Supporting Information

Metastable State Structure Promotes Surface Reconstruction of Spinel $NiFe_2O_4$ for Efficient Oxygen Evolution Reaction

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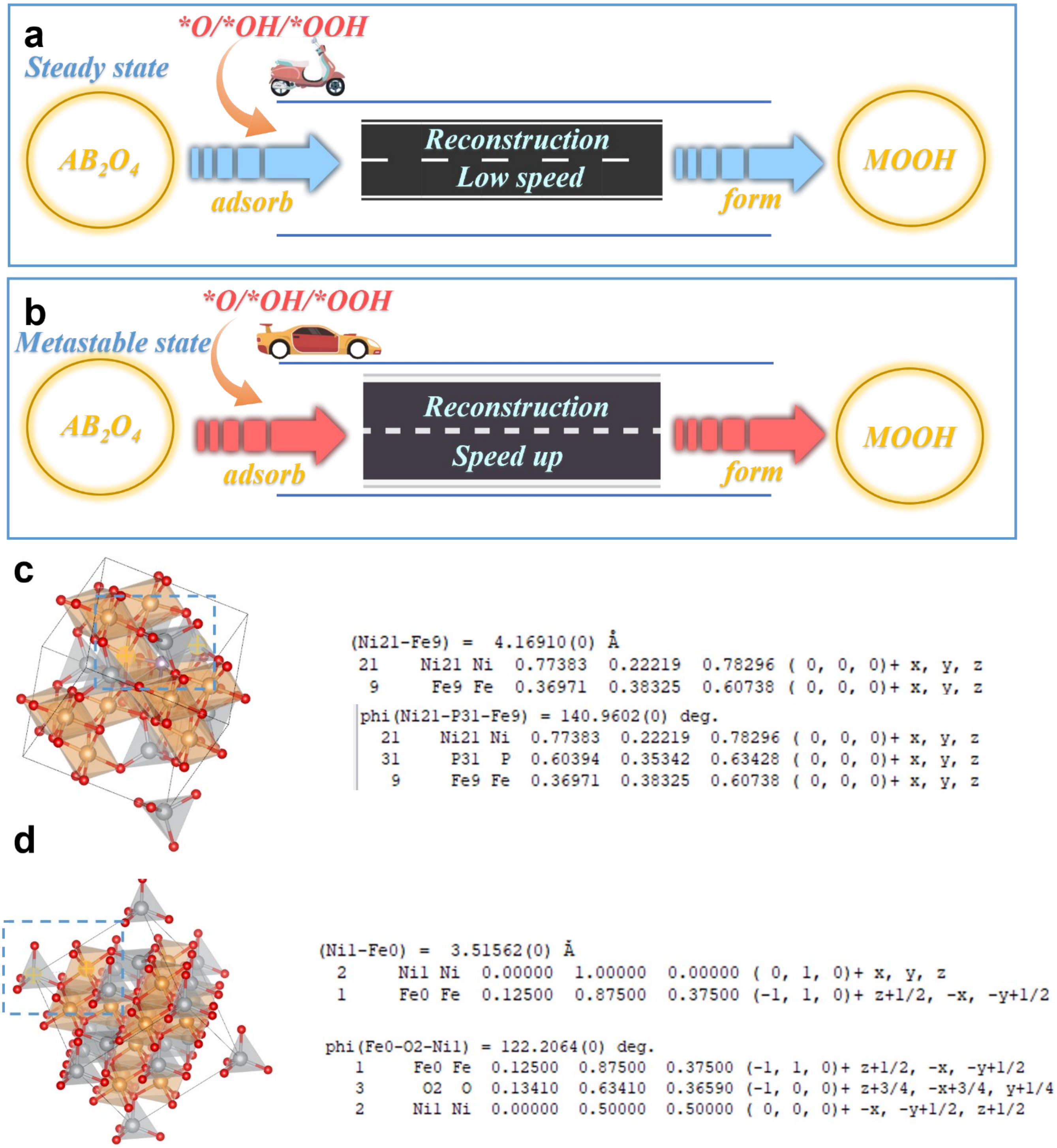

Figure S1. (a,b) Steady state spinel and metastable state spinel reconstruction at different rates to form the MOOH mechanism. (c) The lattice structure models of A-P-NFO and (d) C-NFO (The distances and angle between Ni and Fe atoms are labelled on the right based on the simulations of VESTA).

