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Supporting information

Preparation of Ni-Fe-based transition metal phosphide as efficient electrocatalyst for the oxygen evolution reaction

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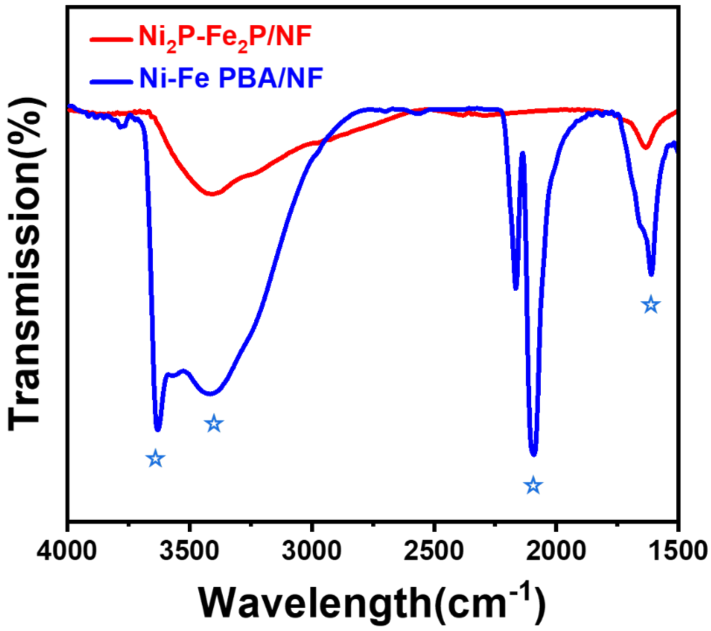

Fig. S1 FT-IR spectra of Ni_2P-Fe_2P/NF and Ni-Fe PBA/NF.

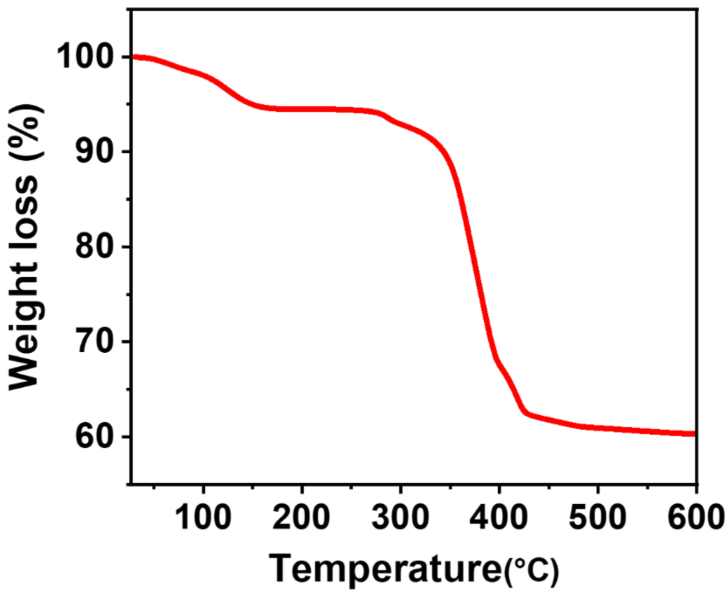

Fig. S2 TGA curve of Ni-Fe PBA precursor measured under a N_2 atmosphere.

