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Supporting Information

Dual-regulating Strategy Fabrication of Porous NiFeP/Ni Electrode for Highly Efficient Hydrazine Oxidation Boost H_2 Evolution

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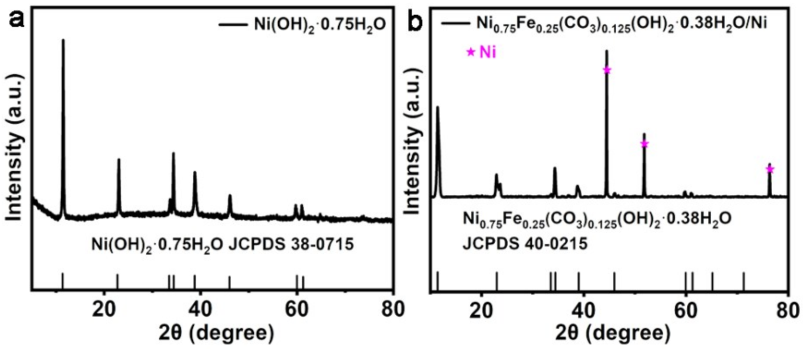

Fig. S1 (a) The XRD patterns of $Ni(OH)_2{\cdot}0.75H_2O$ and (b) Pre-NiFe/Ni.

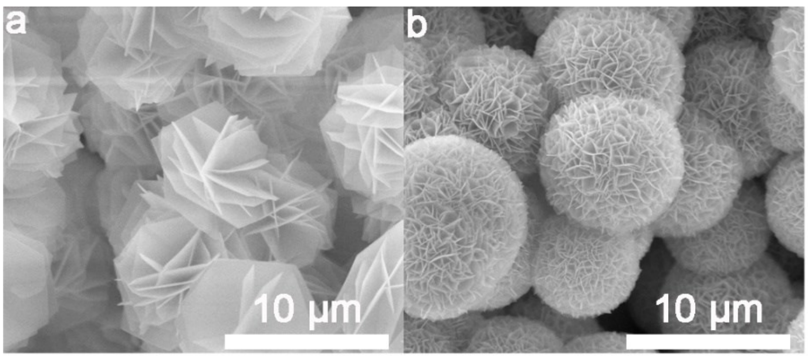

Fig. S2 (a) The SEM images of $Ni(OH)_2{\cdot}0.75H_2O$/Ni and (b) Pre-NiFe/Ni.

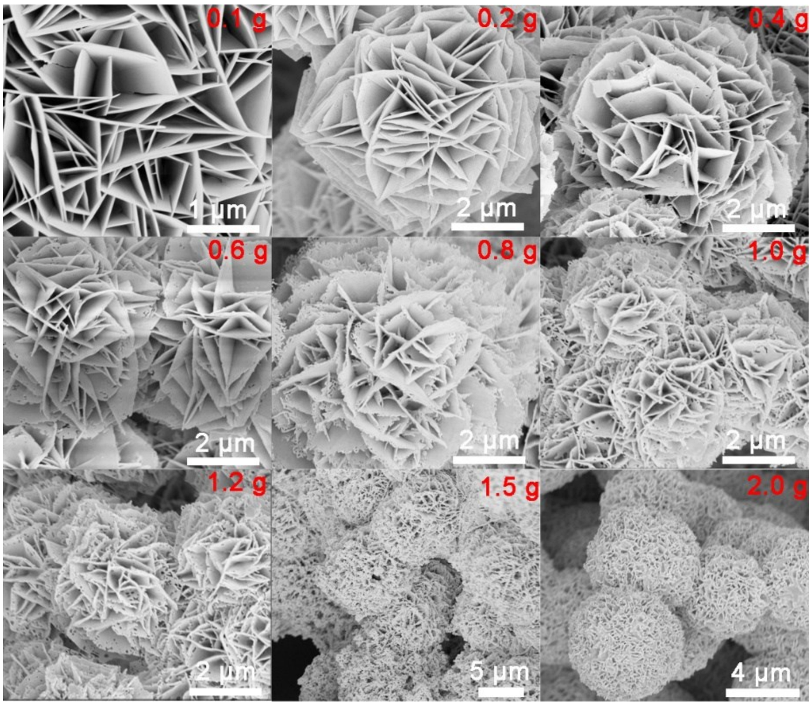

Fig. S3 The SEM images of P-NiFeP/Ni under the different phosphorus sources content.

