Supporting Information

2D Iron/Cobalt Metal-Organic Frameworks with an Extended Ligand for Efficient Oxygen Evolution Reaction

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Calculation formulas

Some data needed to be calculated in the experimental process, and the calculation formulas were as follows:

Overpotential: $\eta = E_{RHE} - 1.23V$,

where E_{RHE} referred to reversible hydrogen electrode, $E_{RHE} = E_{Ag/AgCl} + 0.059*pH + 0.197V$

Tafel slope: $\eta = b \log j + a$,

where b was the Tafel slope. It was derived from the LSV curve, log j (j was the current density) as the abscissa and η as the ordinate, and the resulting slope was called the Tafel slope.

$2C_{dl}$ is estimated by plotting $\Delta J = (Ja - Jc)$ at 0.8794 V against the scan rates.

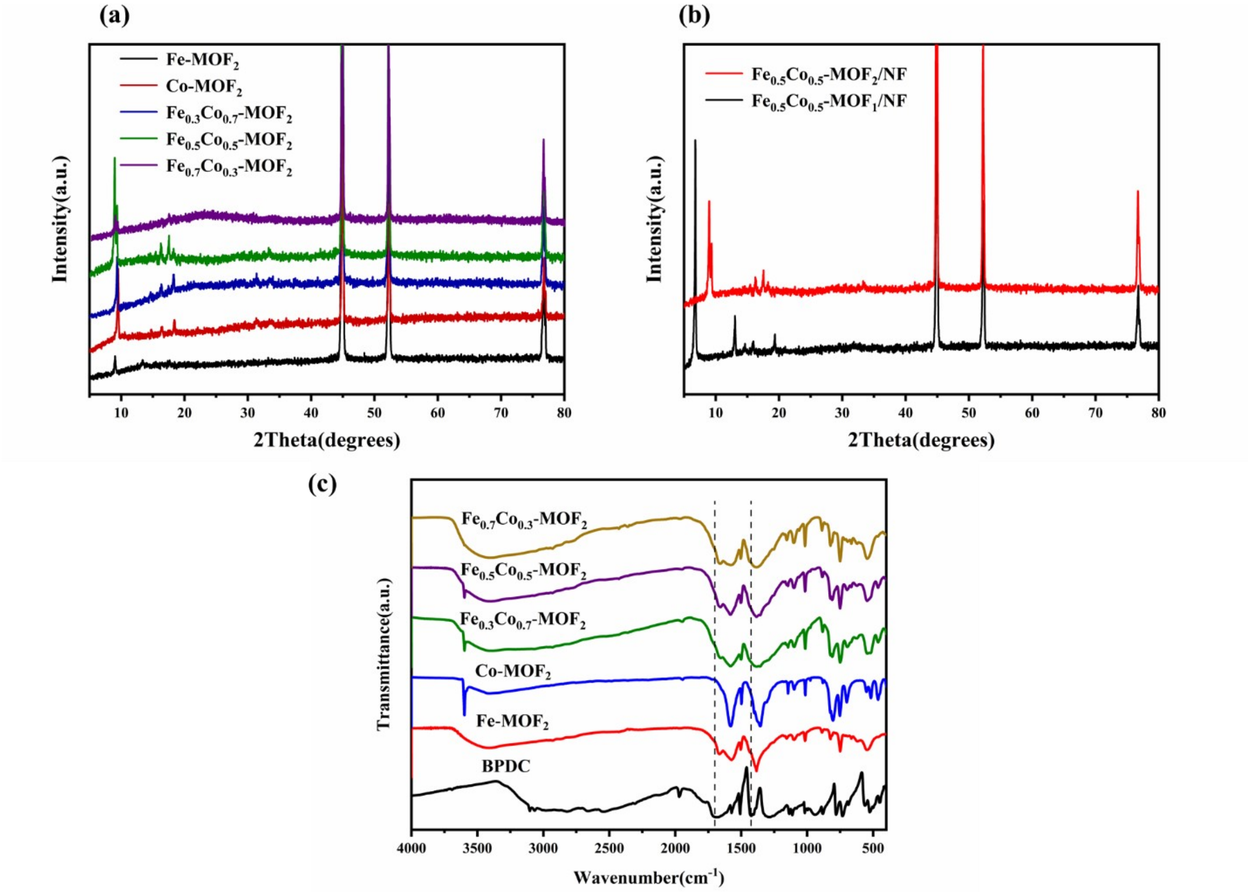


Figure S1. a) XRD patterns of Fe_xCo_{1-x}-MOF_2, b) $Fe_{0.5}Co_{0.5}$-MOF_1 and $Fe_{0.5}Co_{0.5}$-MOF_2, c) FT-IR spectra of Fe_xCo_{1-x}-MOF_2