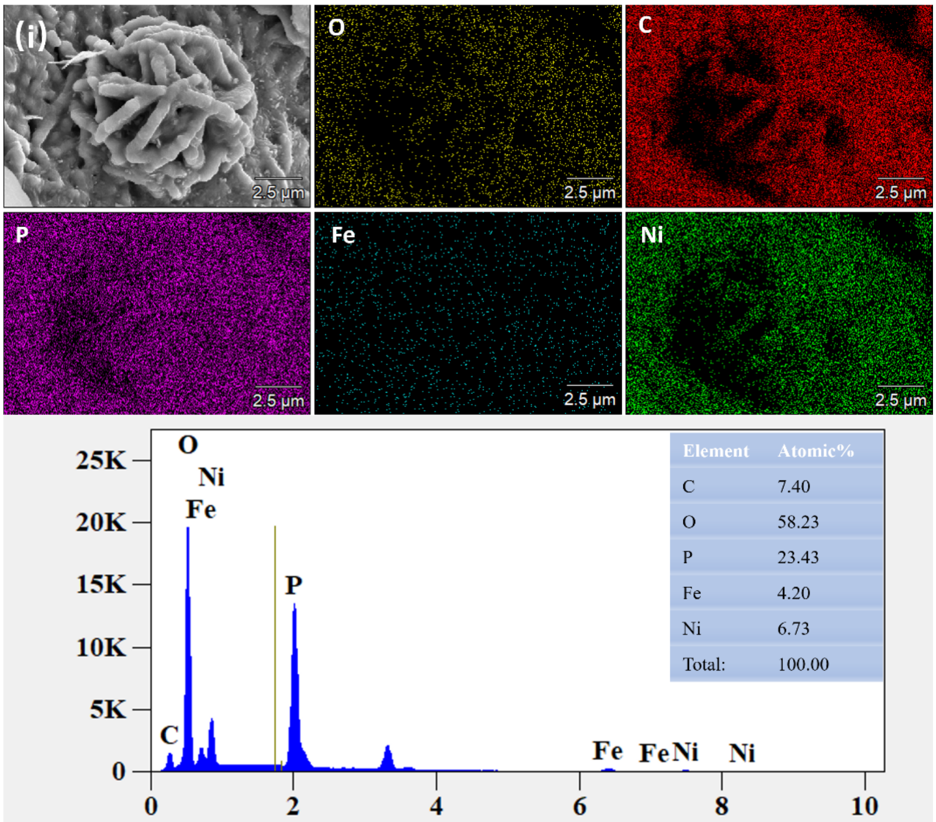

Fig. S3 EDX spectrum and corresponding elemental compositions of the Ni_2P-Fe_2P/NF.

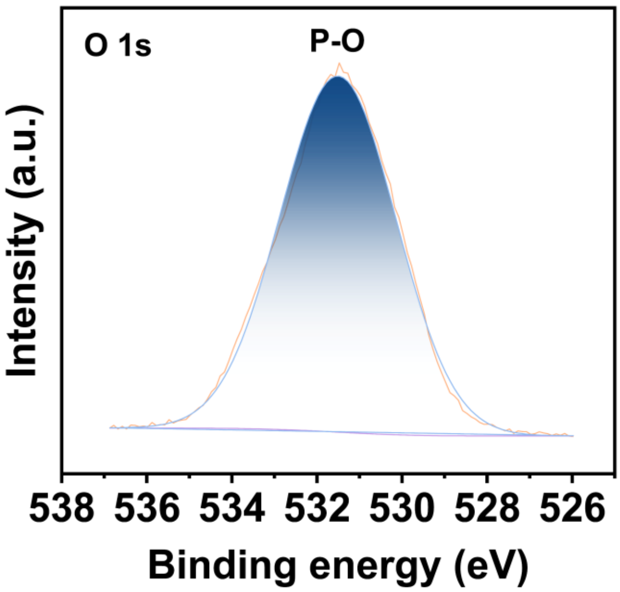

Fig. S4 High-resolution XPS spectrum of O 1s.

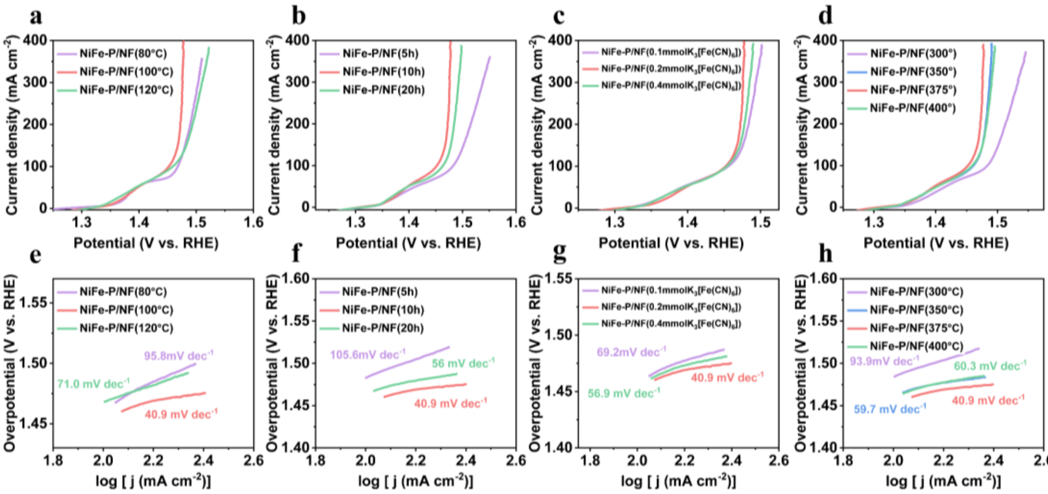

Fig. S5 Under different conditions, the LSV curves and Tafel slopes of mixed-metal phosphides.