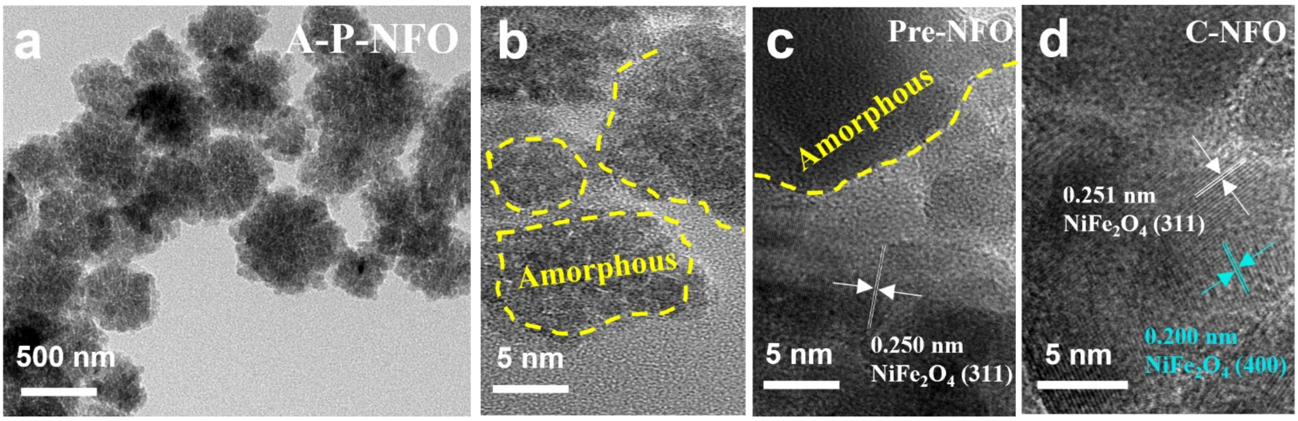

Figure S2. (a) TEM image of A-P-NFO; (b-d) HRTEM images of A-P-NFO, Pre-NFO and C-NFO.

