Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information for

Self-reconstruction of cationic activated Ni-MOFs enhanced the intrinsic activity of electrocatalytic water oxidation

Xuemin Wang,[a,b] Xixi Wang,[a,b] Lin Zhao,[a,b] Hanyu Zhang,[a,b] Ming Liu,[a] Cui Zhang,[*a,b] and Shuangxi Liu[*a,b,c,d]

[a.] *School of Materials Science and Engineering, Institute of New Catalytic Materials Science, Nankai University, Tianjin 300350, China*

E-mail: zhangcui@nankai.edu.cn; sliu@nankai.edu.cn.

[b.] *National Institute for Advanced Materials, Nankai University, Tianjin 300350, China.*

[c.] *Key Laboratory of Advanced Energy Materials Chemistry, Ministry of Education, Nankai University, Tianjin 300071, China.*

[d.] *Collaborative Innovation Center of Chemical Science and Engineering, Tianjin 300072, China*

Related calculation formulas and equations

Overpotential (η) was calculated by the following equation:

$$\eta\ (\mathrm{V}) = E_{RHE} - 1.23\ \mathrm{V} \quad (1)$$

Tafel plots are showed with the linear portions at overpotential fitted to the Tafel equation:

$$\eta = b \log j + a \quad (2)$$

Where η is overpotential, j is the current density, b is the Tafel slope, and a is the exchange current density.

Instruments for Material characterizations*:* The powder X-ray diffraction (XRD) patterns were collected by Rigaku MiniFlex 600. X-ray photoelectron spectroscopy (XPS, Thermo Scientific ESCALAB 250Xi) analysis was carried out on the PHI5000 probe system. The morphology and size of the electrocatalysts were carried out by field emission scanning electron microscopy (FE-SEM, JSM-7800F) and transmission electron microscopy (TEM; JEOL, JEM-2800).

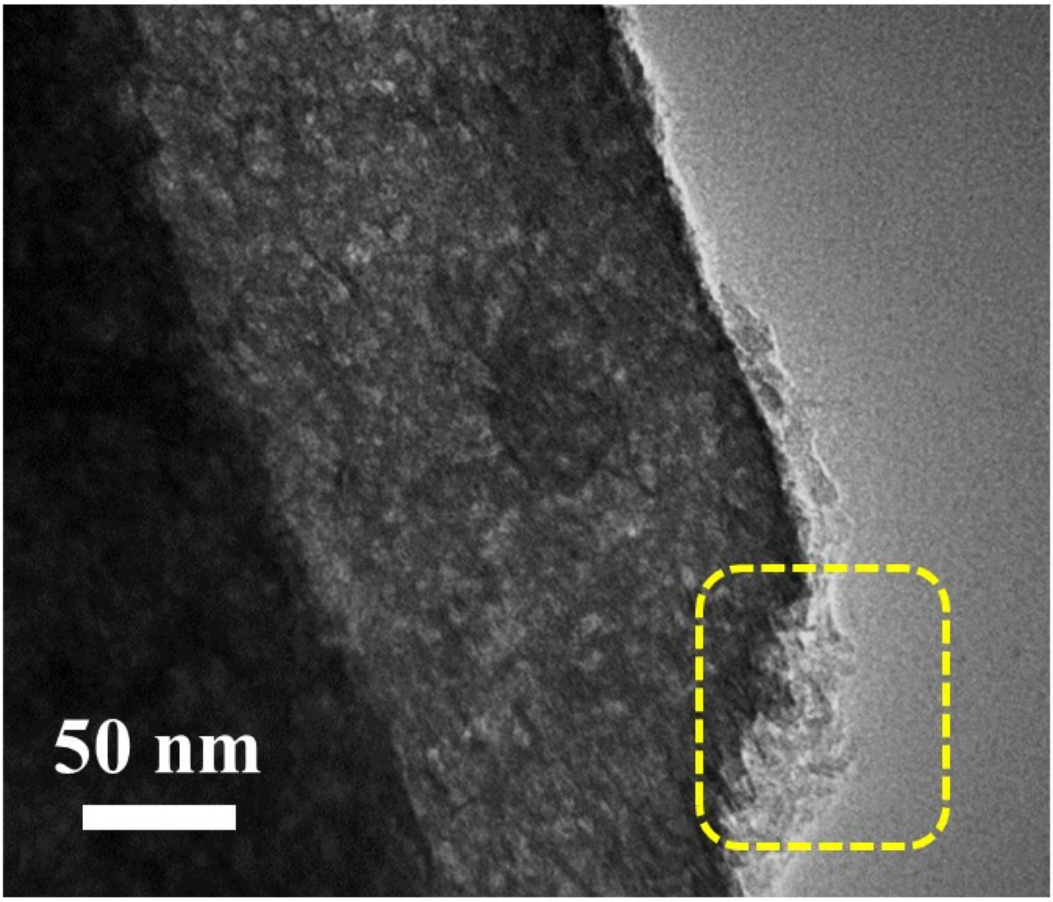

Figure S1. TEM image of of Ni-MOFs-Fe after soaked in 1.0 M KOH.