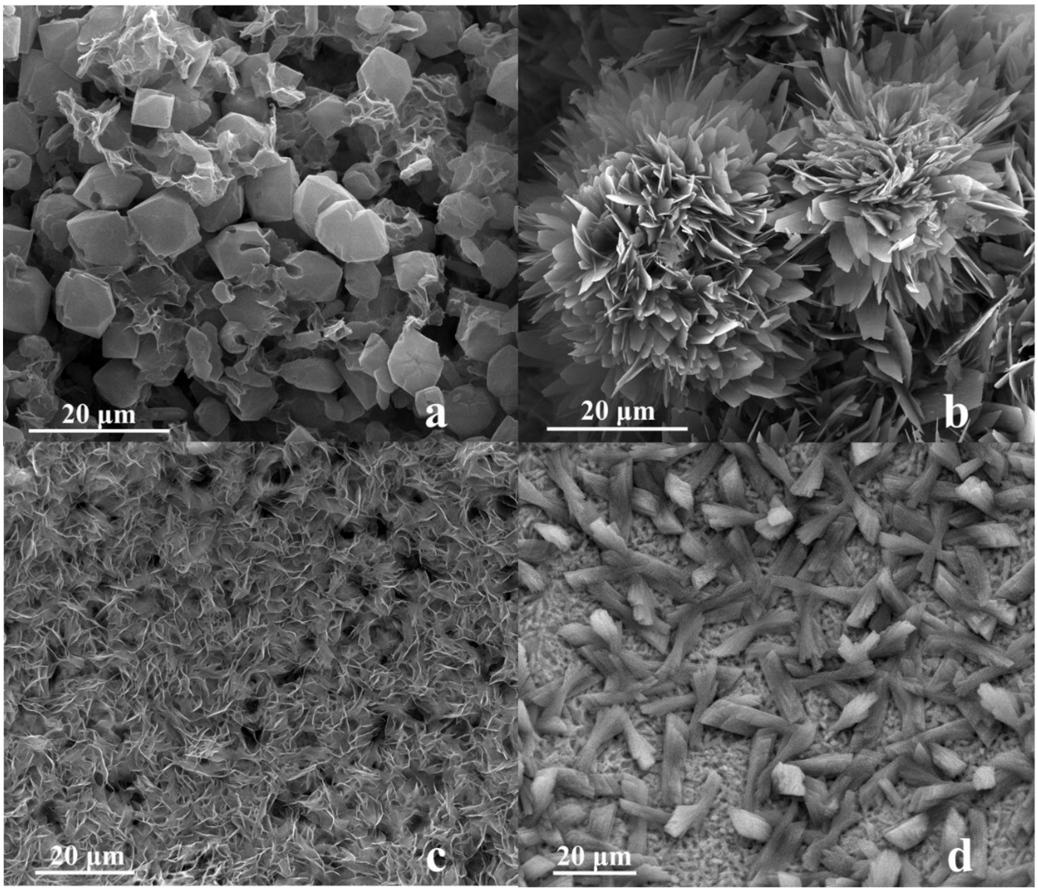


Figure S2. a) SEM images of Fe-MOF_1/NF, b) Co-MOF_1/NF, c) Fe-MOF_2/NF, d) Co-MOF_2/NF

