

Supporting Information

The ZIF-67-derived framework as efficient bifunctional catalysts for overall water splitting in alkaline medium

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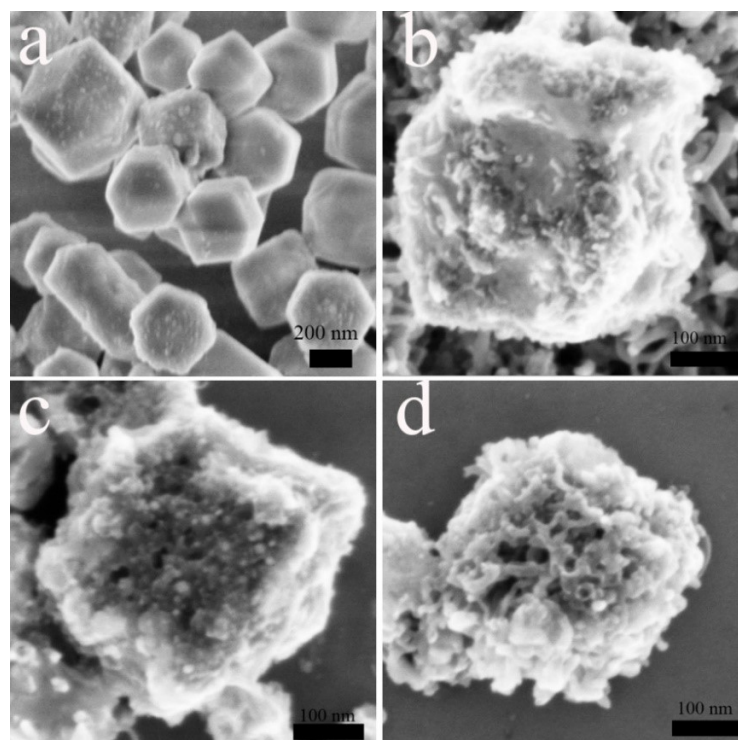