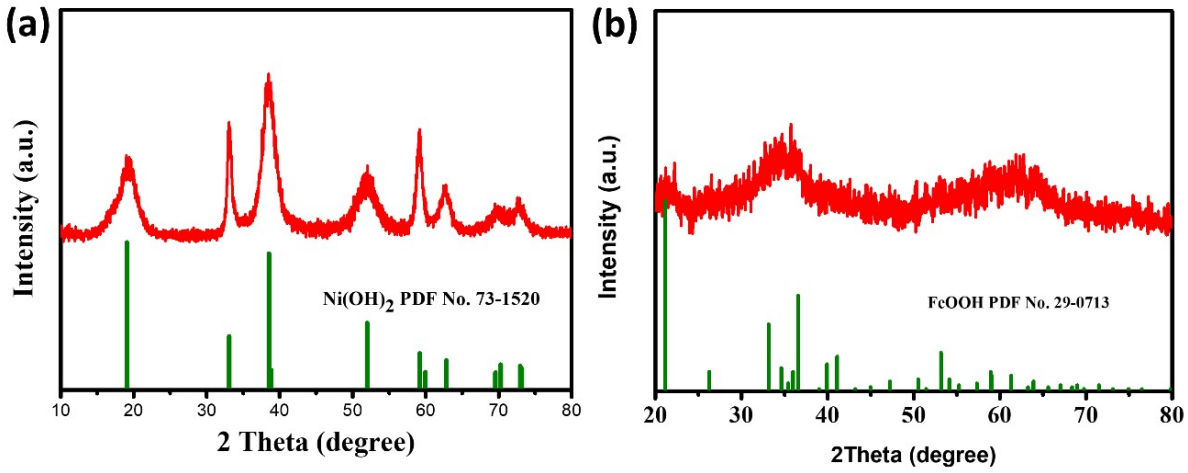

Figure S2. (a) XRD patterns of $Ni(OH)_2$ (named as N-1) and FeOOH (labled as F-1).

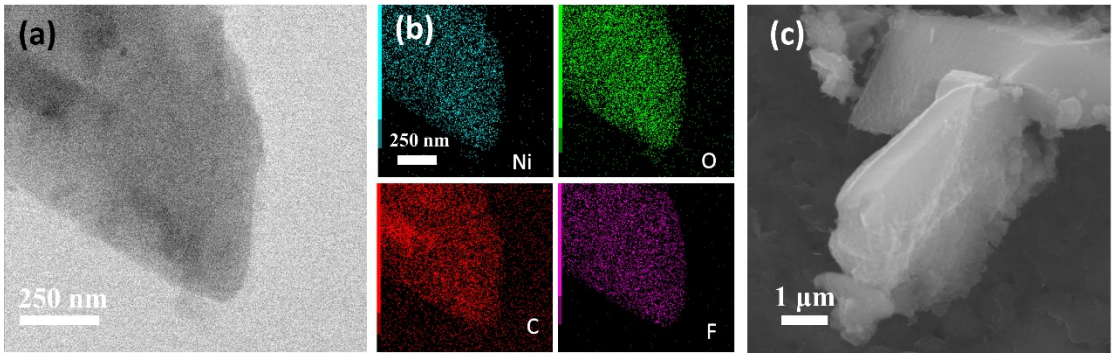

Figure S3. (a) TEM and (b) corresponding mapping images of N-1 (F element comes from binder Nafion). (c) SEM images of F-1.

