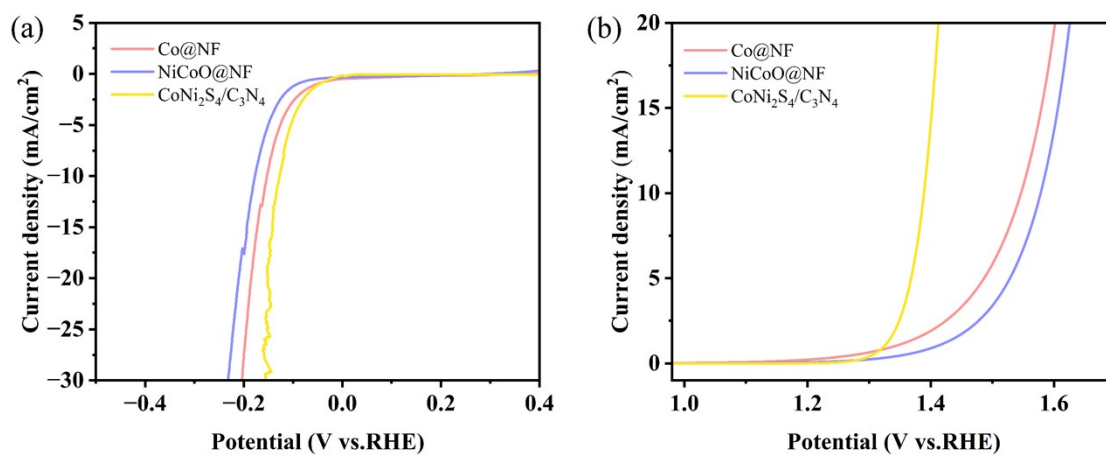




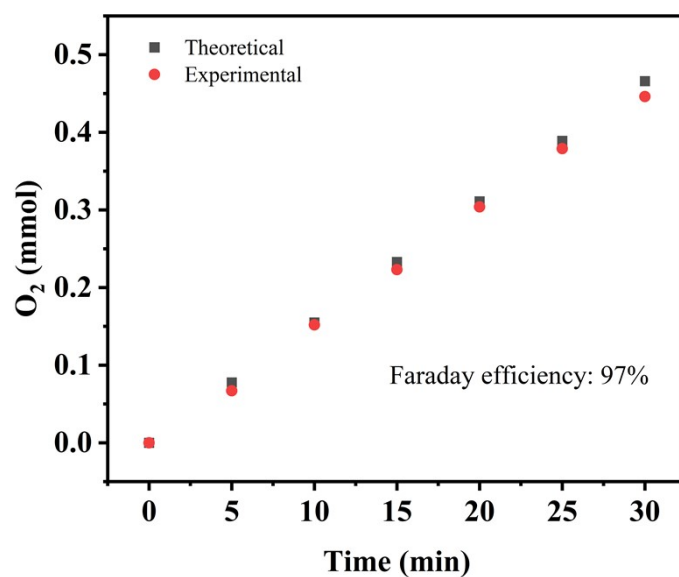
**Fig S14.** CV curves with different scan rates (20, 40, 60, 80, 100 and 120  $\text{mV s}^{-1}$ ) of (a) NF, (b) Co@NF, (c) NiCoO@NF, (d) CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub>@NF, (e) RuO<sub>2</sub>, (f) Pt/C.



**Fig S15.** Nyquist plots of Co@NF, NiCoO@NF and CoNi<sub>2</sub>S<sub>4</sub>/C<sub>3</sub>N<sub>4</sub>.



**Fig S16.** (a) HER LSV curves of different working electrodes normalized by ECSA (b) OER LSV curves of different working electrodes normalized by ECSA.



**Fig S17.** Theoretical and experimental amount of oxygen evolved during water oxidation.

**Table S1.** The catalyst mass loading (m) and active area (ECSA).

Catalyst	m/mg cm <sup>-2</sup>	ECSA/m <sup>2</sup> g <sup>-1</sup>
Co@NF	3.12	0.91
NiCoO@NF	4.17	0.52
CoNi <sub>2</sub> S <sub>4</sub> /C <sub>3</sub> N <sub>4</sub>	17.42	5.28