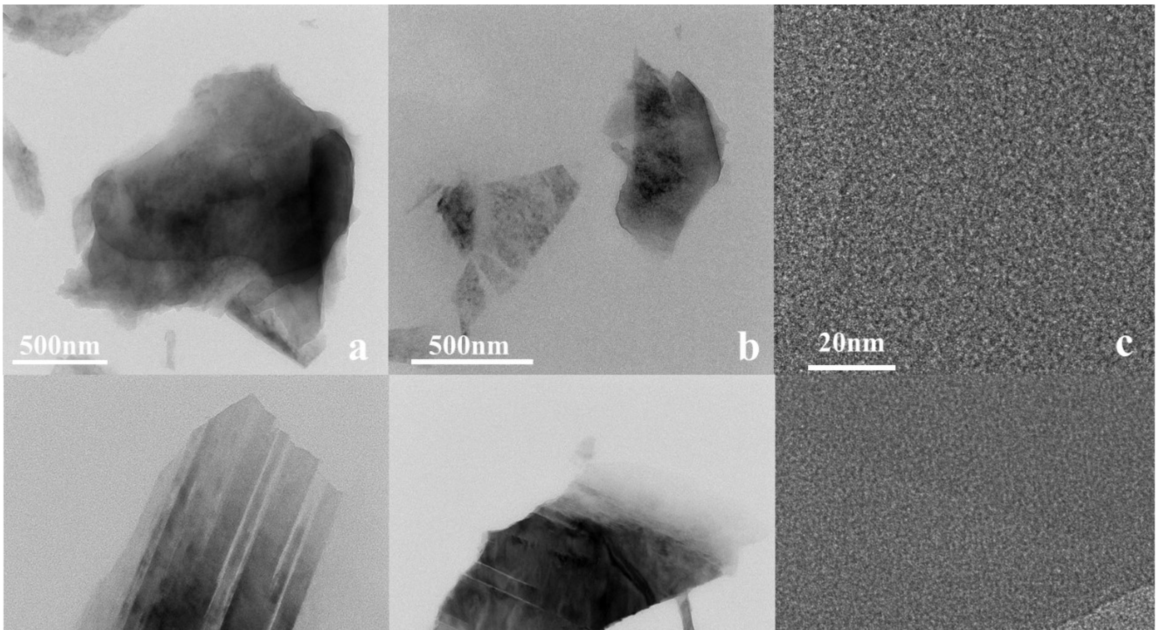


Figure S3. a,b) TEM and c) HRTEM image of $Fe_{0.5}Co_{0.5}$-MOF_1/NF before the OER test, d,e) TEM and f) HRTEM image of $Fe_{0.3}Co_{0.7}$-MOF_2/NF before the OER test

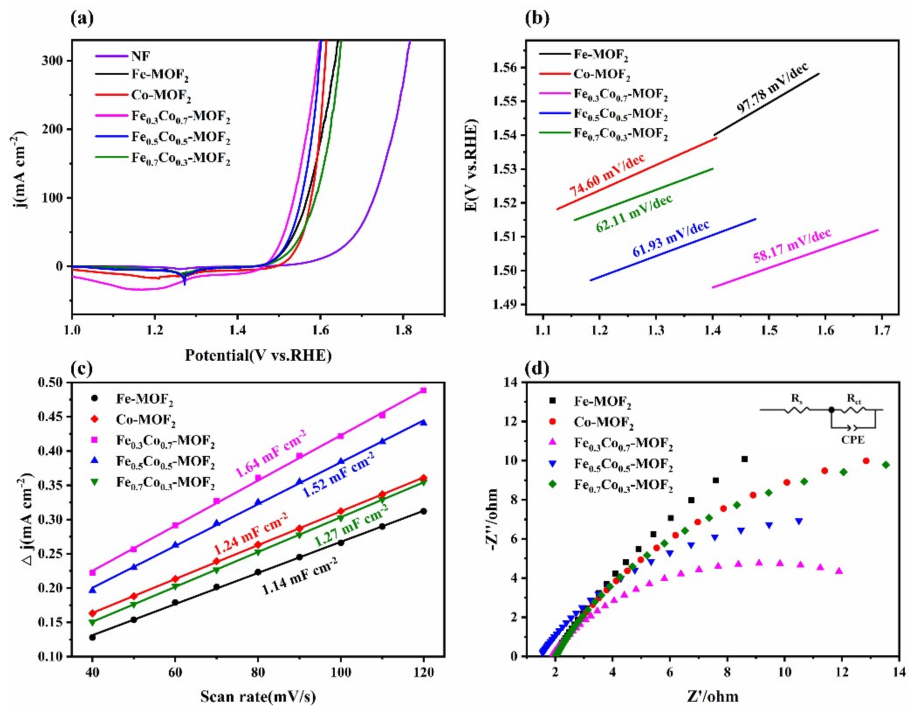


Figure S4. a) LSV curves b) Tafel plots c) C_{dl} curves and d) electrochemical impedance of Fe_xCo_{1-x}-MOF_2/NF