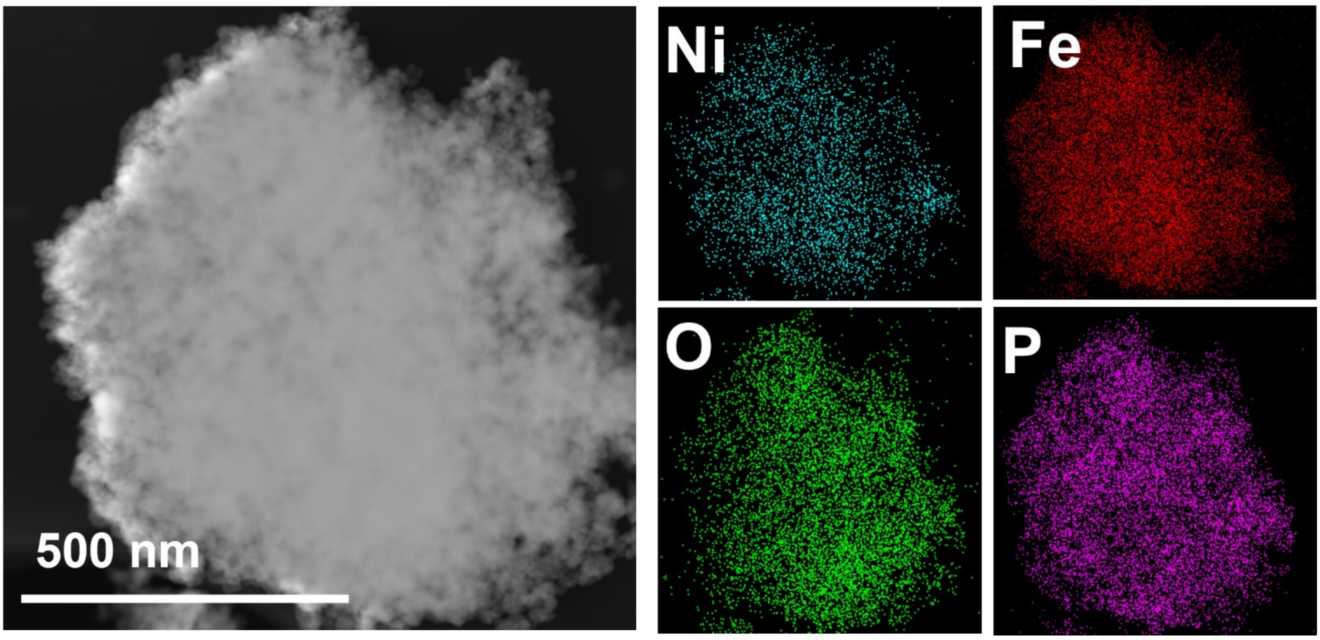

Figure S3. EDX mappings of the A-P-NFO.

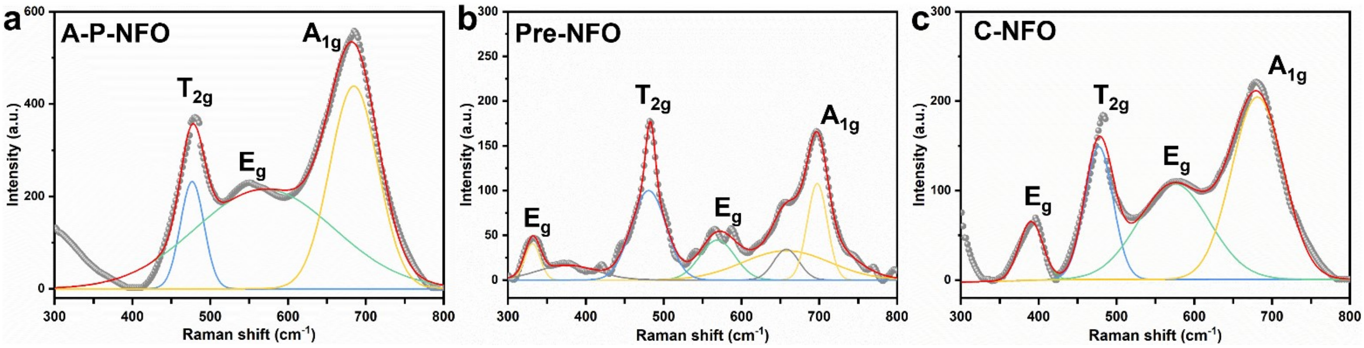

Figure S4. Peak fitting results for Raman spectra of (a) A-P-NFO, (b) Pre-NFO and (c) C-NFO.