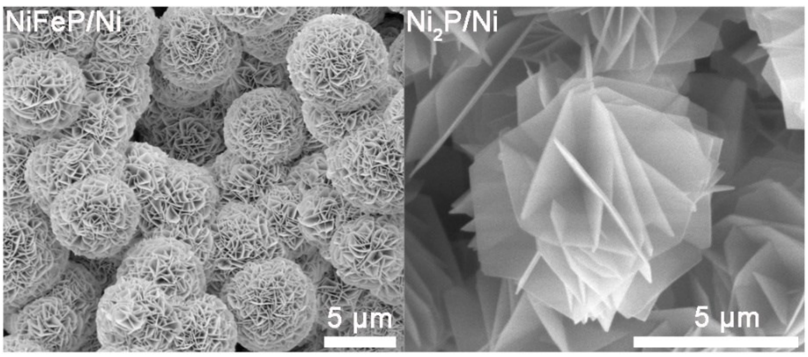

Fig. S4 The SEM images of NiFeP/Ni and Ni_2P/Ni under the same phosphating conditions as P-NiFeP/Ni.

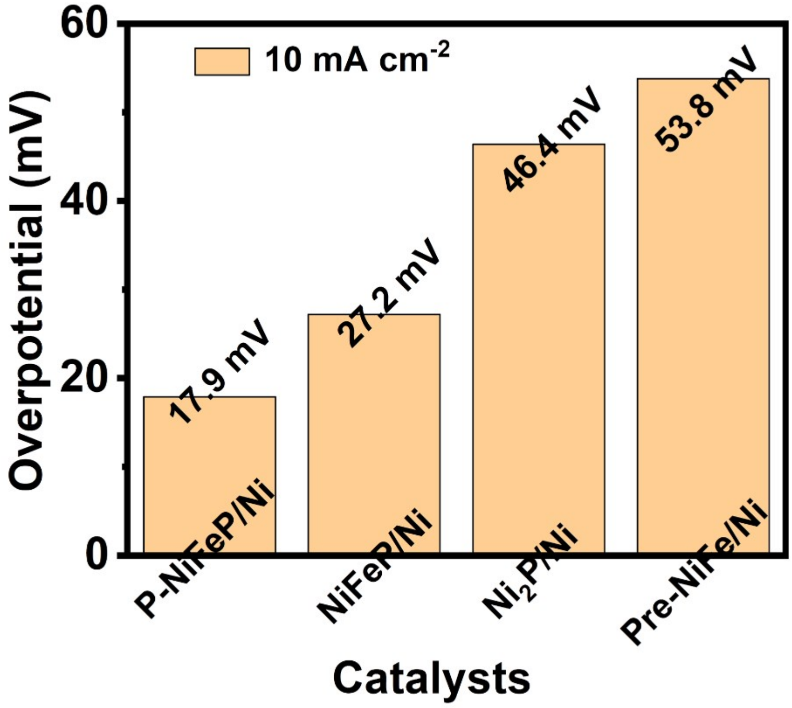

Fig. S5 The overpotential of the catalysts at 10 mA cm^{-2}.