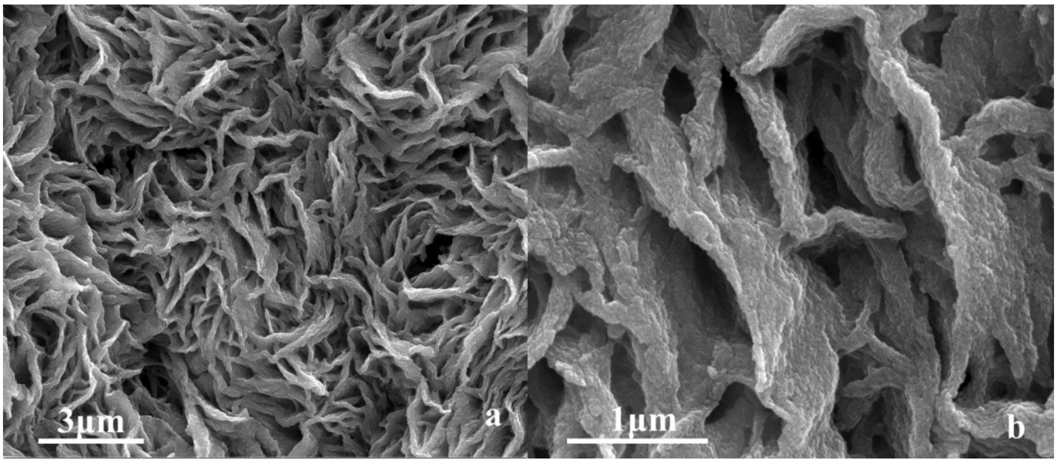
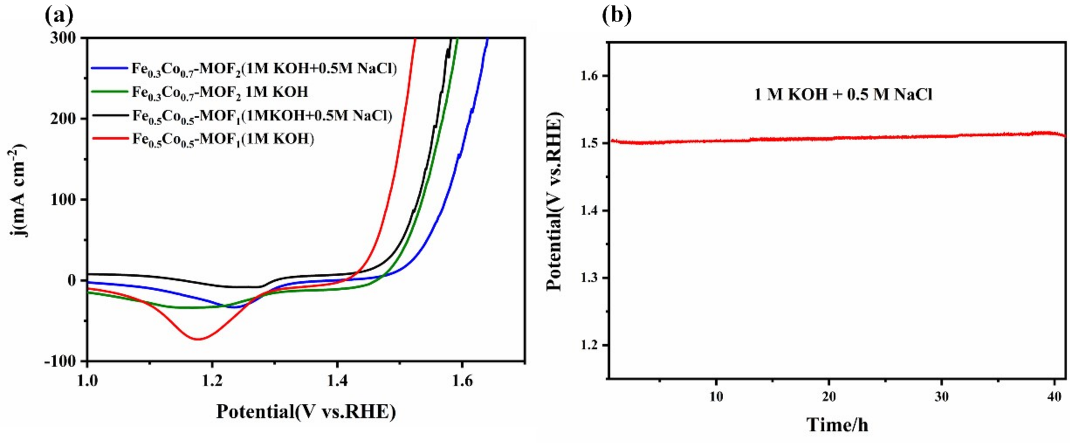


Figure S5. SEM $Fe_{0.5}Co_{0.5}$-MOF_1/NF after the 30 h stability test in 1 M KOH



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igure S6. a) LSV curves in 1 M KOH and 1 M KOH+0.5 M NaCl of $Fe_{0.5}Co_{0.5}$-MOF_1/NF and $Fe_{0.3}Co_{0.7}$-MOF_2, b) Chronopotentiometric curve of $Fe_{0.5}Co_{0.5}$-MOF_1/NF in 1 M KOH+0.5 M NaCl

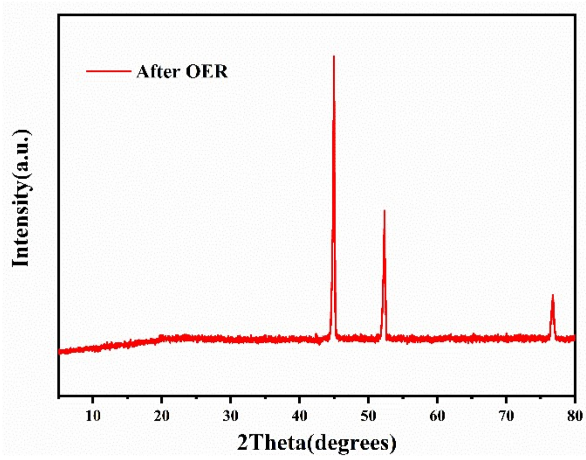

Figure S7. XRD patterns $Fe_{0.5}Co_{0.5}$-MOF_1/NF after the 30 h stability test in 1 M KOH