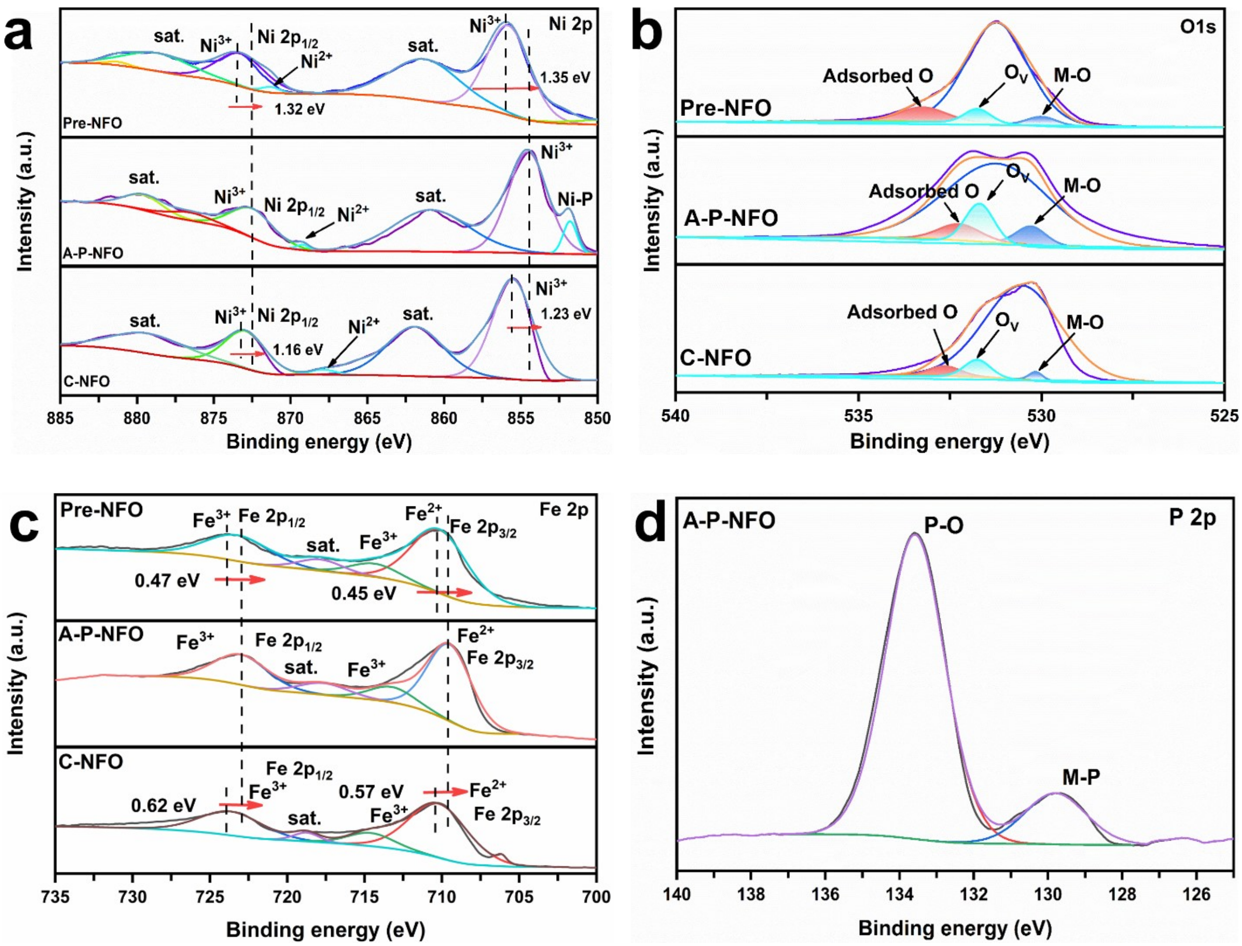

Figure S5. High-resolution XPS spectra of (a) Ni 2p, (b) O1s, (c) Fe 2p of Pre-NFO, NFO and A-P-NFO and (d) P 2p of A-P-NFO.