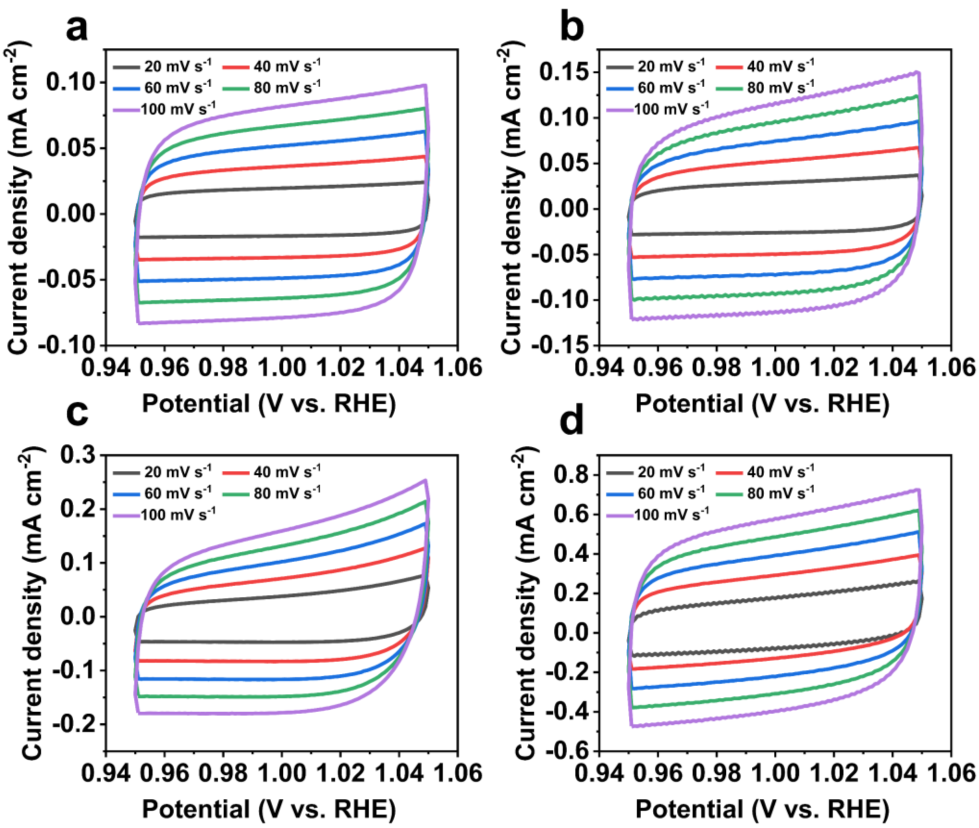

Fig. S6 The cyclic voltammograms (CVs) measurements with various scan rates for (a) NF, (b) $Ni(OH)_2$/NF, (c) Ni-Fe PBA/NF, (d)Ni_2P-Fe_2P/NF.

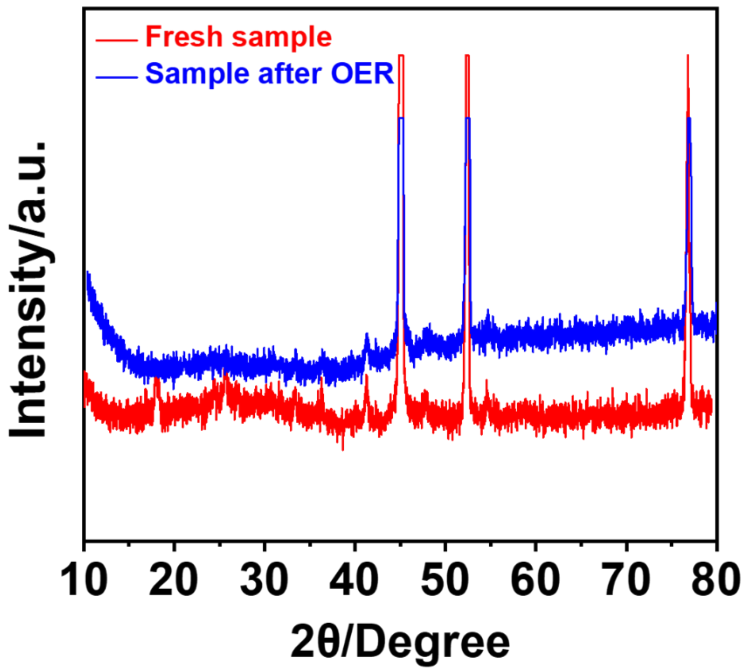

Fig. S7 The XRD patterns of fresh sample and sample after OER.

