Electronic Supplementary Information

Experimental Section

Materials: Copper nitrate trihydrate, 1,4-benzenedicarboxylic acid (TPA), N,N-dimethylformamide (DMF) were purchased from Aladdin Ltd. (Shanghai, China). $RuCl_3 \cdot 3H_2O$ ($\geqslant$ 43%) were bought from Sigma-Aldrich Chemical Reagent Co., Ltd. Nickel foam (NF) was supplied by Changsha Liyuan New Material Ltd, which was washed with acetone, hydrochloric acid (3 mol/L), ethanol and deionized water several times to remove the surface impurities. Ultrapure water (18.2 MΩ.cm) was utilized to prepare all solutions. All reagents were used as received without further purification.

Preparation of NiCu-MOFNs/NF

Ni-Cu MOFNs was grown on the Ni foam through one-pot hydrothermal synthesis: copper nitrate trihydrate 1 mmol (0.242 g) and 1,4-benzenedicarboxylic acid 1mmol (0.166g) were dissolved in 35 mL DMF under constant stirring for 30 min. The final solution and the pre-treated Ni foam (2cm *3cm) were sealed in a 40 mL Teflon-lined stainless-steel autoclave and maintained at 110 °C for 36 h, followed by slow cooling to room temperature. The product was washed for three times with DMF, deionized water and ethanol successively. Dried under 60 °C in air for 4 hours.

Synthesis of RuO_2

RuO_2 was prepared according to previous publication. Briefly, 1.5 g of $RuCl_3 \cdot 3H_2O$ was added into 50 mL distilled water and stirred for ten minutes. Then 15.0 mL KOH (1.0 M) was added and stirred for 45 min at 100 °C. The above solution was centrifuged for 10 minutes and filtered. The precipitates were collected and washed with pure water several times. Finally, the product was dried at 80 °C overnight and then annealed at 300 °C in air atmosphere for 3 h. For a typical synthesis of RuO_2/NF electrode, 50 mg RuO_2 was dispersed in 1 mL ethane/water (*v:v* = 1:1) solution with sonication for 30 min. Then 21 μL catalytic inks were dropped on Ni foam (0.5 × 0.5 cm), and dried at 80 °C for 4 h. The loading for RuO_2/NF was about 4.2 mg cm^{-2}.

Characterizations

X-ray diffraction (XRD) measurements were using a RigakuD/MAX 2550 diffractometer with Cu Kα radiation (λ=1.5418 Å). Samples were analyzed over a range of 5–80° using a step scan mode with a step rate of 4°/min. SEM measurements were carried out on a MERLIN Compact scanning electron microscope at an accelerating voltage of 20 kV. TEM images were collected on a Zeiss Libra 200FE transmission electron microscope operated at 200 kV. XPS measurements were performed using an ESCALABMK II X-ray photoelectron spectrometer with the exciting source of Mg. FT-IR measurement was carried out on Nicolet Nexus 410 spectrometer. ICP-OES was performed using an Agilent Icpoes730 spectrometer.

Electrochemical measurements

All the electrochemical measurements are performed with a CHI 660E electrochemical analyzer (CH Instruments, Inc., Shanghai) at room temperature in a conventional three electrode system, using NiCu-MOFNs/NF as working electrode, graphite rod as counter electrode and mercuric oxide electrode (Hg-HgO) electrode as reference electrode. All tests were carried out at room temperature (25 °C)

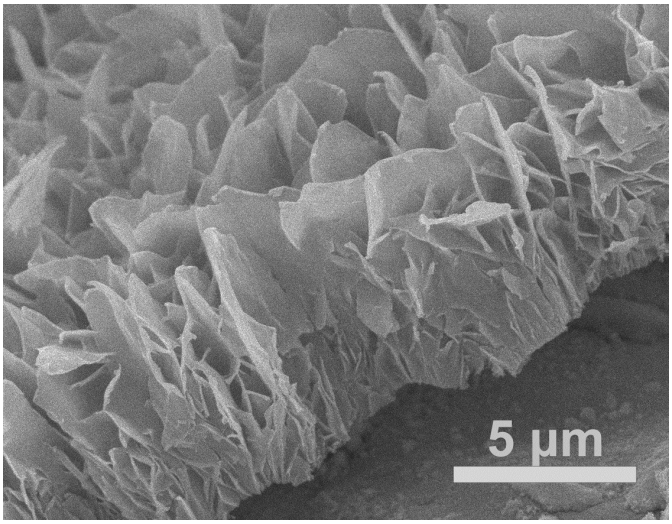

Fig. S1. SEM pattern of NiCu-MOFNs/NF

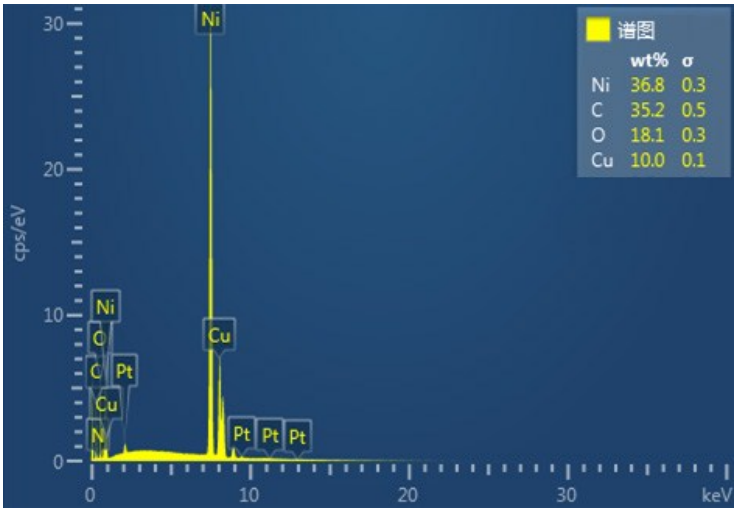

Fig. S2. EDX spectrum of NiCu-MOFNs.