Fig. S1 SEM images of (a) ZIF-67, (b) CoP/CNTs, (c) Co@Co(OH)₂, (d) CoP/HPs

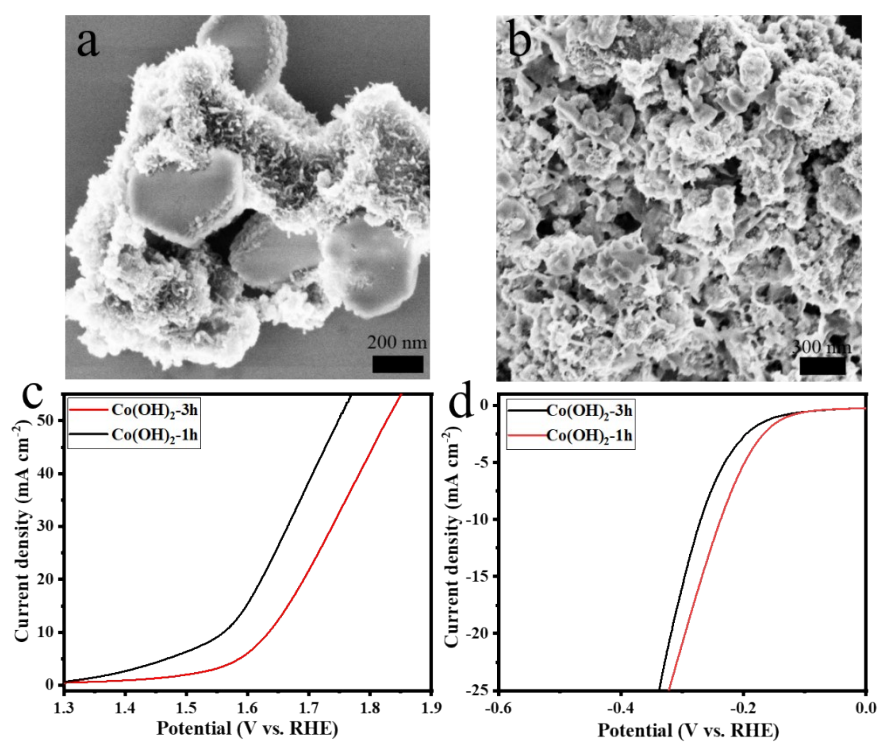


Fig. S2 SEM images of (a) Co(OH)₂-1h, (b) Co(OH)₂-3h, (c, d) LSV curves

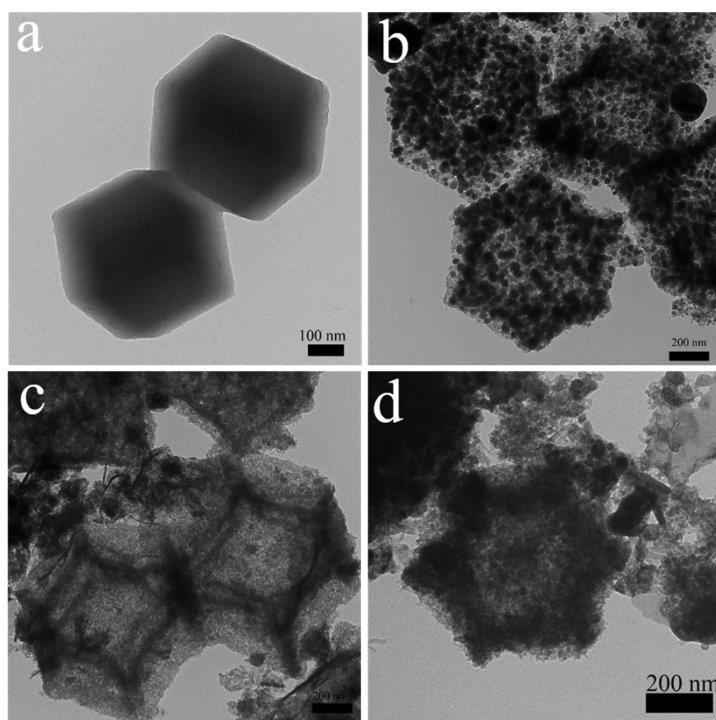


Fig. S3 TEM images of (a) ZIF-67, (b) Co/CNTs, (c) Co@Co(OH)₂/CNTs, (d) CoP/CNTHPs.

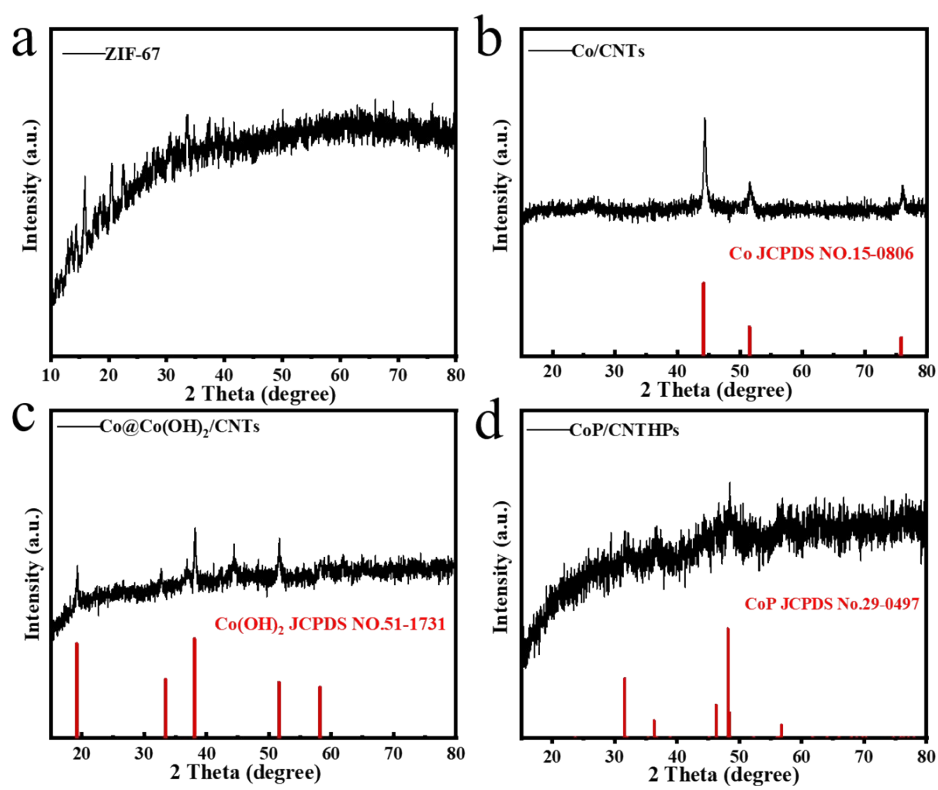


Fig. S4 XRD patterns of (a) ZIF-67, (b) Co/CNTs, (c) Co@Co(OH)₂/CNTs, (d) CoP/CNTHPs