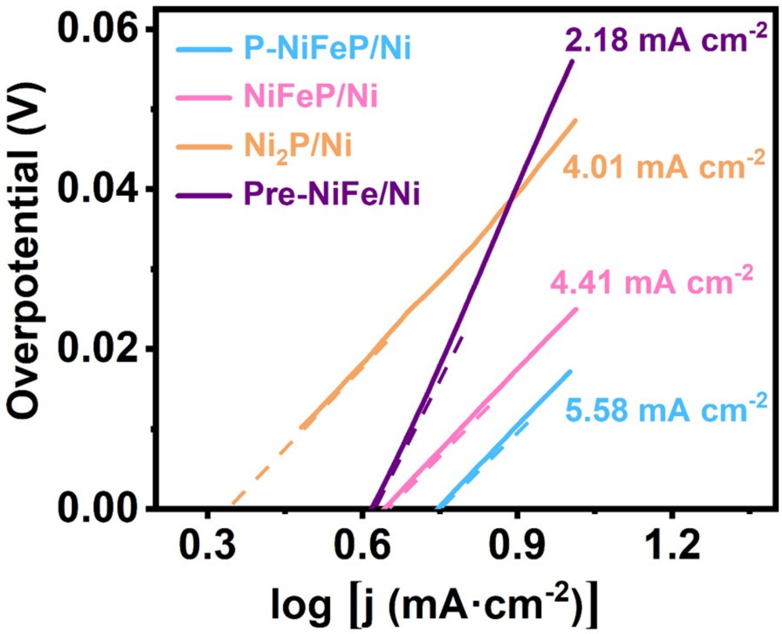

Fig. S6 The exchange current density of the as-prepared catalysts.