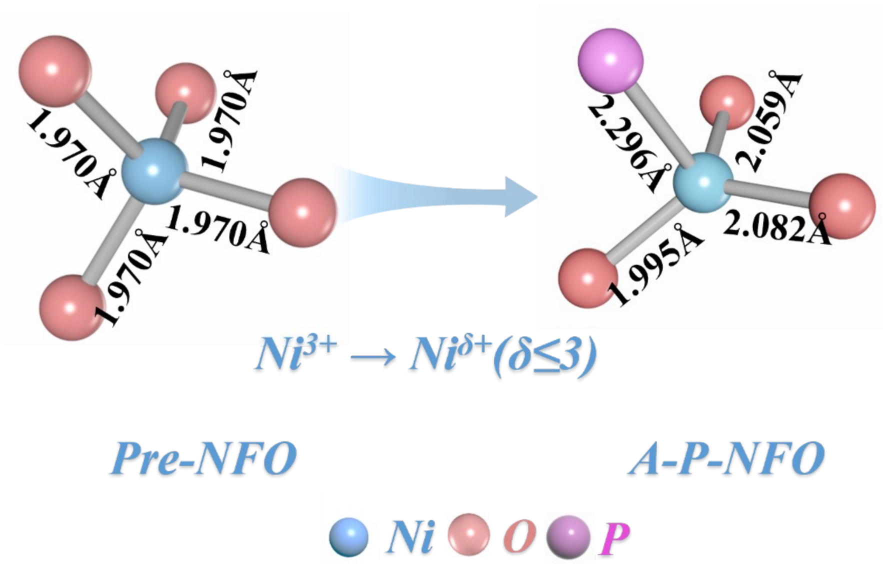

Figure S6. Theoretical models of NFO and A-P-NFO.

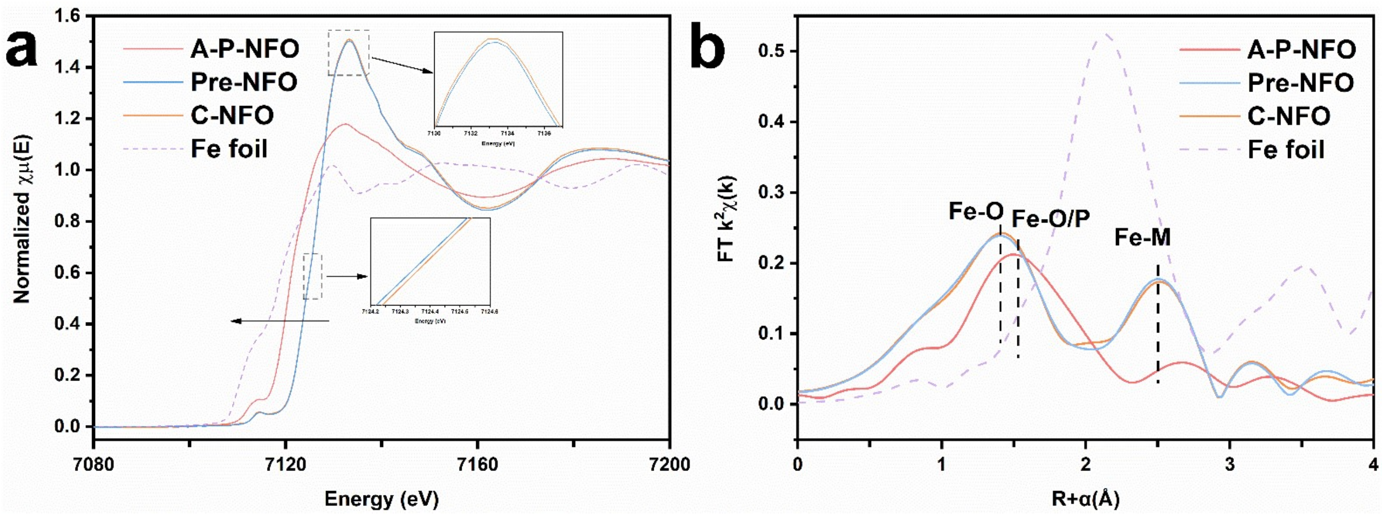

Figure S7. (a) XANES spectra of Fe-K edge of various catalysts; (b) Fe-K edge EXAFS spectra of various catalysts.