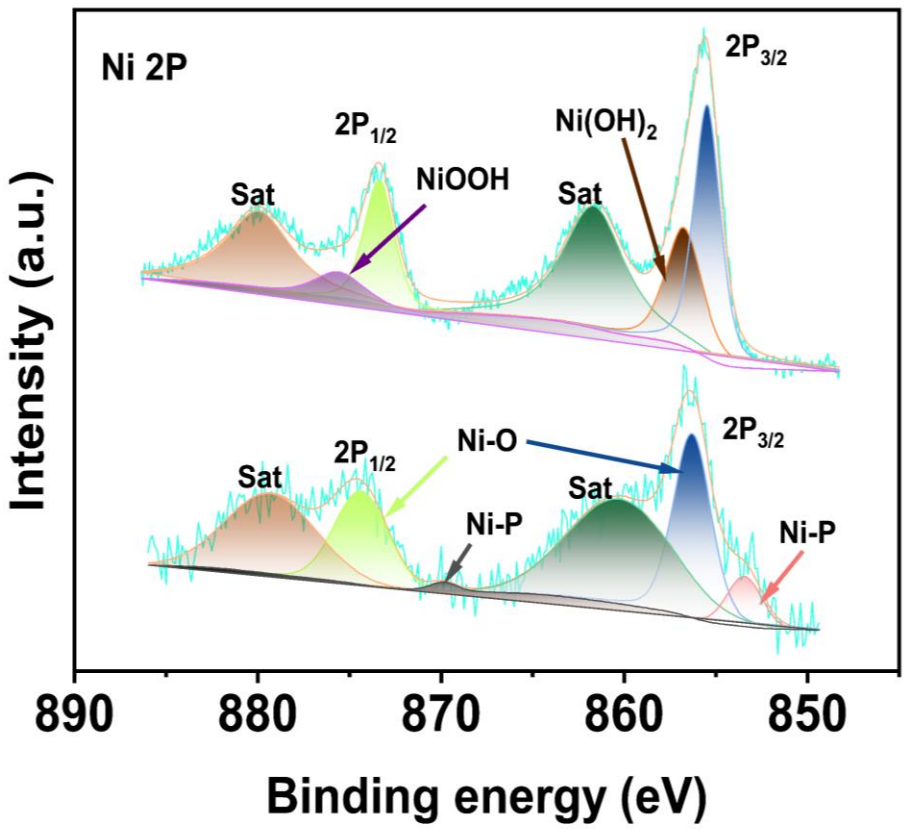

Fig. S8 The high resolution XPS of Ni 2p before (down) and after (up) OER test.