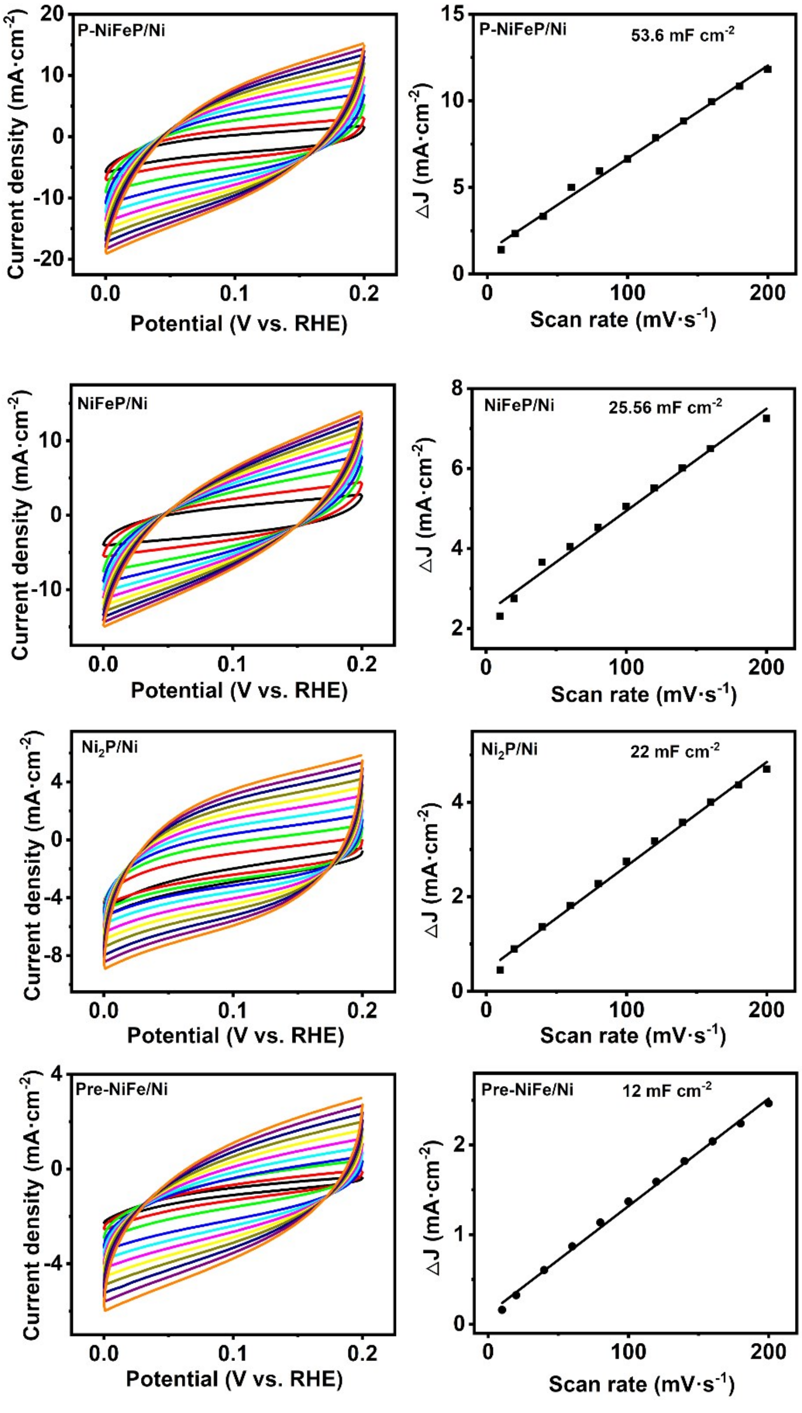

Fig. S7 The CV curves for catalysts with scanning rates from 10 to 200 mV s^{-1} and the capacitive current densities as a function of scan rate for catalysts.

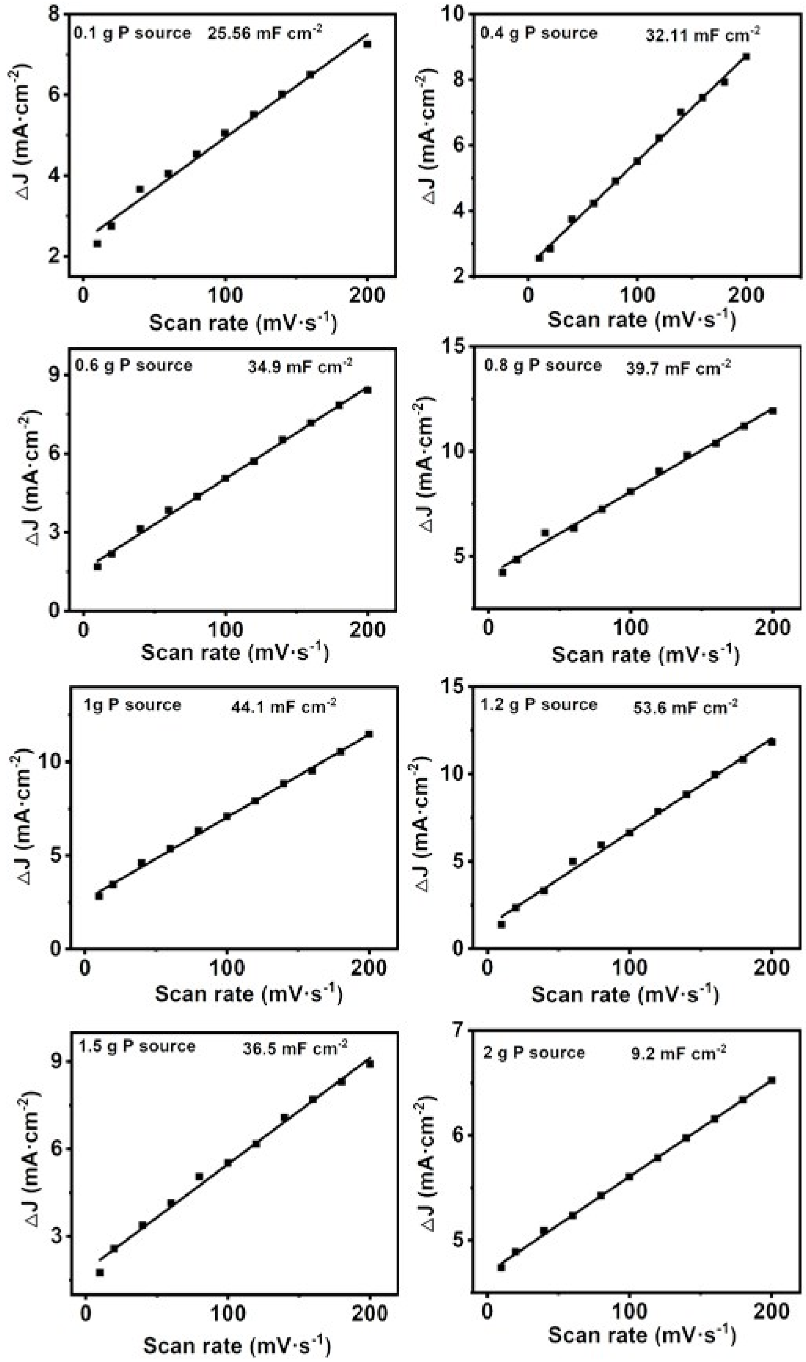

Fig. S8 The capacitive current densities as a function of scan rate for P-NiFeP/Ni with different phosphorus sources.

