Electronic Supplementary Information

Facile Synthesis of Medium-Entropy CoNiFe Subacetate Nanoprism for High Efficiency Oxygen Evolution Reaction

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1. Experimental section：

1.1 Chemicals and materials

The reagents required for this experiment were all purchased from Shanghai Macklin Biochemical Technology Co. LTD, and used directly without further purification.

1.2 Preparation of CoNiFe NP, Co NP, CoFe NP and CoNi NP

For the synthesis of CoNiFe NP, 1 mmol of cobalt acetate tetrahydrate, 1 mmol of nickle acetate tetrahydrate, and 1 mmol of ferric acetate tetrahydrate were dissolved into 100 ml of absolute ethanol, then 2 g of polyvinylpyrrolidone (PVP) was added. The mixed solution was refluxed in oil bath at 85°C for 4 hours, then the resulting solid was collected by filtration and washing with ethanol. Co NP, CoNi NP and CoFe NP were synthesized using the similar procedure, except that Co NP was synthesized using 3 mmol cobalt acetate tetrahydrate, and CoFe NP was synthesized using 1.5 mmol cobalt acetate tetrahydrate and 1.5 mmol iron acetate, and CoNi NP was synthesized using 1.5 mmol cobalt acetate tetrahydrate and 1.5 mmol nickle acetate tetrahydrate.

1.3 Materials characterization

Scanning electron microscopy (SEM, Zeiss Ultra Plus, Zeiss, Germany) and transmission electron microscopy (TEM, JEM-2100F) were used to characterize morphological structure and composition. X-ray photoelectron spectroscopy (XPS, ESCALAB 250 Xi X-ray, Thermo Fisher Scientific) was used to characterize the elemental chemical state of the sample. In addition, a powder polycrystalline X-ray diffractometer (XRD, Ultima IV, Rigaku) was used to qualitatively assess the crystallinity and purity of the material.

1.4 Electrochemical measurements

The electrocatalytic tests were performed with a three-electrode system on a CHI760E electrochemical workstation. Among them, the working electrode is glass carbon electrode loaded with catalyst (0.4 mg cm^{-2}). The counter electrode is graphite rod, and the reference electrode is Ag/AgCl. The linear sweep voltammetry (LSV) test is performed in 1.0 M KOH at a scan rate of 5 mVs^{-1} with 85% IR compensation.

Electrochemical impedance (EIS) is performed at the frequency range of 0.1-10^5 Hz at 0.5 V (vs Ag/AgCl). The cyclic voltammetry (CV) curve was measured in the range of 0.7-0.8 V at different scan rates (20, 40, 60, 80, 100, 120, 140, 160, 180 and 200 mV s^{-1}).
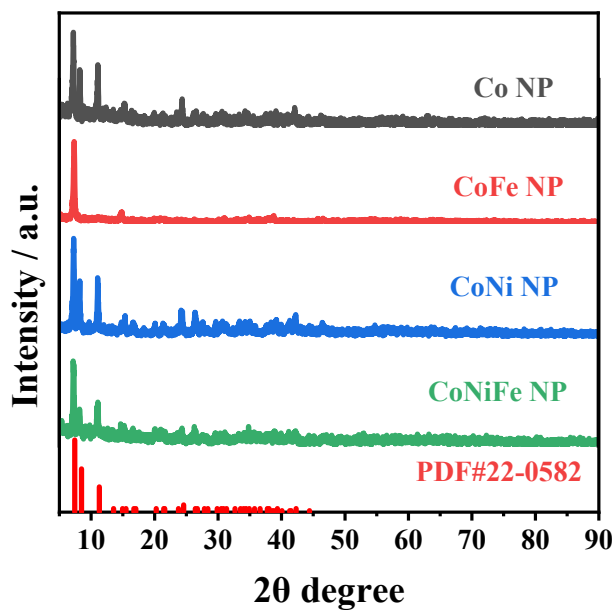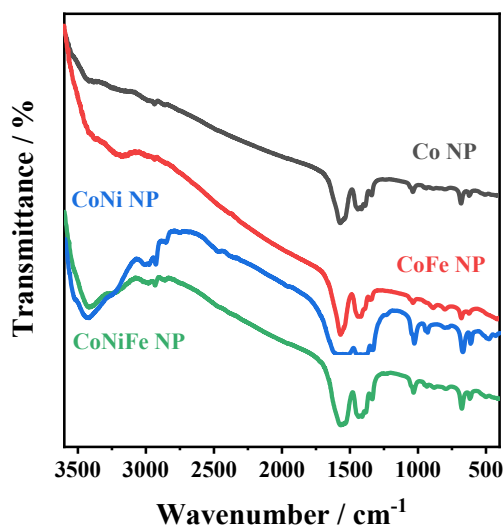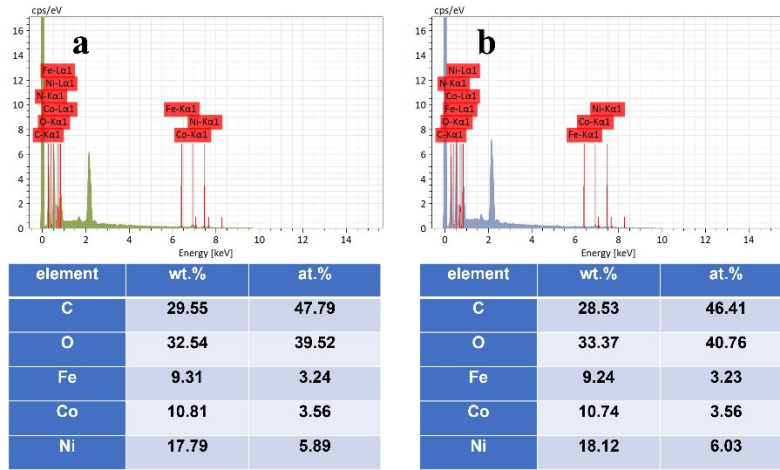

Figure S1 The XRD pattern of the catalysts.

