Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information for

High-efficiency Ni-P catalysts with amorphous and crystalline states on hydrogen evolution reaction

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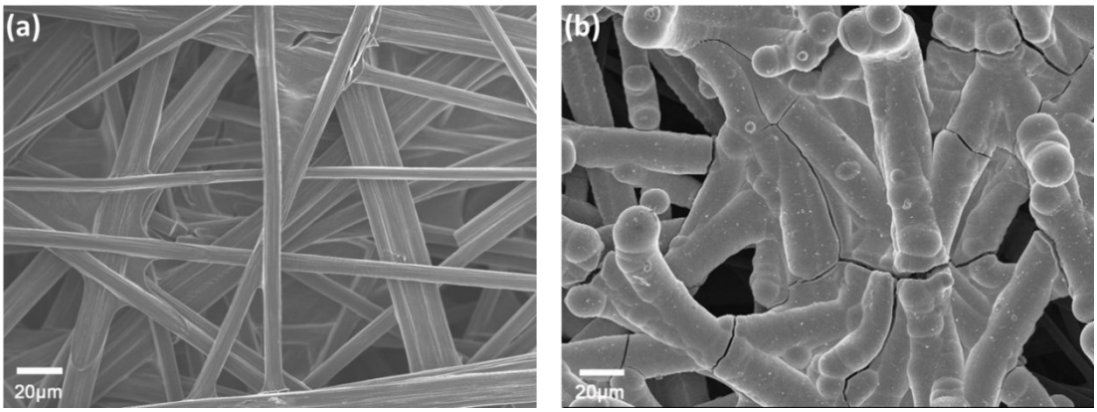

Figure S1 (a) The SEM images of bare CFP and (b) Ni-P-2/1.

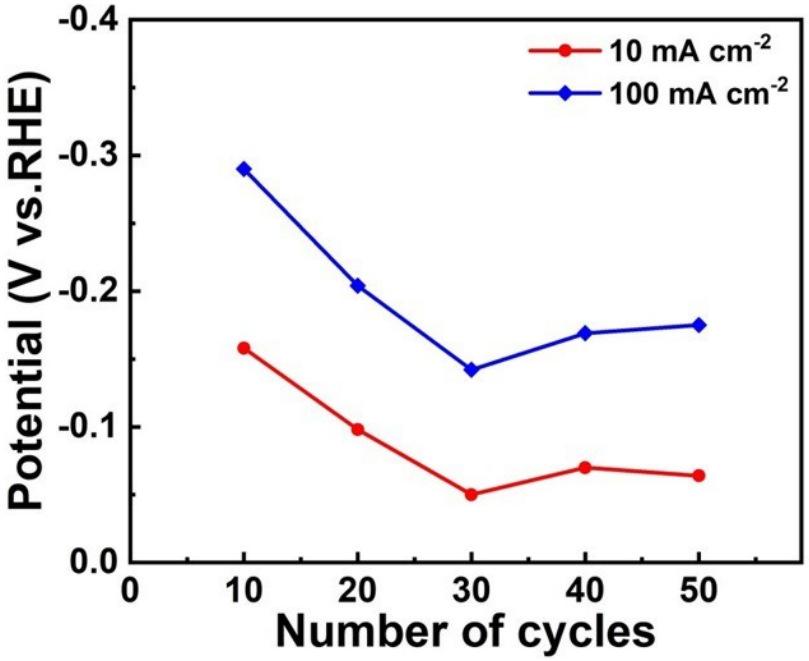

Figure S3 The catalytic activity of the samples prepared with different deposition circles.

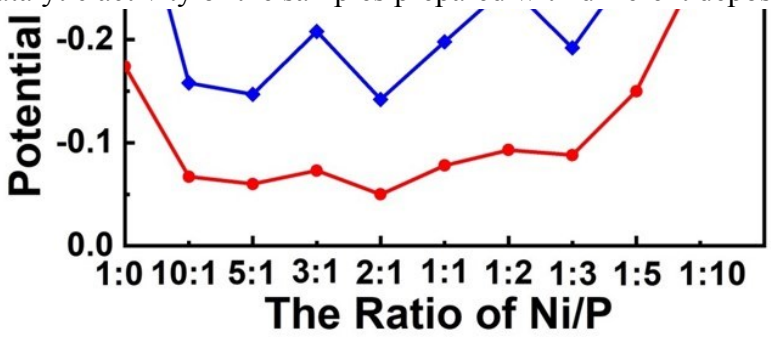

Figure S2 The catalytic activity of the samples prepared with different Ni-P ratio in the solutions.