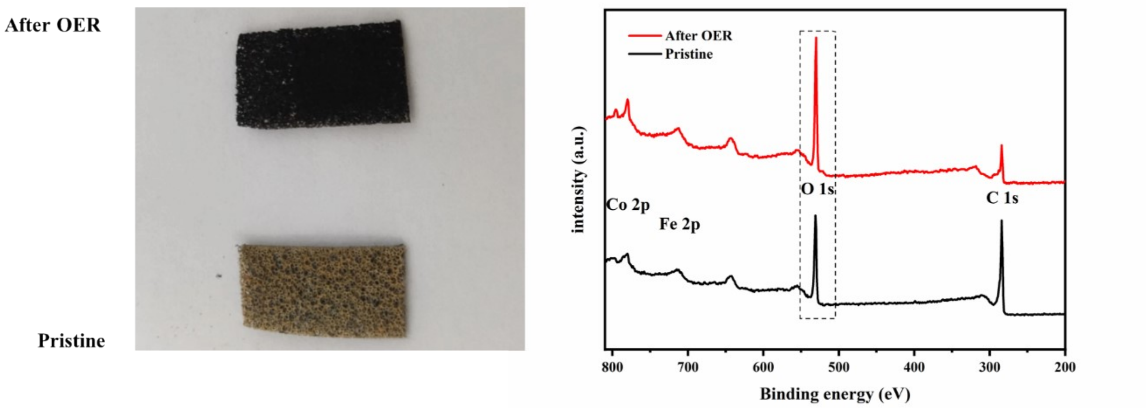

Figure S8. a) Photos, b) survey spectrum of pristine $Fe_{0.5}Co_{0.5}$-MOF_1/NF and $Fe_{0.5}Co_{0.5}$-MOF_1/NF after OER test