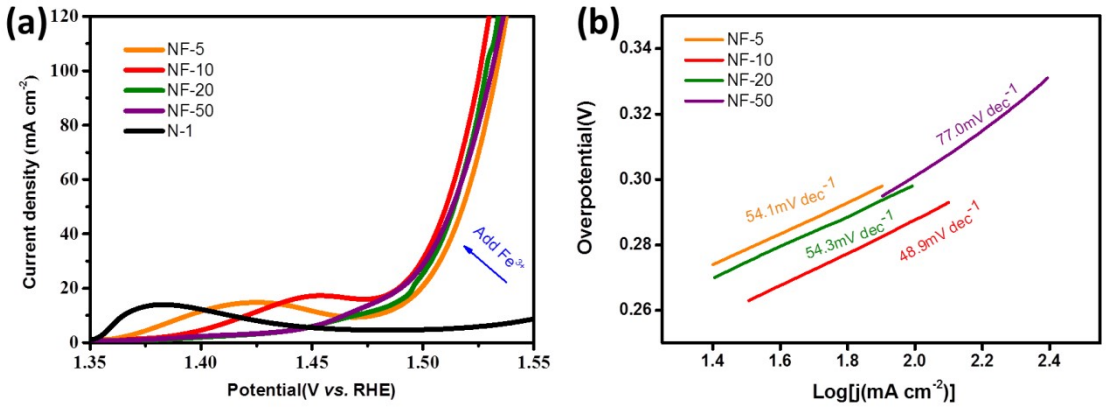

Figure S4. (a) Polarization curves of N-1, NF-5, NF-10, NF-20 and NF-50 in O_2-saturated 1.0 M KOH solution and (b) Tafel plots of above samples.

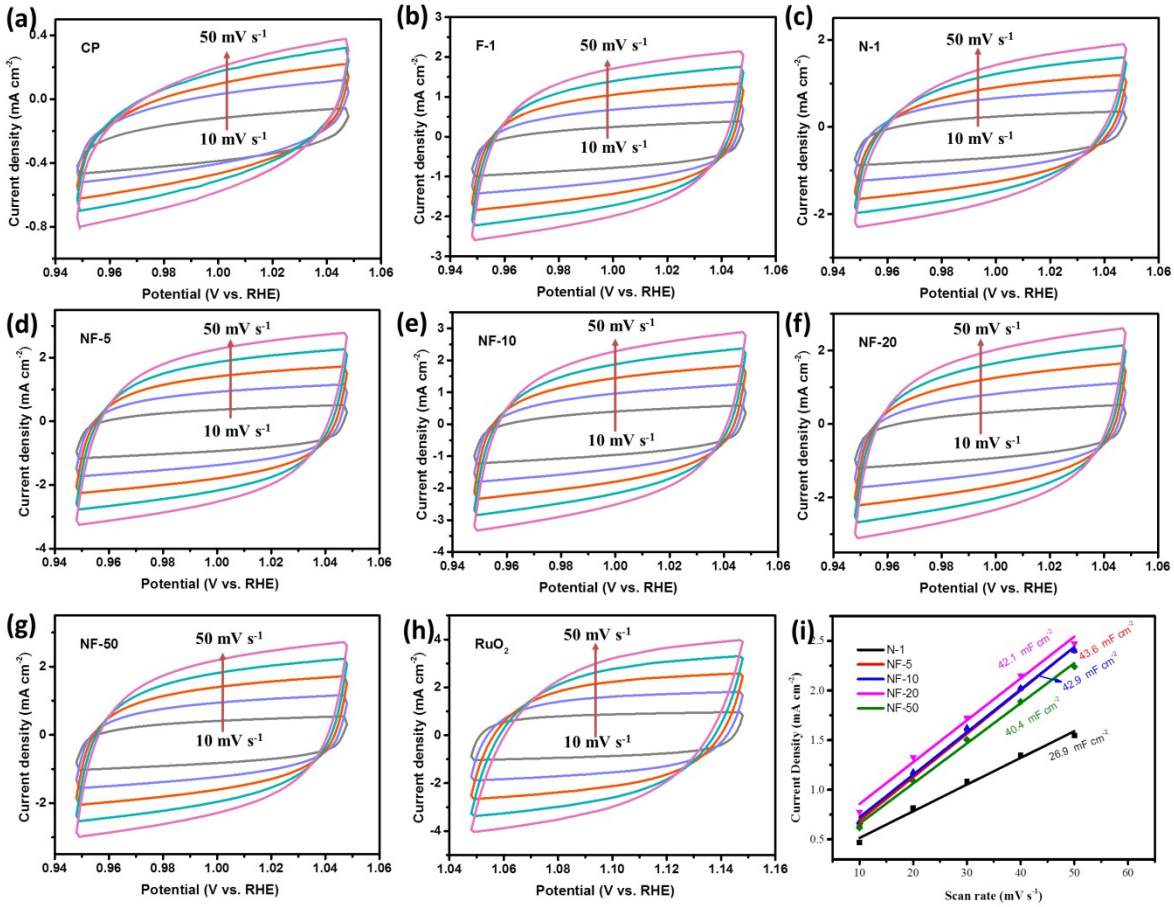

Figure S5. Cyclic voltammetry curves of (a) CP, (b) F-1, (c) N-1, (d) NF-5, (e) NF-10 (f) NF-20, (g) NF-50 and (h) RuO_2 with different scan rates. (i) Double-layer capacitance determined by the current density at different scan rates.