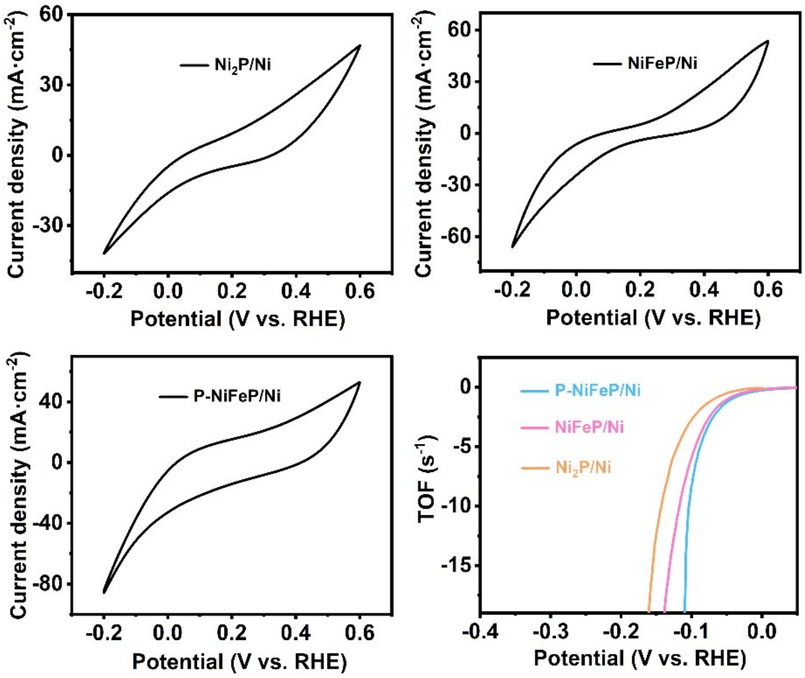

Fig. S9 The CVs with a scan rate of 100 mV s^{-1} at pH=7 and turnover frequency for as-synthesized samples.

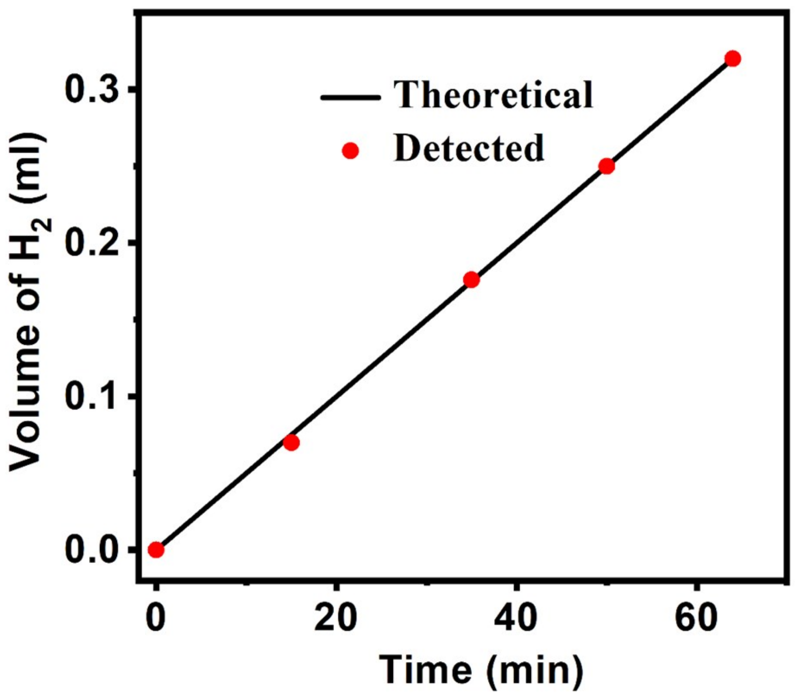

Fig. S10 The amount of H_2 theoretically calculated and experimentally measured versus time for P-NiFeP/Ni at pH = 14 at an overpotential of 300 mV for 80 min.