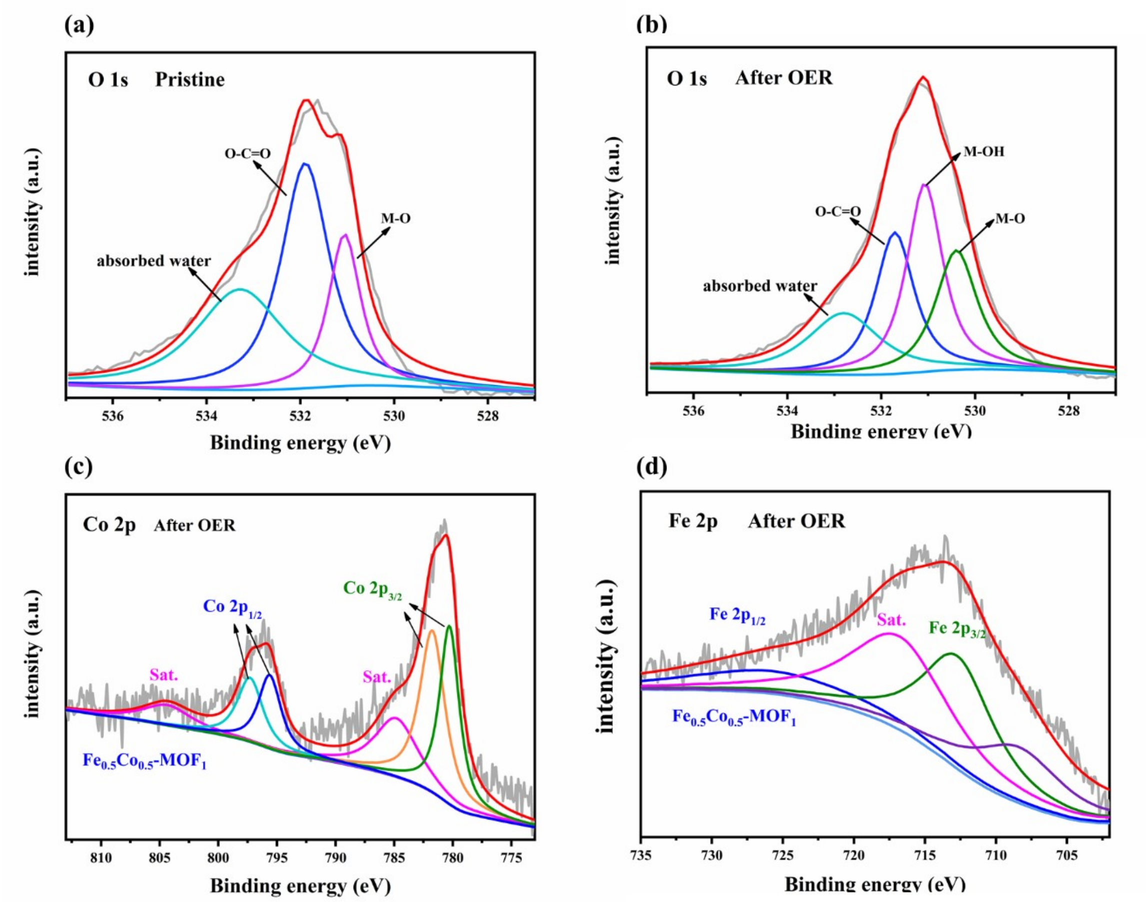

Figure S9. The high-resolution XPS spectra of a) O 1s in pristine $Fe_{0.5}Co_{0.5}$-MOF_1/NF b) O 1s c) Co 2p d) Fe 2p in $Fe_{0.5}Co_{0.5}$-MOF_1/NF after OER test

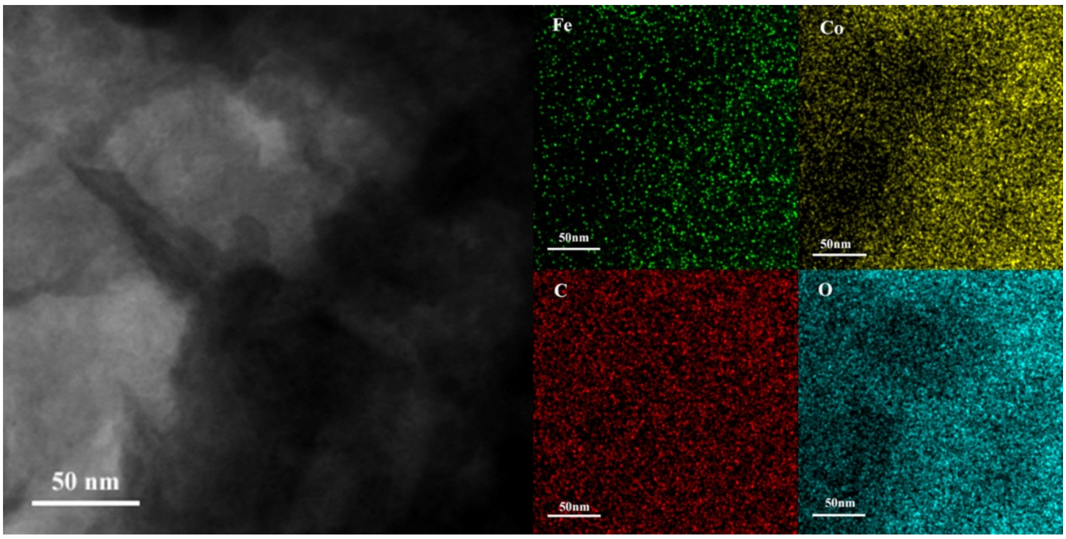

Figure S10. TEM image and corresponding EDS elemental mapping images of $Fe_{0.5}Co_{0.5}$-MOF_1/NF after OER test

Table S1. The amount of metal ions and ligands used to synthesize MOF_1

Catalyst	$Fe(NO_3)_3 \cdot 9H_2O$	$Co(NO_3)_2 \cdot 6H_2O$	BPDC
Fe-MOF_1/NF	404.0 mg (1 mmol)	0 mg	242.2 mg (1 mmol)
$Fe_{0.3}Co_{0.7}$-MOF_1/NF	121.2 mg (0.3 mmol)	203.7 mg (0.7 mmol)	242.2 mg (1 mmol)
$Fe_{0.5}Co_{0.5}$-MOF_1/NF	202.0 mg (0.5 mmol)	145.5 mg (0.5 mmol)	242.2 mg (1 mmol)
$Fe_{0.7}Co_{0.3}$-MOF_1/NF	282.8 mg (0.7 mmol)	87.3 mg (0.3 mmol)	242.2 mg (1 mmol)
Co-MOF_1/NF	0 mg	291.0 mg (1 mmol)	242.2 mg (1 mmol)