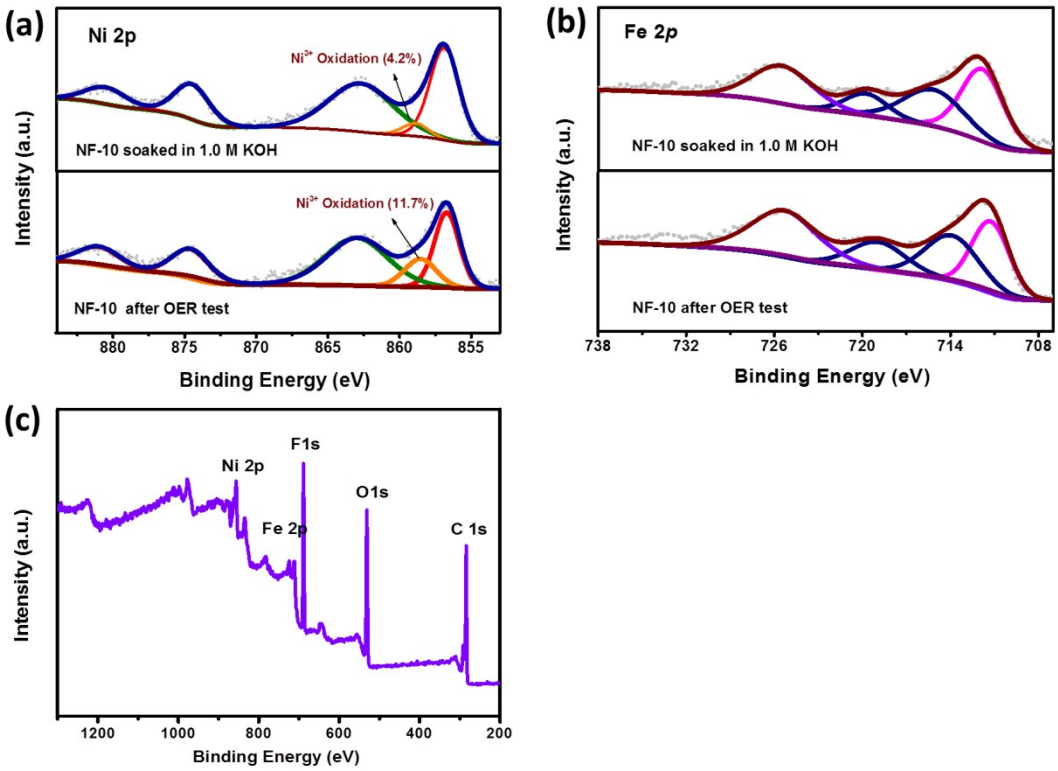

Figure S6. High-resolution spectra of (a) Ni *2p* and (b) Fe *2p* of NF-10 before and after the OER test. (c) Survey spectrum of NF-10.

Table S1. Comparison of the performance of NF-10 with similar catalysts reported in the literature.

Catalysts	Overpotential / mV (10 mV cm^{-2})	Tafel slop (mV dec^{-1})	Electrolyte	References
NF-10	**280 @50 mA cm^{-2}**	**48.9**	**1.0 M KOH**	**This work**
$(Fe(II)_1Fe(III)_1)_{0.6}$/NMOF-Co	330	50	1.0 M KOH	Chem. Eng. J., 2021, 422, 130055.
MIL-53(Co-Fe)/NF	NA	69	1.0 M KOH	Nanoscale, 2020, 12, 67.
FN-2	275	56.7	1.0 M KOH	Small, 2019, 15, 1903410.
NNU-23	365	81.8	0.1 M KOH	Angew. Chem. Int. Ed., 2018, 57, 9660.
MAF-X27-OH	292	88	1.0 M KOH	J. Am. Chem. Soc., 2016, 138, 8336.
NiFe-25	299	48.9	1.0 M KOH	Chem. Eng. J., 2021, 423, 130204.
NCF-MOF	320	49	1 M KOH	Adv. Funct. Mater., 2018, 28, 1802129.
NiFe LDH	300	40	1 M KOH	Nat. Commun., 2014, 5, 4477.
$NiCo/NiCoO_x$@FeOOH	278	47.5	1.0 M KOH	Nano Res., 2020, 13, 3299.
NiFe@N doped carbon	350	56	0.1 M KOH	Nano Energy, 2016, 30, 426.
Fe/(Ni)OOH	290	32	1 M KOH	Angew. Chem. Int., Ed., 2018, 57, 172.
FeCo-MOF-EH	301	42	1.0 M KOH	Angew. Chem. Int., Ed., 2020, 59, 13101.
FeCo LDH	331	85	1 M KOH	Science, 2016, 352, 333.
$Ni_{2/3}Fe_{1/3}$ LDH nanosheets	310	76	1 M KOH	ACS Nano,

				2015, 9, 1977.