Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Biomimetic Nanocoral Reef Electrocatalysts of 2D-Ni(Co,Fe)P/1D-WO_x for Efficient Water Splitting

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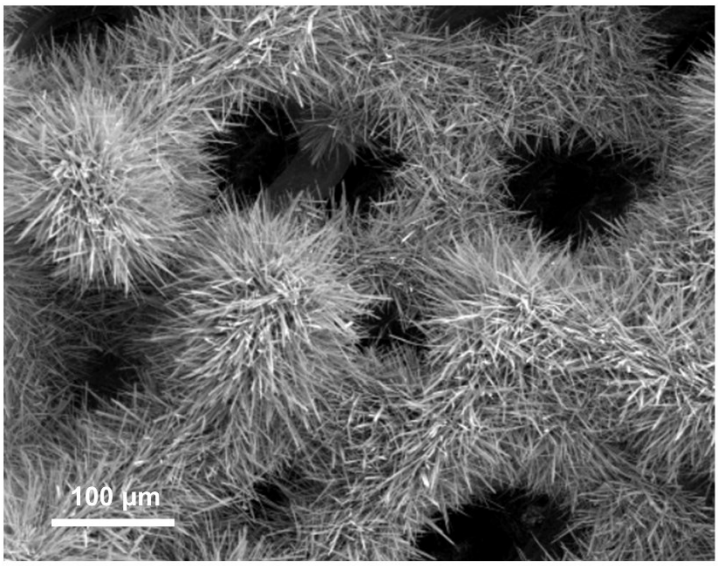

Fig. S1 A SEM image of the WO_x NWs colonies on 3D nickel foam.

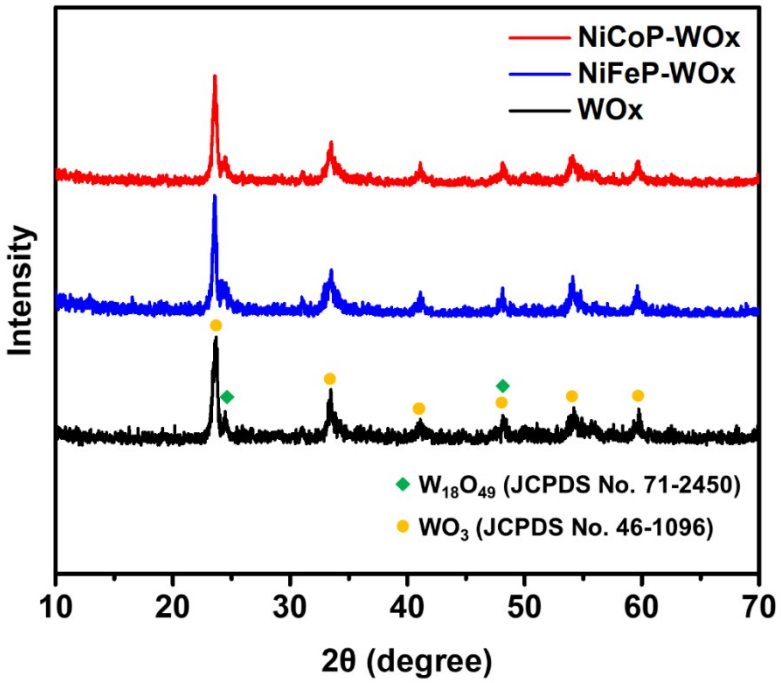

Fig. S2 XRD patterns of NiCoP-WO_x, NiFeP-WO_x and WO_x.

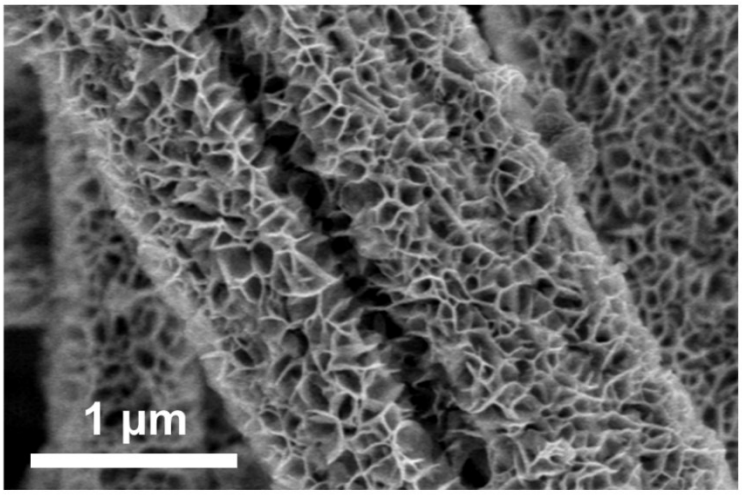

Fig. S3 SEM image of the NiFeP-WO_x nanocoral reef catalyst.