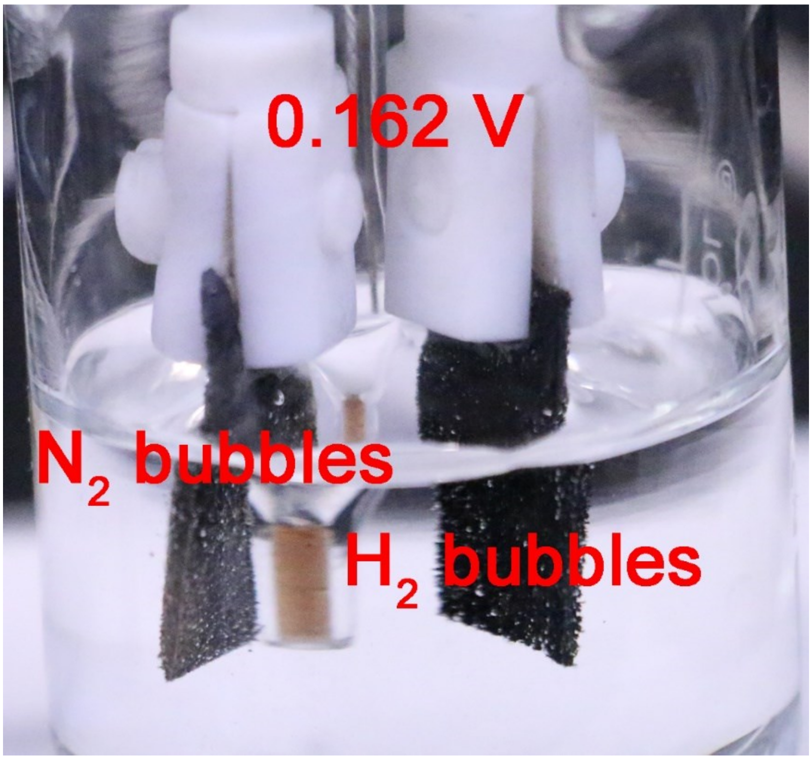

Fig. S11 The photo of the P-NiFeP/Ni electrode couple system for overall hydrazine splitting at 0.162 V voltage.

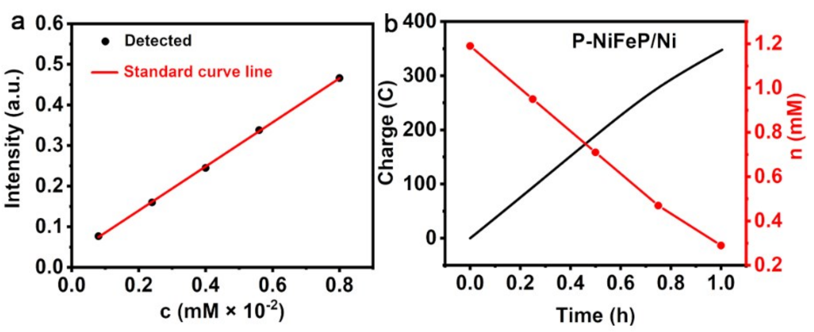

Fig. S12 (a) Calibration curve of reaction products of hydrazine with p-dimethylaminobenzaldehyde. (b) Hydrazine concentration–time and charge–time curve during constant potential (0.28 V vs. RHE) electrolysis.