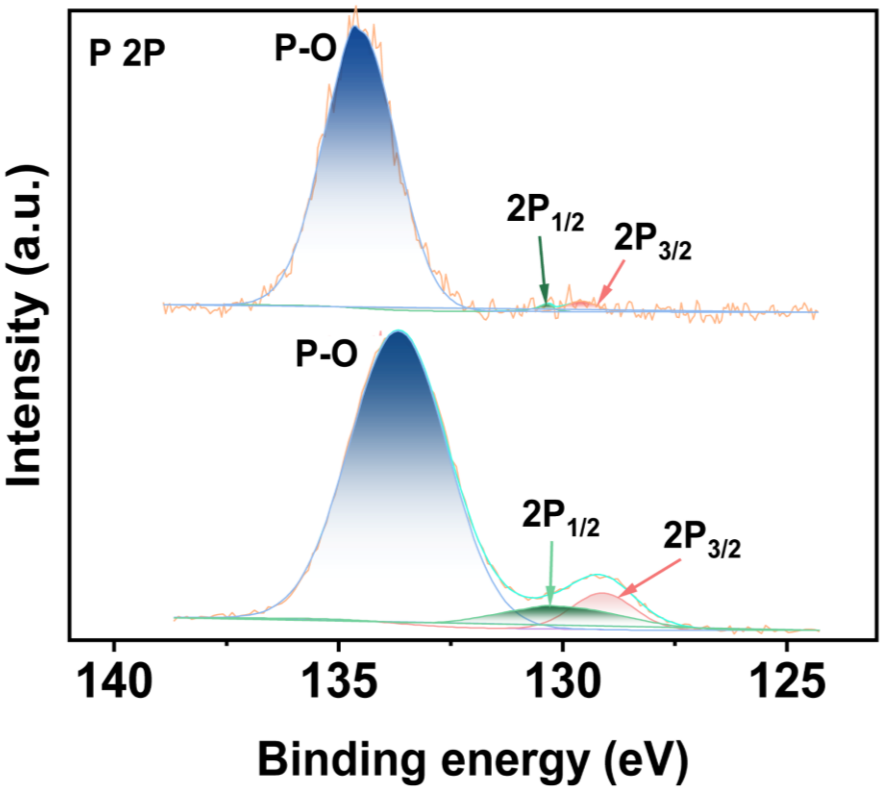

Fig. S9 The high resolution XPS of P 2p before (down) and after (up) OER test.

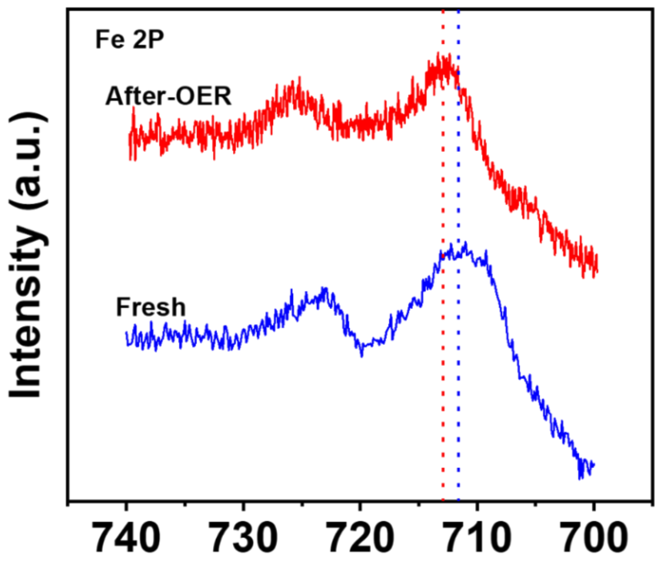

Fig. S10 The high resolution XPS of Fe 2p before (down) and after (up) OER test.