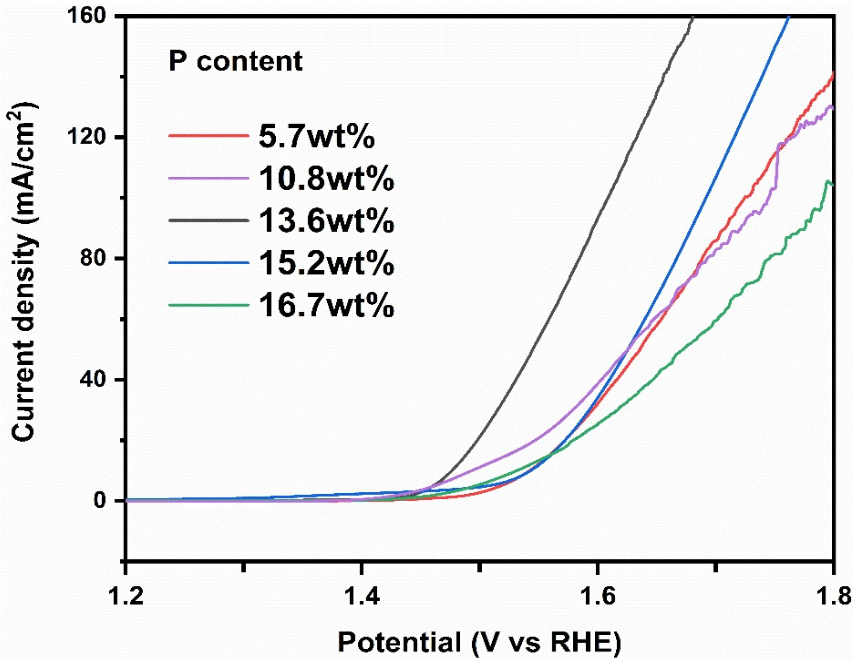

Figure S8. LSVs of A-P-NFO samples with different P contents.

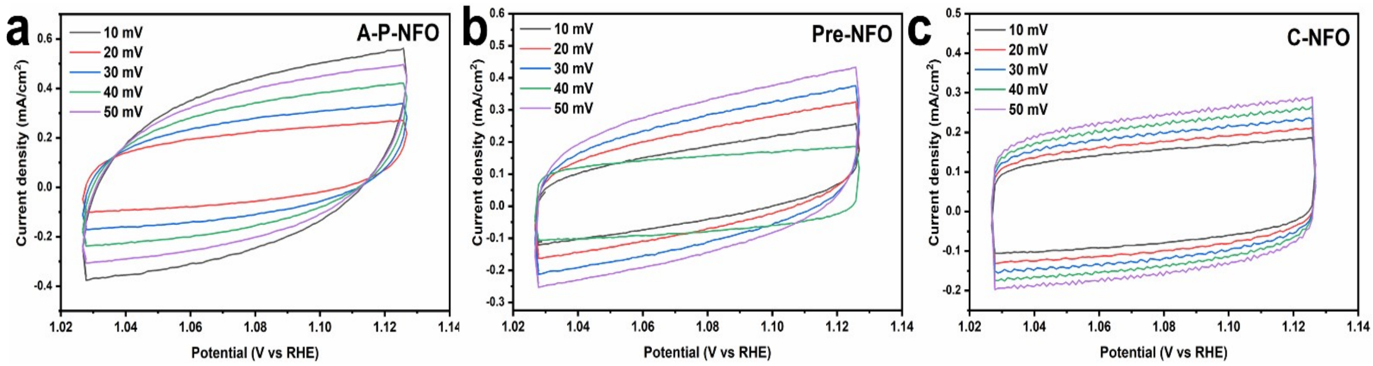

Figure S9. Cyclic voltammograms of different samples at scan rates ranging from 10 to 50 mV s^{-1}: (a) A-P-NFO, (b) Pre-NFO, and (c) NFO.