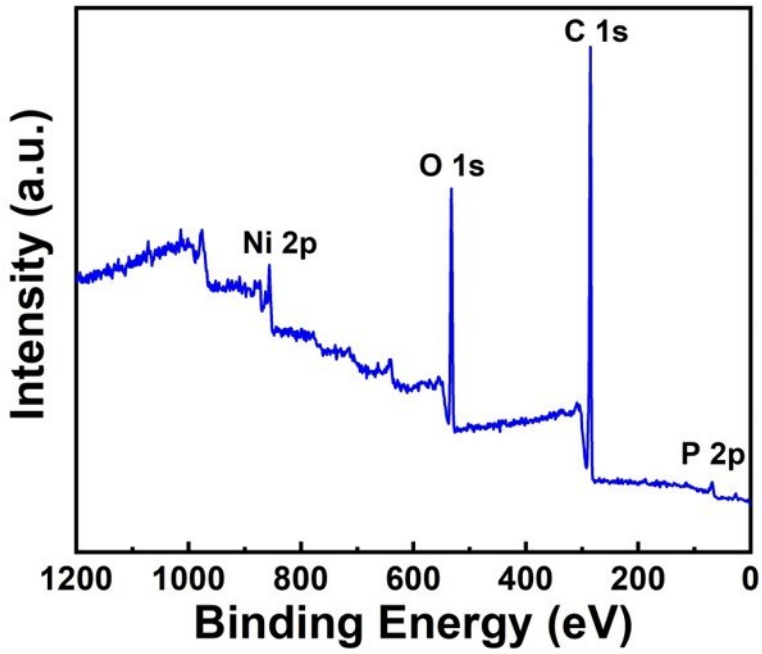

Figure S4 The XPS survey of the Ni-P-2/1 sample.

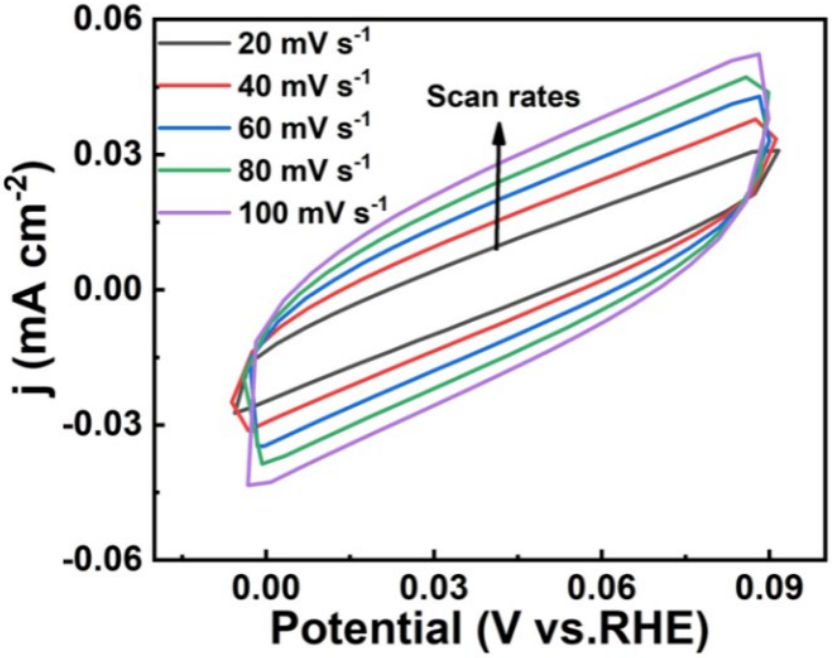

Figure S5 CV curves of bare CFP with different scanning rates.