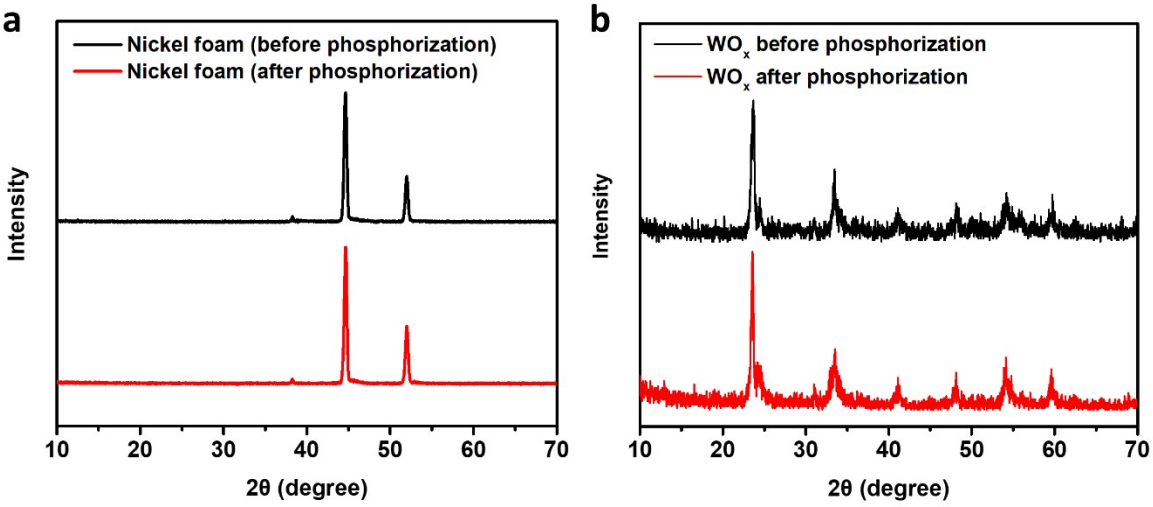

Fig. S4 XRD peaks of (a) nickel foam and (b) WO_x/nickel foam before and after phosphorization.

a

Element	Atomic %
W	14.82
O	45.94
Ni	15.13
Co	7.22
P	16.89

b

Element	Atomic %
W	14.61
O	49.36
Ni	13.44
Fe	3.31
P	19.28

Fig. S5 Atomic composition ratios of the catalyst surfaces obtained from the EDX analysis:

(a) NiCoP-WO_x and (b) NiFeP-WO_x.

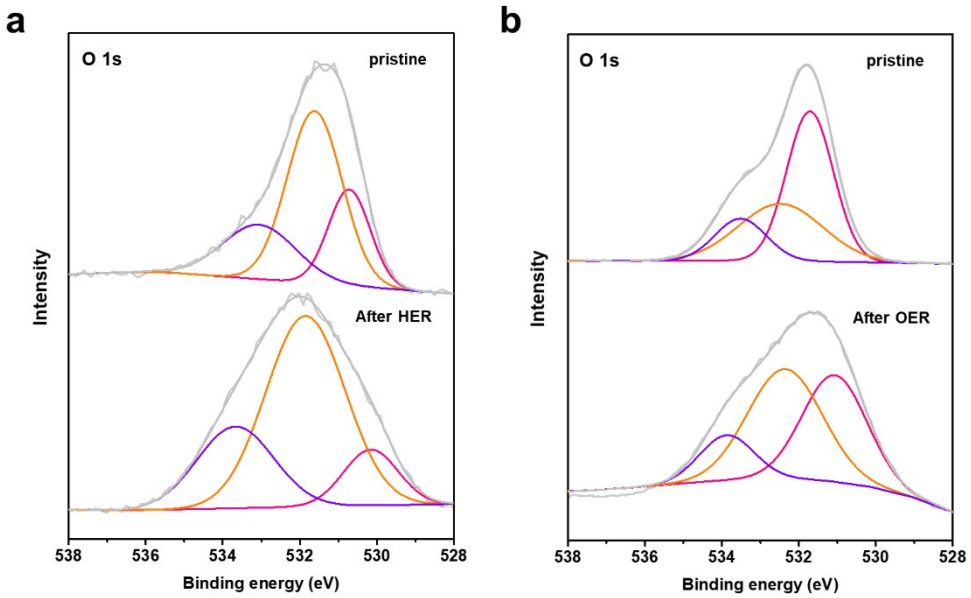

Fig. S6 XPS O 1s spectra: (a) NiCoP-WO_x and (b) NiFeP-WO_x.