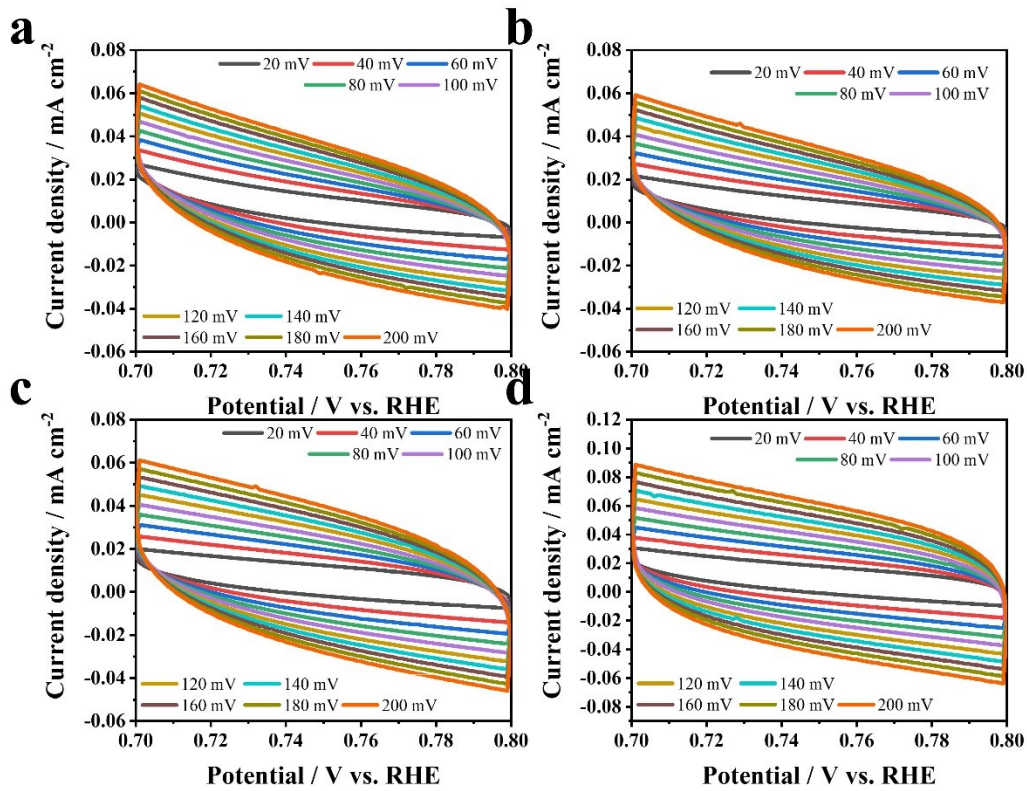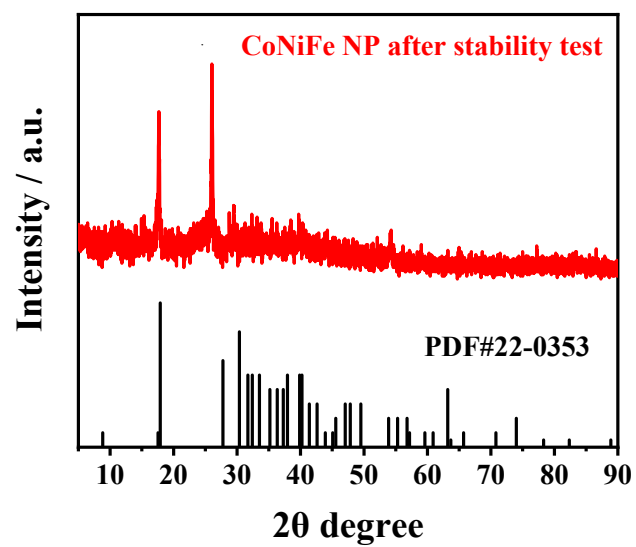

Figure S2 The FTIR spectra of the catalysts.

element	wt.%	at.%
C	29.55	47.79
O	32.54	39.52
Fe	9.31	3.24
Co	10.81	3.56
Ni	17.79	5.89

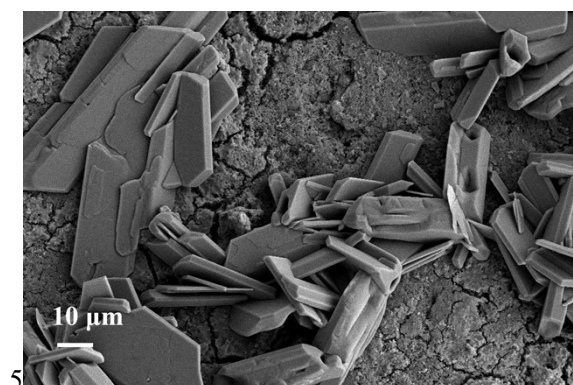| element	wt.%	at.%
C	28.53	46.41
O	33.37	40.76
Fe	9.24	3.23
Co	10.74	3.56
Ni	18.12	6.03

Figure S3 EDX of CoNiFe NP measured by two different areas.

Figure S4 The CV curves in different rates of sample: (a) Co NP. (b) CoFe NP. (c) CoNi NP and (d) CoNiFe NP.

Figure S5 The XRD pattern of the CoNiFe NP after OER stability test.

Figure S6 SEM image of the CoNiFe NP after OER stability test.