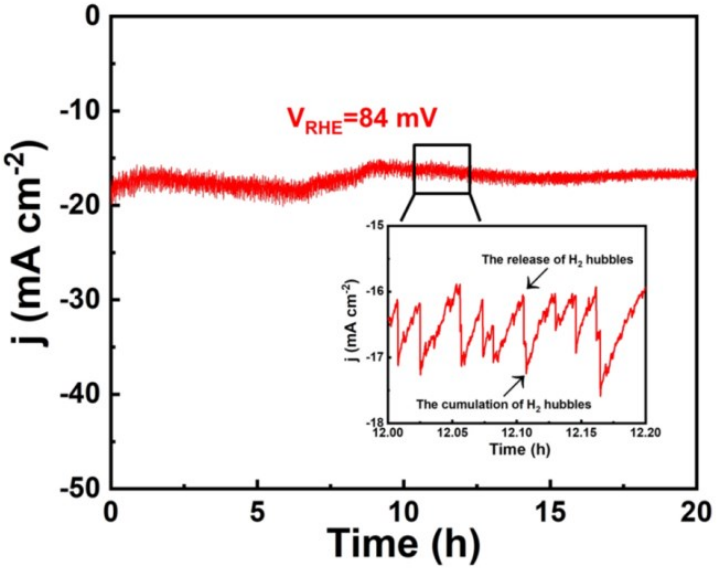

Figure S6 The potentiostatic test at 84 mV on Ni-P-2/1 in 1.0 M KOH and the inset image shows the release and cumulation of H_2 hubbles.

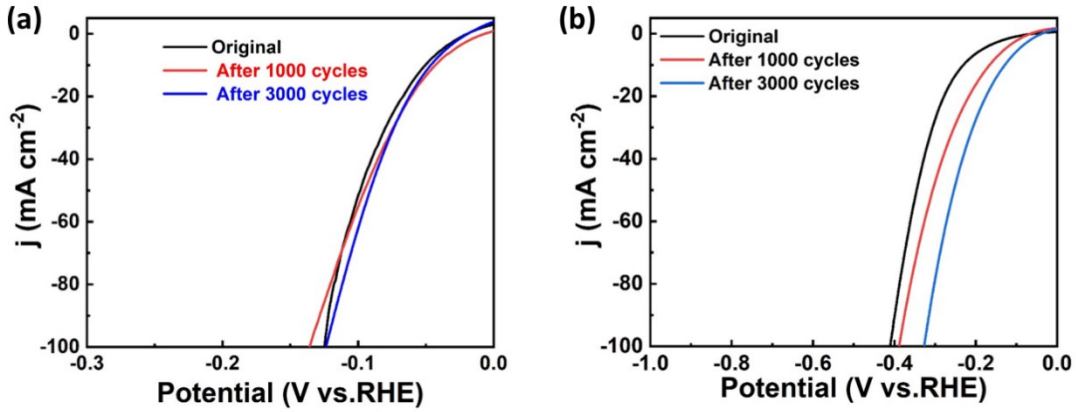

Figure S7 The LSV curves of (a) Ni-P-2/1 and (b) annealed Ni-P at the first cycle and after 1000, 3000 cycles in 1.0 M KOH.