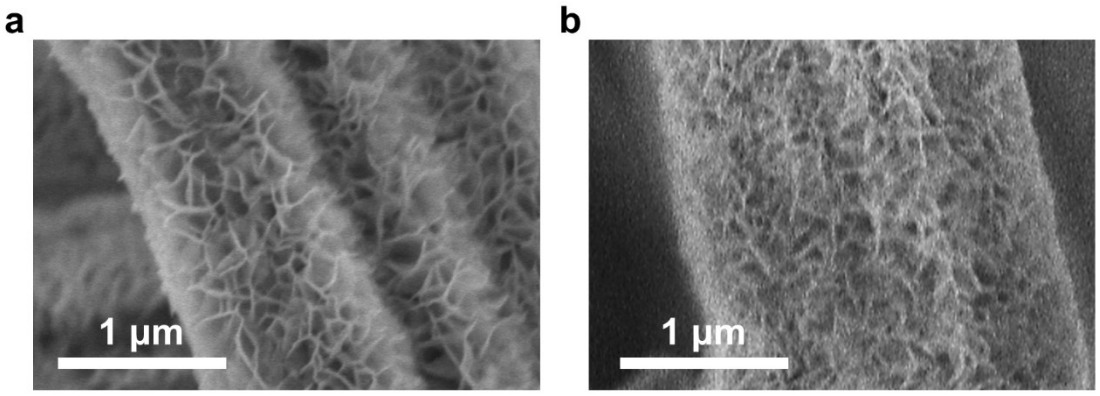

Fig. S7 SEM images after the stability test: (a) NiCoP-WO_x and (b) NiFeP-WO_x.

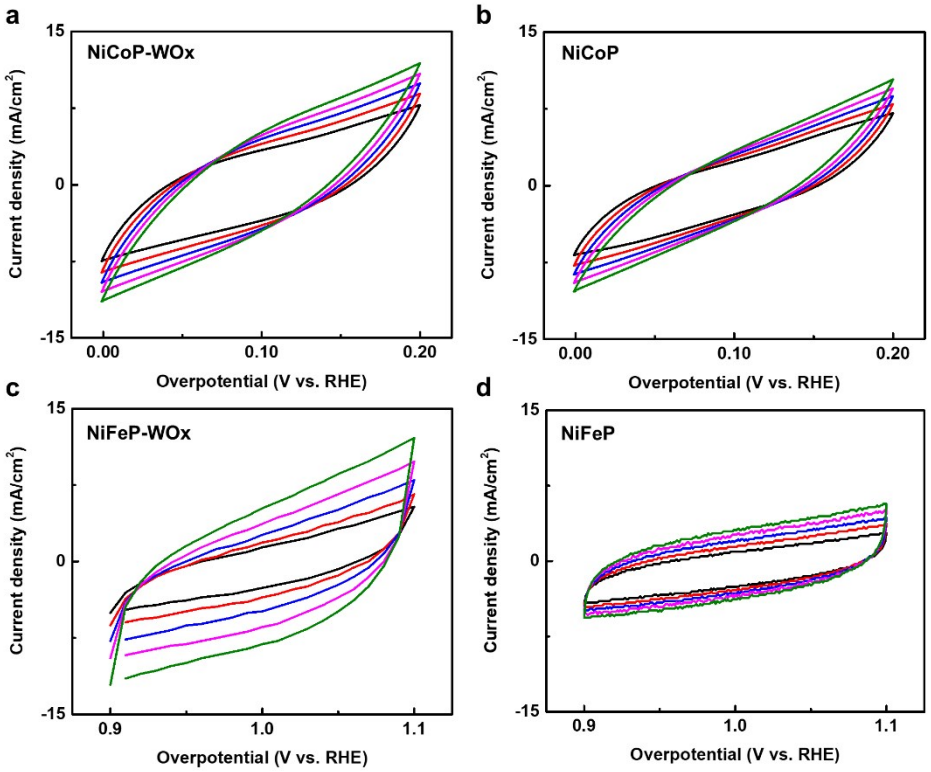

Fig. S8 Cyclic voltammograms of catalysts in the non-Faradaic capacitance current range at scan rates of 60, 80, 100, 120 and 140 mV/s: (a) NiCoP-WO_x, (b) NiCoP, (c) NiFeP-WO_x, and (d) NiFeP.

Catalysts	η_{10} (HER)	η_{10} (OER)	Cell voltage$_{10}$ (OWS)
This work	49 mV	270 mV	1.51 V
Pt@Co_3O_4/NF[47]	30 mV	263 mV	1.53 V
Pt-CoS_2/CC[48]	24 mV	300 mV	1.55 V
PtNiP MNs/C[49]	54 mV	320 mV	1.59 V
Co-P-B-5[50]	145 mV	290 mV	1.56 V
Fe_xV_yPC/NF[51]	66 mV	201 mV	1.56 V
V-$FeNi_2P$[52]	70 mV	200 mV	1.57 V
Fe_x-NiCoP[53]	60 mV	293 mV (50 mA/cm²)	1.61 V
NiFeP NSA[26]	106 mV	270 mV (20 mA/cm²)	1.62 V
CoP ND[54]	134 mV	318 mV	1.62 V
CoP/TM[55]	72 mV	310 mV	1.64 V
H-CoP@NC[56]	200 mV	320 mV	1.72 V

Table. S1 Comparison of HER/OER/OWS performance of our catalysts with other noble and non-noble metal electrocatalysts in alkaline media (1.0 M KOH).