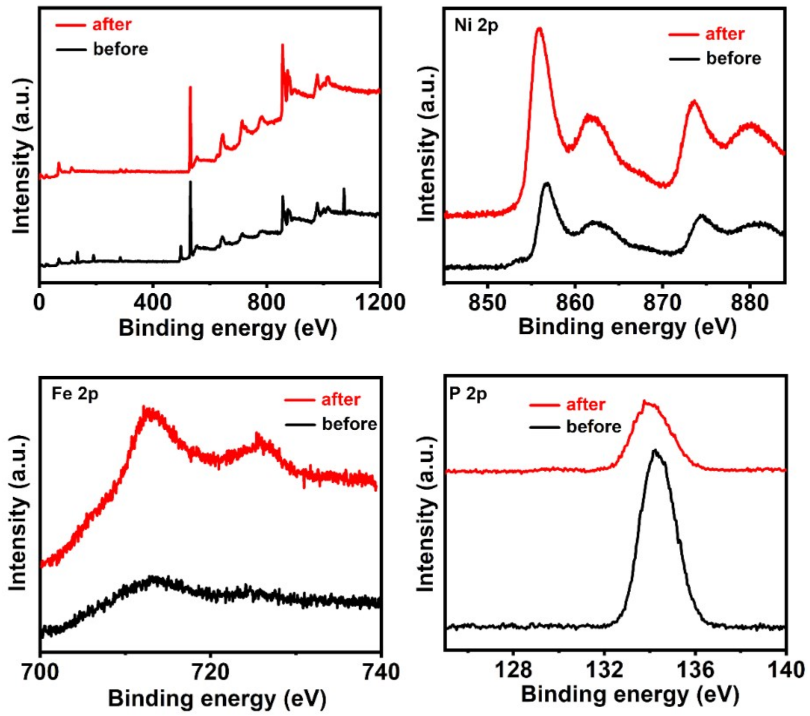

Fig. S13 The comparison of the XPS spectra of P-NiFeP/Ni before and after hydrazine oxidation.

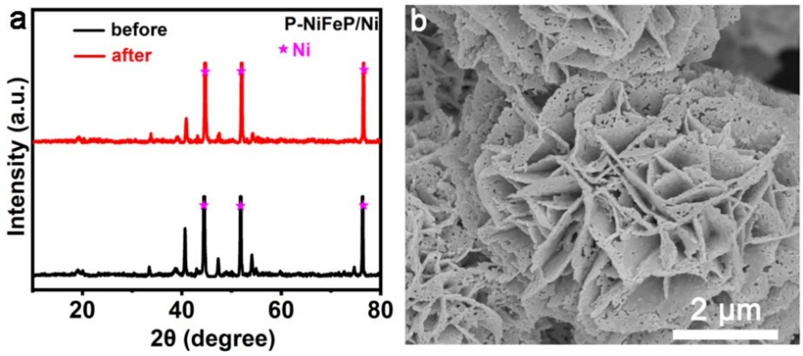

Fig. S14 The XRD pattern and SEM image of P-NiFeP/Ni after H_zOR.

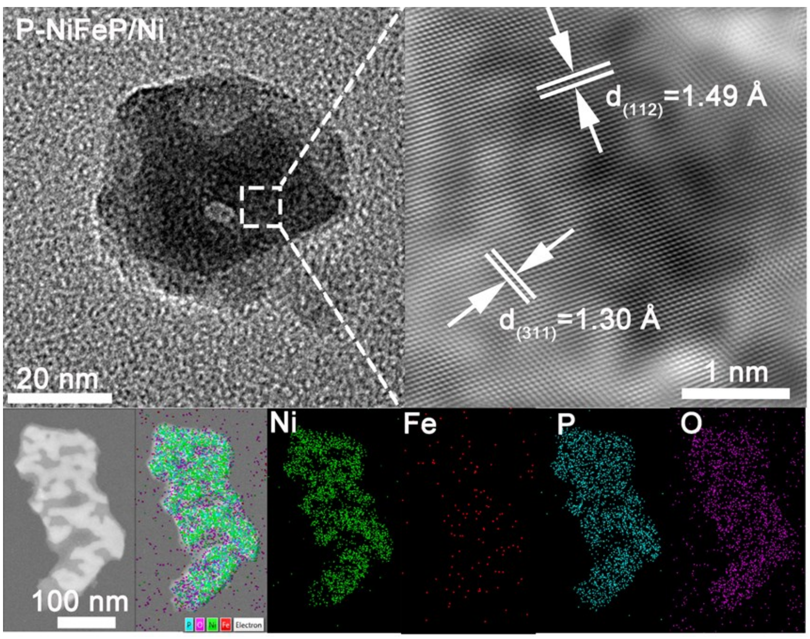

Fig. S15 The TEM image and corresponding the elements mapping of P-NiFeP/Ni after H_zOR.