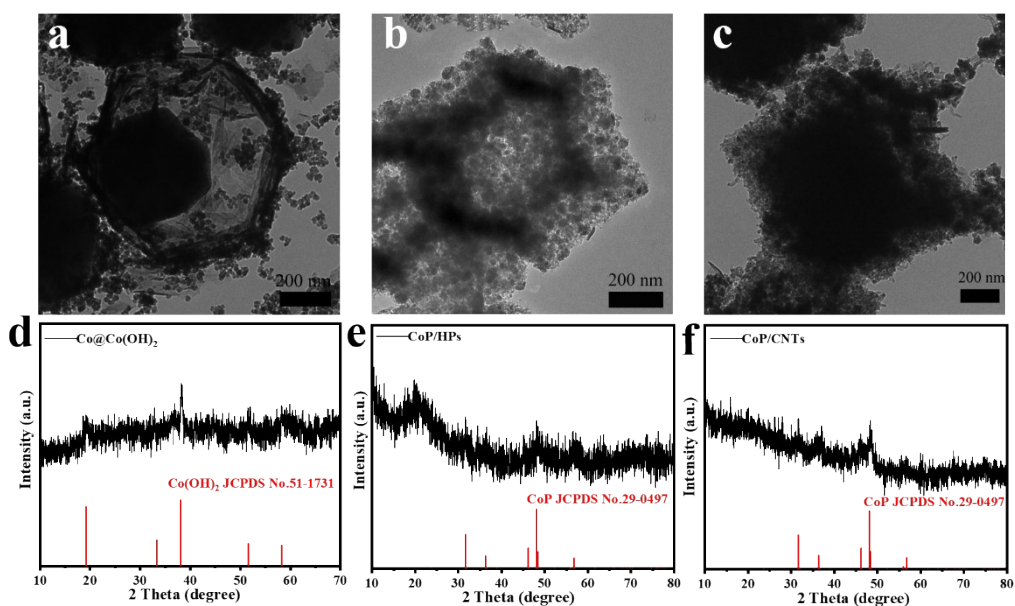


Fig. S5 TEM images and XRD patterns of (a,d) Co@Co(OH)₂, (b,e) CoP/HPs, (c,f) CoP/CNTs

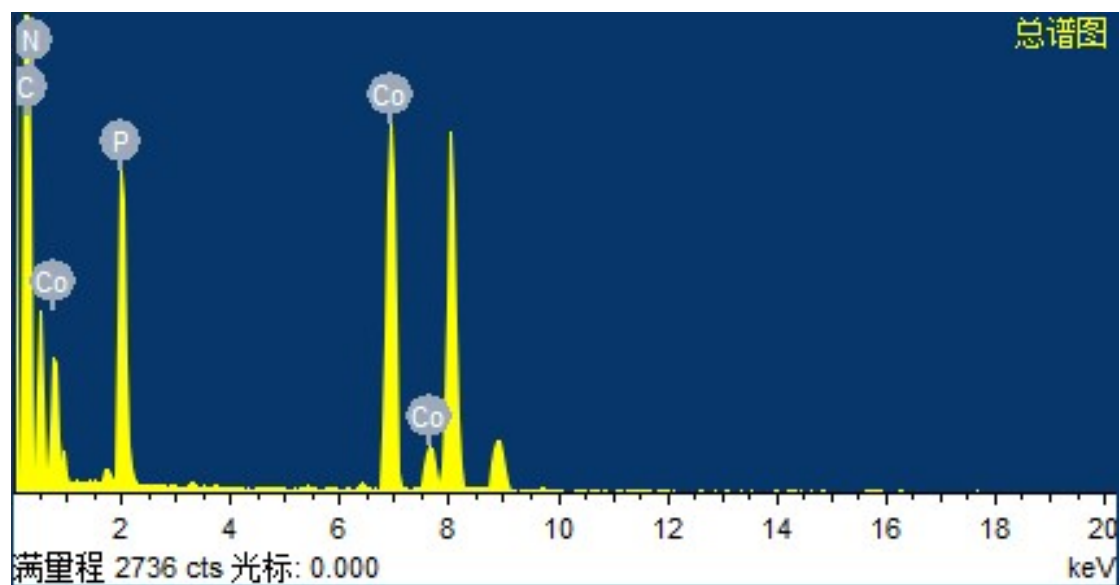


Fig. S6 Energy dispersive X-ray spectroscopy (EDX) of CoP/CNTHPs

Table. S1 The weight and atomic percentage of different elements in CoP/CNTHPs

Element	Wt.%	At.%
Co	20.92	6.08
P	16.14	8.93
C	47.65	68.94
N	1.79	1.6
O	13.50	14.45