Table S2. The amount of metal ions and ligands used to synthesize MOF_2

Catalyst	$Fe(NO_3)_3 \cdot 9H_2O$	$Co(NO_3)_2 \cdot 6H_2O$	BDC
Fe-MOF_2/NF	404.0 mg (1 mmol)	0 mg	166.1 mg (1 mmol)
$Fe_{0.3}Co_{0.7}$-MOF_2/NF	121.2 mg (0.3 mmol)	203.7 mg (0.7 mmol)	166.1 mg (1 mmol)
$Fe_{0.5}Co_{0.5}$-MOF_2/NF	202.0 mg (0.5 mmol)	145.5 mg (0.5 mmol)	166.1 mg (1 mmol)
$Fe_{0.7}Co_{0.3}$-MOF_2/NF	282.8 mg (0.7 mmol)	87.3 mg (0.3 mmol)	166.1 mg (1 mmol)
Co-MOF_2/NF	0 mg	291.0 mg (1 mmol)	166.1 mg (1 mmol)

Table S3. Comparisons of electrochemical performance and the mass loading of electrodes

Catalyst	**Overpotential at 10 mA cm^{-2} (mV)**	**Tafel slope (mV/dec)**	**C_{dl} (mF cm^{-2})**	**R_{ct} (Ω)**	**Mass loading (mg cm^{-2})**
Fe-MOF_1/NF	280	86.33	1.13	22.32	3.7
$Fe_{0.3}Co_{0.7}$-MOF_1/NF	252	41.21	2.17	17.12	4.3
$Fe_{0.5}Co_{0.5}$-MOF_1/NF	217	31.16	2.40	4.19	4.1
$Fe_{0.7}Co_{0.3}$-MOF_1/NF	254	51.90	1.86	2.68	4.0
Co-MOF_1/NF	270	74.38	1.24	6.62	4.7
Fe-MOF_2/NF	272	97.78	1.14	60.95	4.2
$Fe_{0.3}Co_{0.7}$-MOF_2/NF	249	58.17	1.64	14.91	4.4
$Fe_{0.5}Co_{0.5}$-MOF_2/NF	269	61.93	1.52	21.34	4.5
$Fe_{0.7}Co_{0.3}$-MOF_2/NF	258	62.11	1.27	29.04	4.2
Co-MOF_2/NF	284	74.60	1.24	31.21	3.8

Table S4. Comparison of OER catalytic performances of various MOF-based electrocatalysts

Catalysts	Overpotential (mV@ mA/cm^2)	Tafel slope (mV/dec)	Ligand	Reference
$Fe_{0.5}Co_{0.5}$-MOF_1/NF	**217@10**	**31.16**	**BPDC**	**This work**
2D MOF-Fe/Co(1:2)	238@10	52	1,4-BDC	1
MIL-53(Co-Fe)/NF	262@100	69	TPA	2
Fe_2Co-MOF	224@10	45.3	TPA	3
Ni-Fe-MOF NSs	221@10	56	1,4-BDC	4
(Fe,Co)OOH/MI	230@10	53	MI	5
$BaTiO_3$@MOF-Fe/Co	247@10	38.4	1,4-BDC	6
CoFe-MOF-OH	265@10	44	$C_5H_4N_2O_4$	7
Co_3Fe-MOF	280@10	38	NH_2-BDC	8
$Au_{5,30}$/(FCN)MOF/NP	216@10	31.7	1,4-BDC	9
Fe-Co-O/Co@ NC-mNS/NF	257@10	41.56	MI	10
Co_2Fe-MOF	280@10	44.7	H_3BTC	11
CF-PBA-400	254@10	51	PBA	12
CoFeBiP	273@10	77.3	MI	13
NiFc-MOF/NF	195@10	44.1	FcDA	14
Ni_2Fe_1 Sq-zbr-MOF	230@10	37	$C_4H_2O_4$	15

TPA, 1, 4-BDC: 1, 4-bezenedicarboxylate

MI: 2-Methylimidazole

$C_5H_4N_2O_4$: 4, 5-Imidazoledicarboxylic acid

NH_2-BDC: 2-Aminoterephthalic acid

H_3BTC: Trimesic acid

PBA: Prussian blue analogue

FcDA: 1, 1'-Ferrocene dicarboxylate

$C_4H_2O_4$: 3, 4-Dihydroxy-3-cyclobutene-1, 2-dione (squaric acid)

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