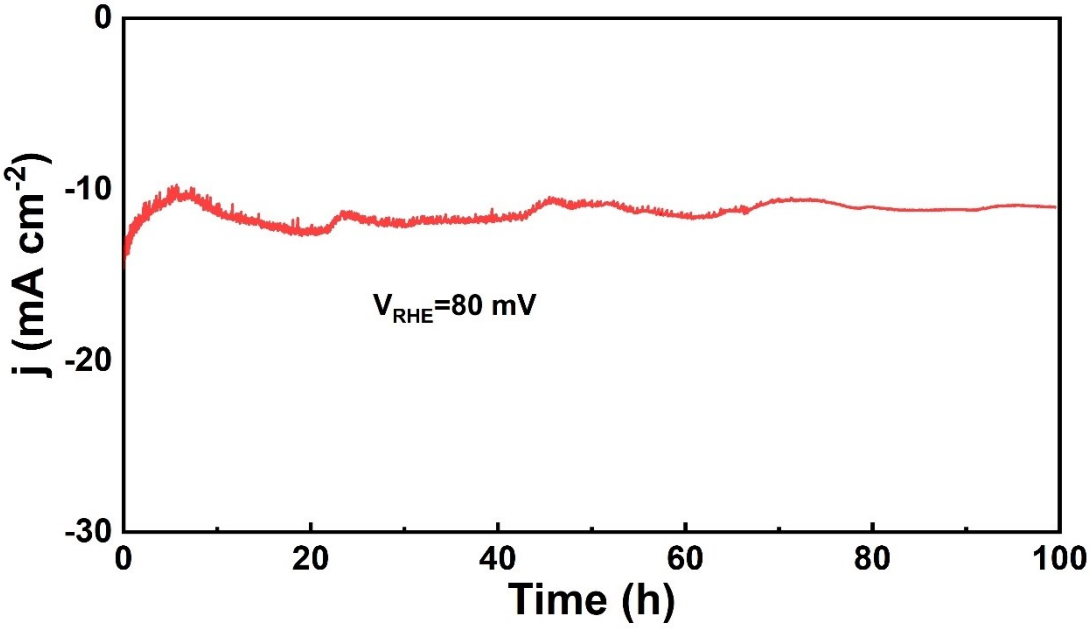

Figure S8 The potentiostatic test of Ni-P-2/1 in 1.0 M KOH for 100 h.

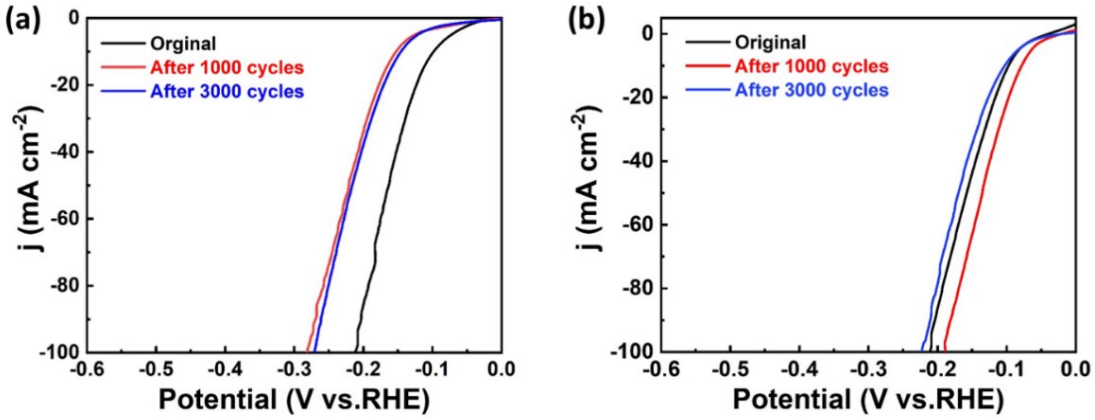

Figure S9 The LSV curves of Ni-P-2/1 (a) and annealed Ni-P (b) at the first cycle and after 1000, 3000 cycles in 0.5 M H_2SO_4.

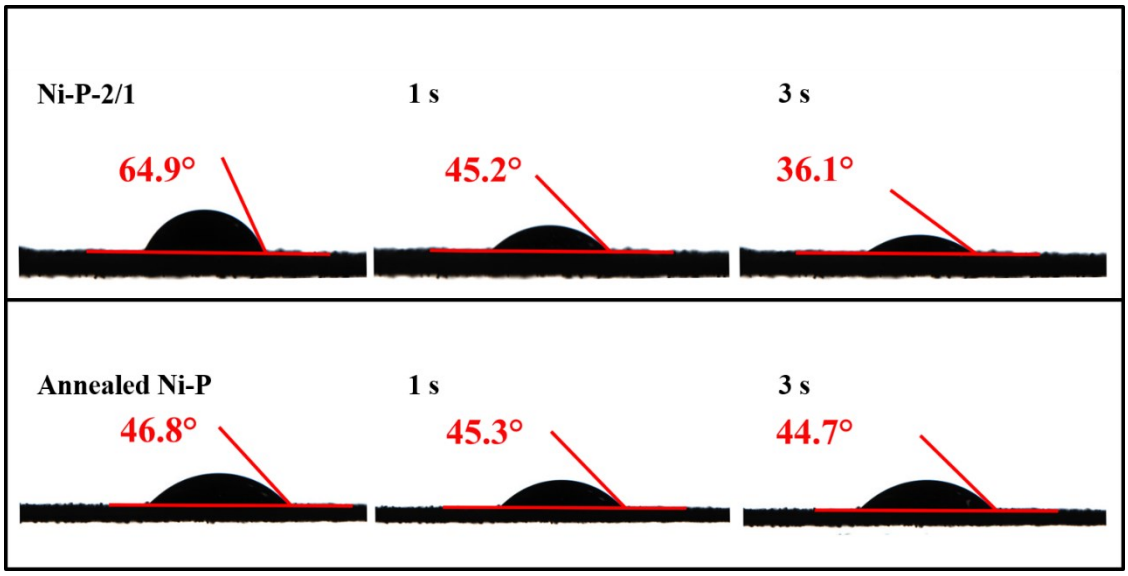

Figure S10 Contact angles of Ni-P-2/1 and annealed Ni-P.