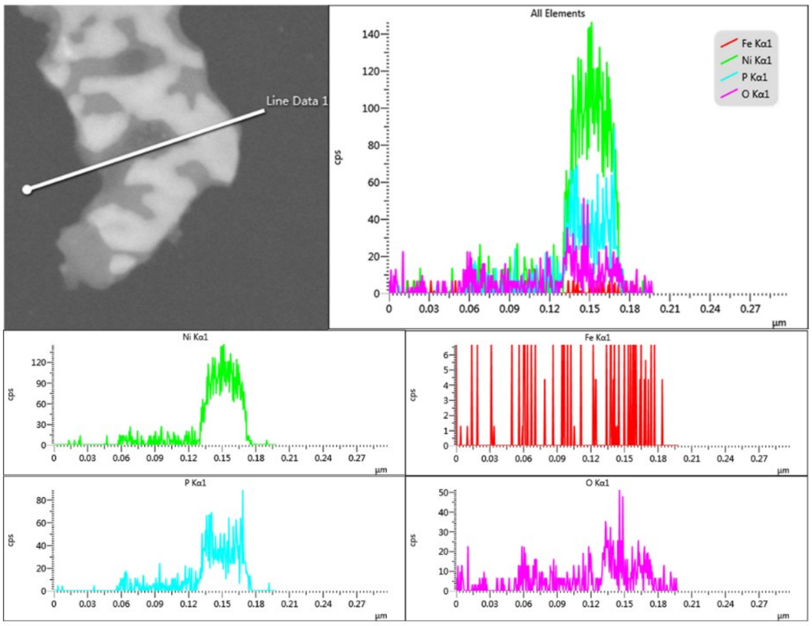

Fig. S16 The compositional line profiles of Ni (green), Fe (red), P (cyan), and O (pink) were recorded along the arrow of the sample after testing.

Table S1. The content of each element in P-NiFeP/Ni determined by XPS.

Element	Atomic (%)
C	9.65
O	58.26
Fe	4.87
Ni	12.8

P	14.42

Table S2. The content of each element in P-NiFeP/Ni determined by EDS.

Element	Weight (%)	Atomic (%)
C	3.54	11.07
O	13.31	31.26
P	10.46	12.69
Fe	5.18	3.49
Ni	63.70	40.77
Pt	3.82	0.74

Table S3. Comparison of the HER performance of this work with the reported catalysts in 1.0 M KOH.

Materials	η_{10} (mV)	Tafle slope (mV dec^{-1})	Reference
P-NiFeP/Ni	**17.9**	**63**	**This work**
PW-Co_3N NWA/NF	41	40	1
Ni_3N/C	64	48	2

N-CoP_2	38	46	3
Co_2N/Co	12	41.6	4
Co_4N	37	44	5
Co-Ni_3N	194	156	6
NiP_2-650	134	67	7
TM-$ReSe_2$	109	81	8
SGNC-900	32	39	9

Table S4. Comparison of the H_zOR performance of this work with recently reported catalysts in 1.0 M KOH.

Catalysts	Current density (mA)	Overpotential (mV)	Reference
P-NiFeP/Ni	10	77	This work
	100	153	
	300	269	
$CoSe_2$	10	164	10
Cu_1Ni_2-N	50	96.9	11
Ni_xP/NF	172	100	12
Ni_3S_2/NF	100	415	13
NiZn	320	600	14
$NiCoSe_2$/NF	40	600	15
Ni_3Se_4/NF	75	400	16
NiFeP/NM	200	300	17
$Ni_{0.6}Co_{0.4}Se$/NF	300	400	18

Notes and references

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