

Supporting Information

Self-supporting np-AlFeNiO bifunctional electrode material for electrochemical water splitting prepared by electrooxidation

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Figure S1. The cross section SEM of the dealloyed sample.

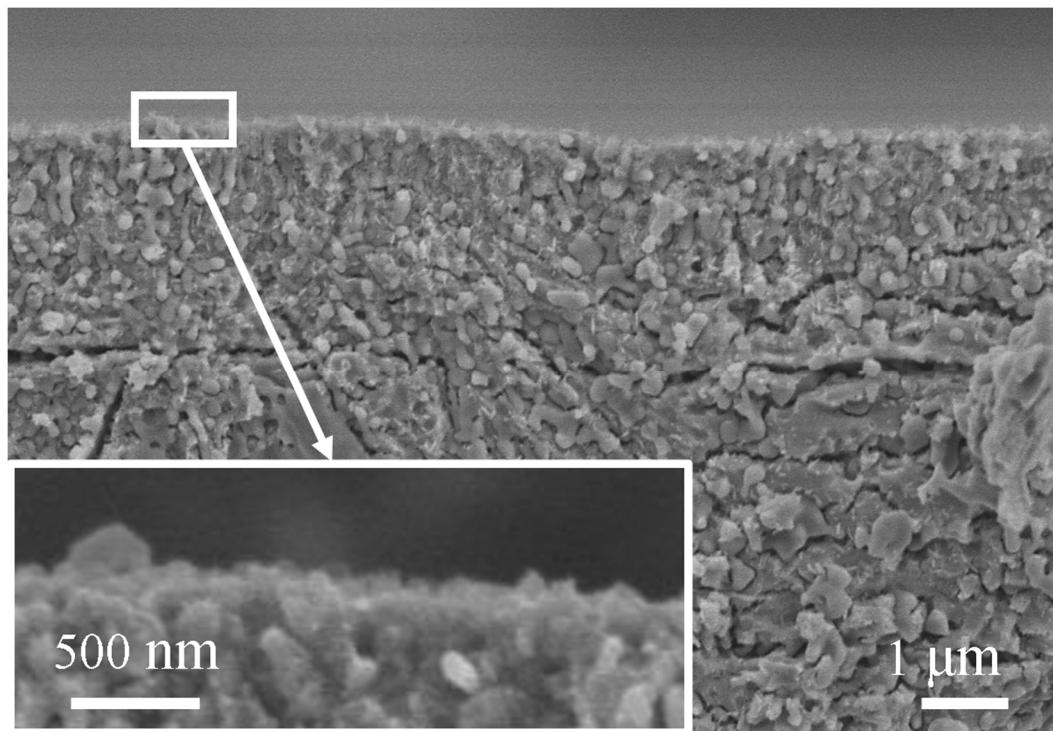


Figure S1. The SEM of cross-section of the dealloyed sample.

Figure S2. (a) TEM and (b) HRTEM images of np-AlFeNiO-4s sample.