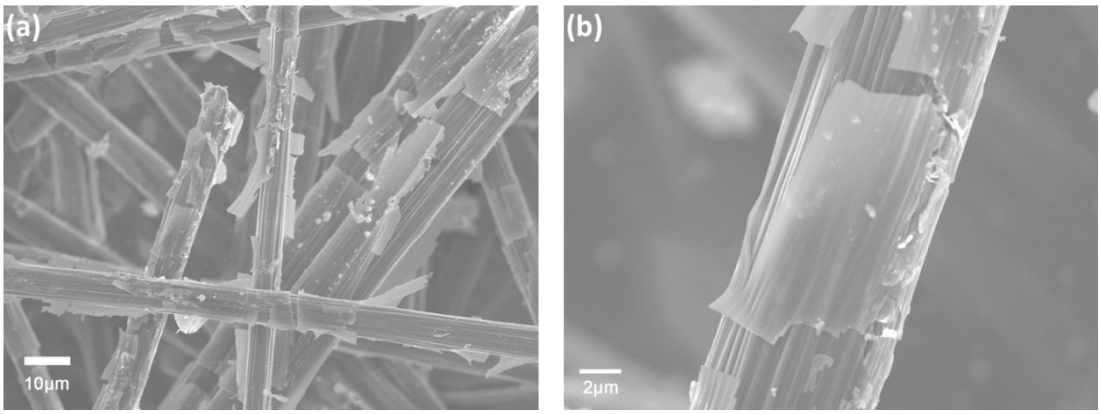

Figure S11 (a) Low and (b) high magnification SEM images of Ni-P-2/1 after stability test.

Table S1 Comparison of the performance of non-noble metal electrocatalysts in 1.0 M KOH or 0.5 M H_2SO_4

Catalyst	Substrate	Electrolyte	Overpotential at 10 mA cm^{-2}	References
Ni-P-2/1	Carbon fiber paper	1 M KOH	50	This work
Ni-$N_{0.59}$	Carbon fiber paper	1 M KOH	42	[1]
Ni_3Se_2 nanoforest	Ni foam	1 M KOH	203	[2]
N-doped surface-etched Stainless steel	Stainless steel mesh	1 M KOH	230	[3]
NiMoN	Carbon cloth	1 M KOH	109	[4]
$NiCo_2P_x$ nanowires	Carbon felt	1 M KOH	58	[5]
$Ni_{0.89}Co_{0.11}Se_2$	Ni foam	1 M KOH	85	[6]
Ce-doped CoP	Ti	1 M KOH	92	[7]
Cu,O-CoP	Carbon cloth	1 M KOH	98	[8]
S-$NiFe_2O_4$	NF	1 M KOH	138	[9]
Ni_2P@NPCNFs	Carbon cloth	1 M KOH	104	[10]
Ni-P-2/1	Carbon fiber paper	0.5 M H_2SO_4	94	This work
FeS_2 nanoparticles	RGO	0.5 M H_2SO_4	139	[11]
CoS_2 nanowires	Graphite	0.5 M H_2SO_4	145	[12]
Mo_2C microislands	Carbon cloth	0.5 M H_2SO_4	140	[13]
$NiCo_2P_x$ nanowires	Carbon felt	0.5 M H_2SO_4	104	[5]
CoP	Carbon cloth	0.5 M H_2SO_4	67	[14]
FLNPC@MoPNC/MoP-C	Carbon cloth	0.5 M H_2SO_4	74	[15]
$CoSe_2$ nanoparticles	Carbon paper	0.5 M H_2SO_4	137	[16]
FeP nanowire array	Ti plate	0.5 M H_2SO_4	57	[17]
Ni_5P_4–Ni_2P nanosheets	Ni foam	0.5 M H_2SO_4	120	[18]
Cu_3P nanowire arrays	Cu foam	0.5 M H_2SO_4	143	[19]

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