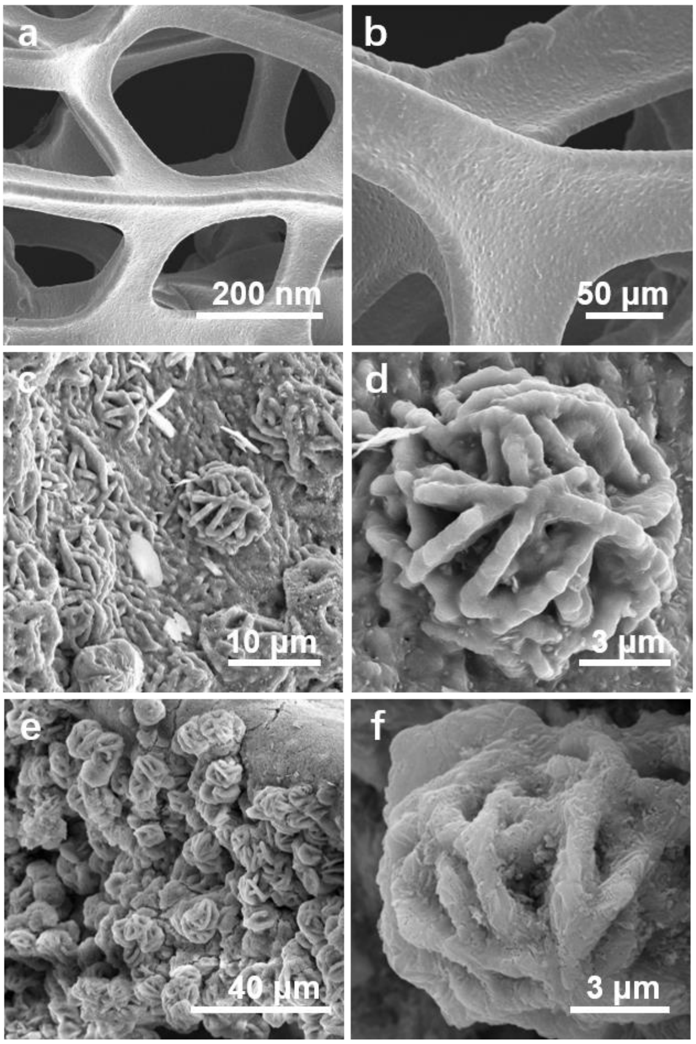

Fig. S11 The SEM images of (a,b)bare NF, (c,d) Ni_2P-Fe_2P/NF and (e,f) Ni_2P-Fe_2P/NF after OER test.

Table S1 Average mass loading of catalysts on NF substrates.

Samples	Mass loading (mg cm^{-2})
$Ni(OH)_2$/NF	3.19
Ni-Fe PBA/NF	2.02
Ni_2P-Fe_2P/NF	2.63

Table S2 The simulated series resistance (R_s) and charge transfer resistance (R_{ct}) values based on the fitting models.

Samples	R_s (Ω)	R_{ct} (Ω)
NF	1.258	5.68
$Ni(OH)_2$/NF	1.276	5.50
Ni-Fe PBA/NF	1.497	1.18
Ni_2P-Fe_2P/NF	1.288	0.23

Table S3 The activity comparison of PBA precursors on the surface of NF for OER in 1.0 M KOH solution.

Catalysis	Electrolyte	Overpotential	Tafel slope	Ref
Ni_2P-Fe_2P/NF	1 M KOH	222 mV 100 mA cm^{-2}	40.9 mV dec^{-1}	This work
NiFeP@NiP@NF	1 M KOH	252 mV 100 mA cm^{-2}	56 mV dec^{-1}	1
$NiFe_2O_4$@NPNiFePBA/NF	1 M KOH	304 mV 100 mA cm^{-2}	80 mV dec^{-1}	2
$Ni(OH)_2$@Ni_3S_2/NF	1 M KOH	210 mV 100 mA cm^{-2}	62.0 mV dec^{-1}	3
$NiSe_2$/CoSe/NF	1 M KOH	270 mV 100 mA cm^{-2}	69.77 mV dec^{-1}	4
Ni-Fe-P@NC/NF	1 M KOH	245 mV 100 mA·cm^{-2}	81.0 mV·dec^{-1}	5
(Mo, Fe)P_2O_7@NF	1 M KOH	250 mV 100 mA cm^{-2}	40.0 mV dec-1	6
$NiFeP_x$/NF	1 M KOH	258 mV 100 mA cm^{-2}	29 mV dec^{-1}	7
FeCoNi-LDH/NF	1.0 M KOH	230 mV	45.76 mV dec^{-1}	8

	+ 0.5 M urea	100 mA cm^{-2}		
FeCoNiN/NF	1 M KOH	267 mV 50 mA cm^{-2}	60mV dec^{-1}	9
Ni_3S_2@MIL-53(NiFeCo)/NF	1 M KOH	236 mV 50 mA cm^{-2}	14.8 mV dec^{-1}	10
MOF CoFeP	1 M KOH	140 mV 50 mA cm^{-2}	40 mV dec^{-1}	11
NiFeP@NC/NF	1 M KOH	286 mV 20 mA cm^{-2}	69 mV dec^{-1}	12
Ru–MnFeP/NF	1 M KOH	191 mV 20 mA cm^{-2}	69 mV dec^{-1}	13
PBA-SMo /NF-10 h	1 M KOH	252 mV 20 mA cm^{-2}	64 mV dec^{-1}	14
CuFe-P/NF	1 M KOH	231 mV 10 mA cm^{-2}	63.0 mV dec^{-1}	15
Fe-CoP/NF	1 M KOH	190 mV 10 mA cm^{-2}	92 mV dec^{-1}	16
$Ni_xCo_{3-x}O_4$/NF	1 M KOH	287 mV 10 mA cm^{-2}	88 mV dec^{-1}	17
CoFePBA@NiCoFe-LTH/NF	1 M KOH	228 mV 10 mA cm^{-2}	36 mV dec^{-1}	18
$(NiCo)_2P$/NF	1 M KOH	162 mV 10 mA cm^{-2}	135 mV dec^{-1}	19

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