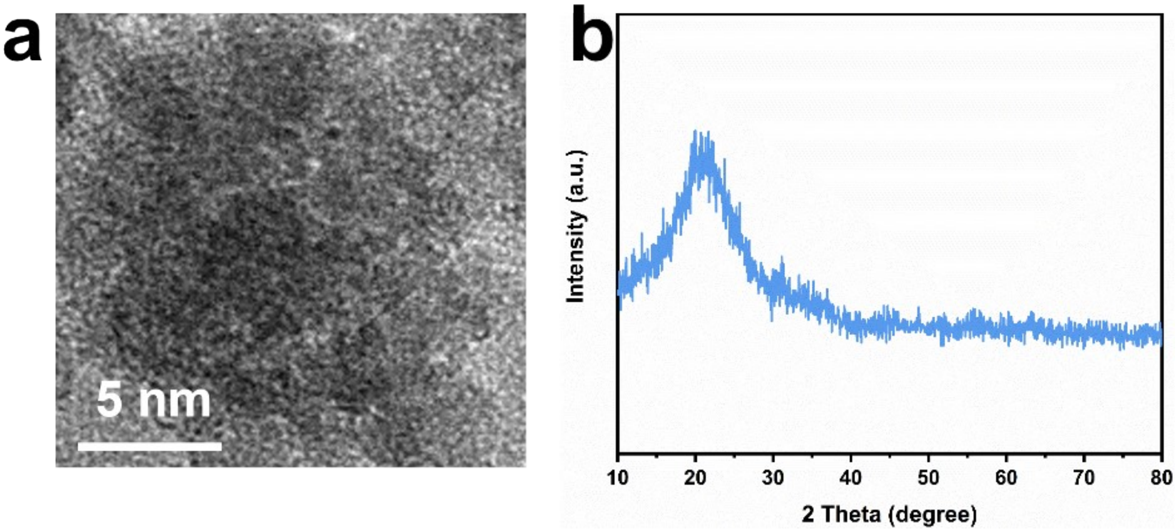

Figure S10. (a) TEM image and (b) XRD pattern of A-P-NFO after durability test.

Table S1. Elemental composition of the synthesized catalysts calculated from the weight percentages of Ni, Fe, O and P by ICP analysis.

Sample	Ni (wt%)	Fe (wt%)	P (wt%)
A-P-NFO	17.8	41.4	13.6
Pre-NFO	18.65	48.88	/
C-NFO	20.68	51.56	/

Table S2. The fitting results of the solution resistance (R_s) and charge transfer resistance (R_{ct}) of different samples by EIS.

Sample	R_s (Ω)	R_{ct} (Ω)
A-P-NFO	10.81	5.57
Pre-NFO	9.35	8.62
C-NFO	11.25	10.88

Table S3. OER catalytic performance of various electrocatalysts in 1 M KOH for comparison.

Electrode	Overpotential (mV) (at 10 mA/cm^2)	Tafel slope (mV dec^{-1})	Stable (h)	Ref.
A-P-NFO	240	52	100	This work
Ni_2P-$NiFe_2O_4$	255	48.54	48	[7]
HO_{oct}-NFO NC/IF	260	36.1	50	[8]
$NiFe_2O_4$-x/NMO-25	262	41.9	40	[9]
$NiFe_x/NiFe_2O_4$@NC	262	51.4	150	[10]
AT $NiFe_2O_4$ QDs	262	53	9	[11]
$NiFe_2O_4/Ti_3C_2$	266	71.4	8.33	[12]
NiCo LDH-TPA	267	52.4	18	[13]
Fe-Ni@NC-CNTs	274	45.47	11.11	[14]
$NiFe_2O_4/NiFe(OH)_x$	276	68	12	[15]
$NiO/NiFe_2O_4$	279	42	450	[16]
Ni_3S_2@FeNi-NFO/C	280	33.9	12	[17]
MoS_2@$NiFe_2O_4$	290	68.7	24	[18]
Ni/Fe_3O_4@ONC	296	61	10	[19]
$M_xNi_{1-x}Fe_2O_4$	381	46.4	2	[20]

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