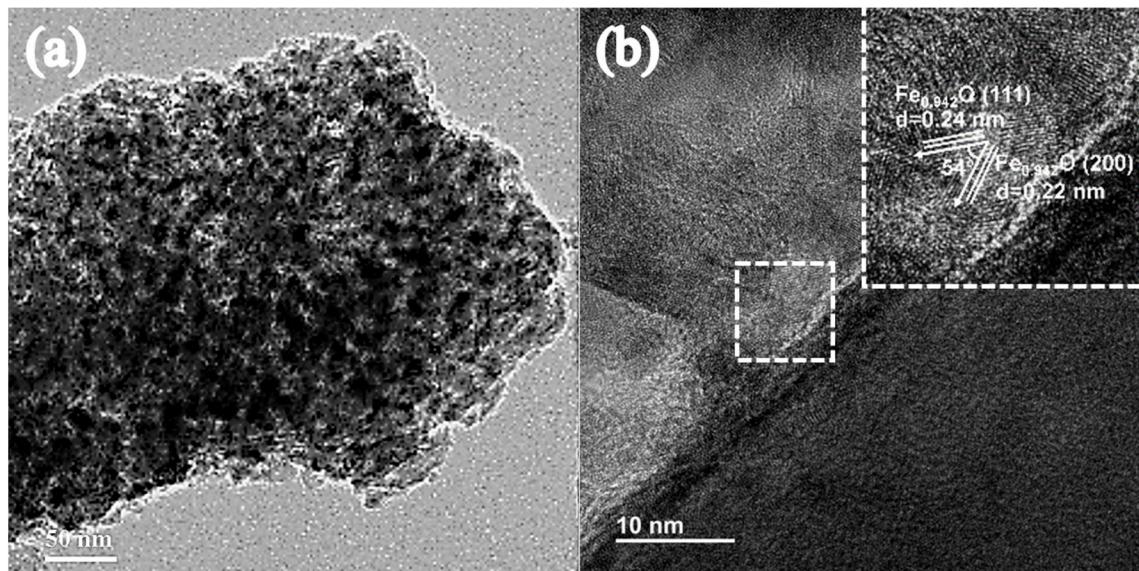


Figure S2. (a) TEM and (b) HRTEM images of np-AlFeNiO-4s sample.

Figure S3. (a) TEM and (b) HRTEM images of np-AlFeNiO-4s sample.

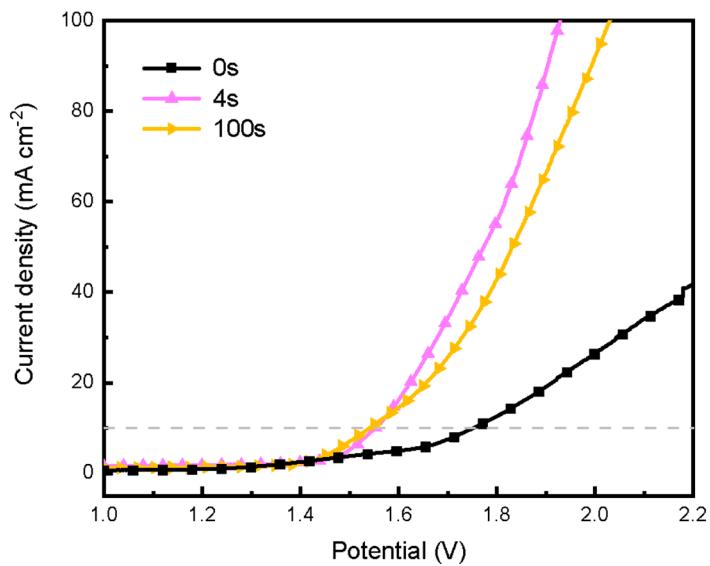


Figure S3. The LSV curves of np-AlFeNiO-0s, 4s and 100s two-electrode configuration system in 1 M KOH with iR correction ($iR = 20 \text{ mV}$)

Table S1. The EDX results of the samples.**Table S1.** The EDX results of the samples.

Element	The precursor ribbon	np-AlFeNiO-0s	np-AlFeNiO-4s	np-AlFeNiO- 100s
Al[%]	50.28	3.27	1.86	1.34
Fe[%]	17.38	25.33	24.91	23.63
Ni[%]	13.78	22.55	21.71	16.38
O[%]	18.56	48.85	51.52	58.65

Table S2. The overpotentials at 10 mA cm⁻², Tafel slope, C_{dl}, ECSA and TOF of np-AlFeNiO for HER.

Table S2. The overpotentials at 10 mA cm⁻², Tafel slope, C_{dl}, ECSA and TOF of np-AlFeNiO for HER.

Catalyst	Overpotential (mV) 10 mA cm ⁻²	Tafel Slope (mV dec ⁻¹)	C _{dl} (mF cm ⁻²)	ECSA	TOF(s ⁻¹)
np-AlFeNiO-0s	121	141	3.26	81.5	0.17
np-AlFeNiO-1s	58	53	6.98	174.5	0.34
np-AlFeNiO-4s	32	41	8.83	220.75	0.38
np-AlFeNiO-20s	53	49	5.04	126	0.39
np-AlFeNiO-50s	64	67	3.37	84.25	0.40
np-AlFeNiO-100s	77	96	1.44	36	0.33

Table S3. The overpotential at 10 mA cm^{-2} , Tafel slope for HER electrocatalysts in recently reported literature.