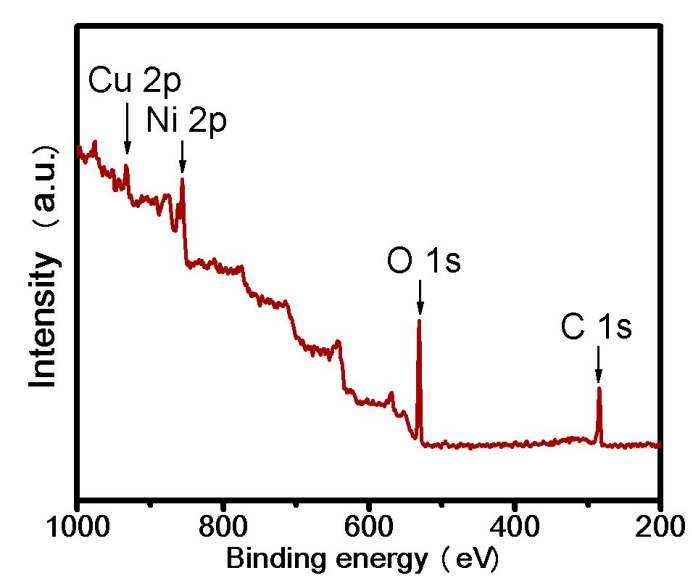

Fig. S3. XPS spectra of NiCu-MOFNs

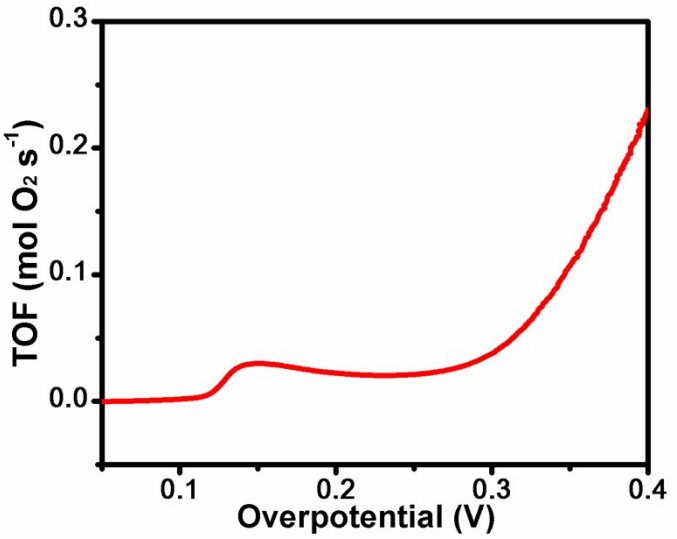

Fig. S4. Plot of TOF for NiCu-MOFNs/NF

Table S1: ICP-OES data for NiCu-MOFNs powder scratched from NiCu-MOFNs/NF

Mass of sample/g	Volume/ml	Metal	Concentration in solution (mg/L)	Concentration (mg/g)	Concentration (mol/g)
0.0138	250	Ni	13.54	245.29	0.00418
		Cu	3.471	62.88	0.00099

Table S2. Comparison of OER performance for NiCu-MOFNs/NF with other non-noble-metal electrocatalysts in alkaline media.

Catalyst	j (mA cm^{-2})	η (mV)	Electrolyte	Ref.
NiCu-MOF/NF	100	309	1.0M KOH	This work
NiFe-MOF/NF	10	240	1.0M KOH	1
NiCo-MOF/CF	10	189	1.0M KOH	2
(GO 8 wt%) Cu-MOF/GC	2	110	0.5M H_2SO_4	3
NiS/Ni foam	100	350	1.0 M KOH	4
Ni-P/Ni	100	374	1.0 M KOH	5
$Zn_xCo_{3-x}O_4$ nanowire array	50	390	1.0 M KOH	6
NiFe LDH/NF	100	390	1.0 M KOH	7
Ni_3Se_2/Cu foam	100	388	1.0 M KOH	8
NiFe/NF	20	264	1.0 M KOH	9
Cu_3P@NF	10	320	1.0 M KOH	10
$Co_3O_4/NiCo_2O_4$	10	340	1.0 M KOH	11
NiCo-NS	10	334	1.0 M KOH	12
$CeO_2/CoSe_2$	10	288	0.1 M KOH	13
Al-CoP/CC	10	265	1.0 M KOH	14
Cu/($Cu(OH)_2$-CuO) NA/CF	10	390	1.0 M KOH	15
carbonate-$Co(OH)_2$/NF	50	337	1.0 M KOH	16
Fe-CoP/CC|Fe-CoP/CC	10	340	1.0 M KOH	17
Ni_3Se_2/CF|Ni_3Se_2/CF	10	420	1.0 M KOH	18
Co_3O_4/N -rmGO	10	310	1.0 M KOH	19
Co_3O_4@C-MWCNTs	10	320	1.0 M KOH	20

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