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Catalyst	Overpotential (mV) 10 mA cm^{-2}	Tafel Slope (mV dec $^{-1}$)	Reference
np-AlFeNiO-4s	32	41	This work
np-Pd ₁₀ Fe ₇₀ P ₅ C ₁₅	45	30	[S1]
(Ni, Fe)S ₂ @MoS ₂	130	101.22	[S2]
NiCo-300	156	82.7	[S3]
CFC@EC/CoP	39	37	[S4]
N-CNT@Cu ₁ -Fe ₁ Oxide Alloy NPs	375	68.28	[S5]
Mn _x O _y @FNS	105	57.89	[S6]
Fe-Ni@NC-CNTs	202	113.7	[S7]
NiO/Al ₃ Ni ₂	66	87	[S8]
Rh/NiFeRh-LDH	57	81.3	[S9]
Fe-MOF@MoS ₂ -6h	118	68	[S10]
NiO@Co ₃ O ₄ /CF	104	109	[S11]
NiFeVS _x @NF	127	121	[S12]

Table S4. The overpotential at 10 mA cm⁻² and 100 mA cm⁻², the Tafel slope of np-AlFeNiO for OER.

Table S4. The overpotential at 10 mA cm⁻² and 100 mA cm⁻², the Tafel slope of np-AlFeNiO for OER.

Catalyst	Overpotential (mV)		Tafel Slope (mV dec ⁻¹)
	10 mA cm ⁻²	100 mA cm ⁻²	
np-AlFeNiO-0s	282	321	39.63
np-AlFeNiO-1s	279	320	42.99
np-AlFeNiO-4s	279	318	40.24
np-AlFeNiO-20s	283	325	40.16
np-AlFeNiO-50s	279	319	40.54
np-AlFeNiO-100s	278	319	40.08

Table S5. The overpotential at 10 mA cm⁻² and 100 mA cm⁻², the Tafel slope for OER electrocatalysts in recently reported literatures.

Table S5. The overpotential at 10 mA cm⁻² and 100 mA cm⁻², the Tafel slope for OER electrocatalysts in recently reported literatures.

Catalyst	Overpotential (mV)		Tafel Slope (mV dec ⁻¹)	Reference
	10 mA cm ⁻²	100 mA cm ⁻²		
np-AlFeNiO-4s	279	318	40.24	This work
Rh/NiFeRh-LDH	206	229	40	[S5]
NiFe_B	290	464	36	[S7]
Fe-Ni-nanotube	236	290	125	[S9]
Fe-MOF@MoS ₂ -6h	187	251	61	[S13]
(Ni, Fe)S ₂ @MoS ₂	270	330	43.21	[S14]
NiCo-300	320	390	69.4	[S15]
NiFeVS _x @NF	259	334	34	[S16)
Ni ₁₈ Fe ₁₂ Al ₇₀	255	345	44	[S17]
Ni/Ni(OH) ₂	310	410	74.8	[S18]
Mo-CoP/Co-N-C	201	283	88	[S19]
Fe ₂ O ₃ /ZnCo ₂ O ₄	212	~370	77	[S20]

Table S6. Comparison of the overall hydrolysis performance for electrocatalysts in recently reported literatures.

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Catalyst	Cell voltage (V)	Reference
np-AlFeNiO-4 s	1.56	This work
(Ni, Fe)S ₂ @MoS ₂	1.56	[S2]
NiCo-300	1.69	[S3]
Rh/NiFeRh-LDH	1.46	[S9]
Fe-MOF@MoS ₂ -6h	1.52	[S10]
NiFeVS _x @NF	1.60	[S12]
Ni ₁₈ Fe ₁₂ Al ₇₀	1.54	[S21]
Ni/Ni(OH) ₂	1.68	[S22]
Fe-Ni-nanotube	1.58	[S23]
Fe ₂ O ₃ /ZnCo ₂ O ₄	1.44	[S24]
CoCr-LDH@VNiS ₂	1.62	[S25]

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