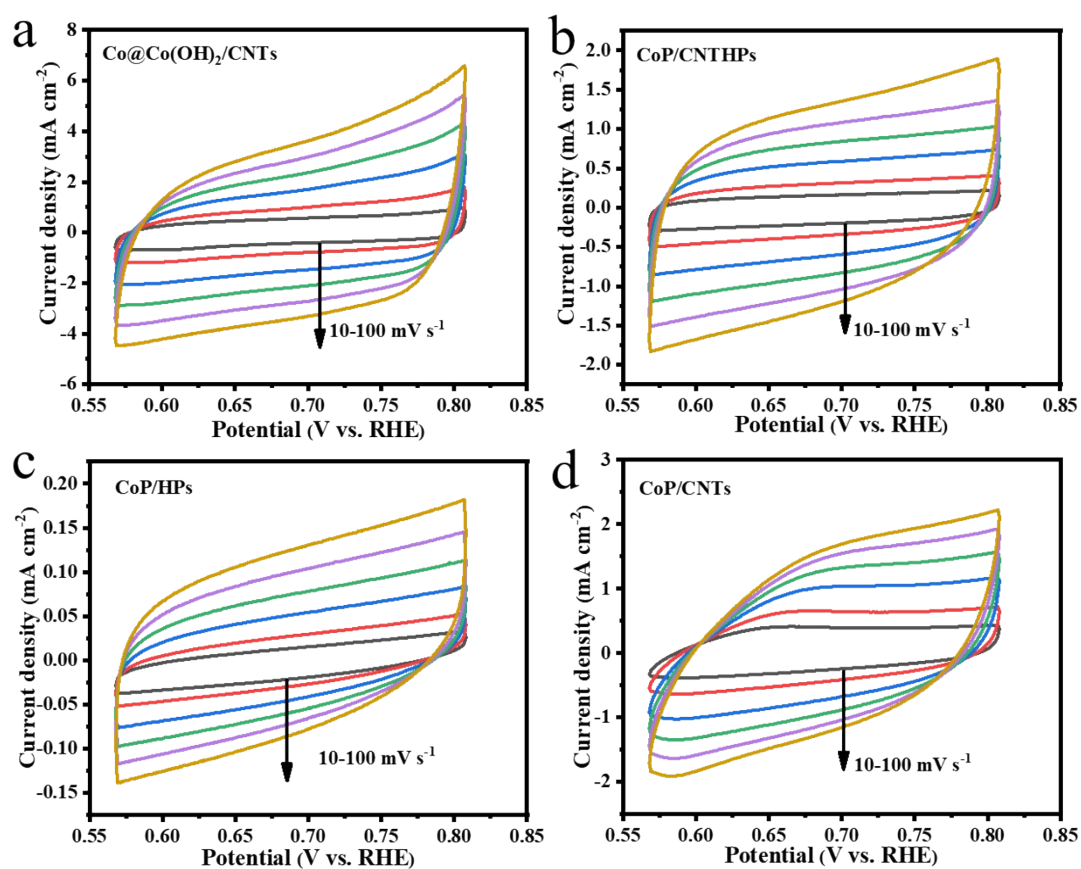


Fig. S7 Cyclic voltammety curves (CVs) of (a) Co@Co(OH)₂/CNTs, (b) CoP/CNTHPs, (c) CoP/HPs and (d) CoP/CNTs measured in 1.0 M KOH solution at scan rates of 10-100 mV s⁻¹ for HER

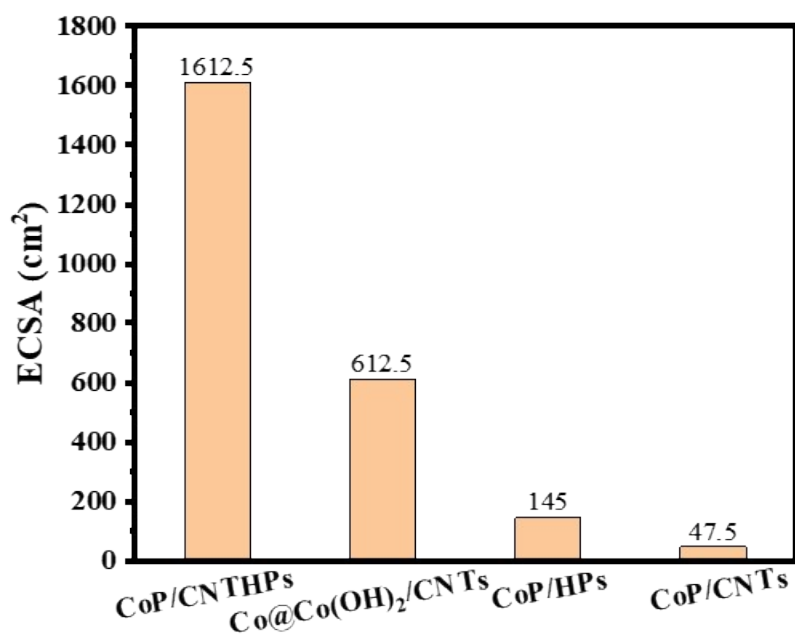


Fig. S8 The electrochemical surface area (ECSA) of CoP/CNTHPs, Co@Co(OH)₂/CNTs, CoP/HPs and CoP/CNTs for HER

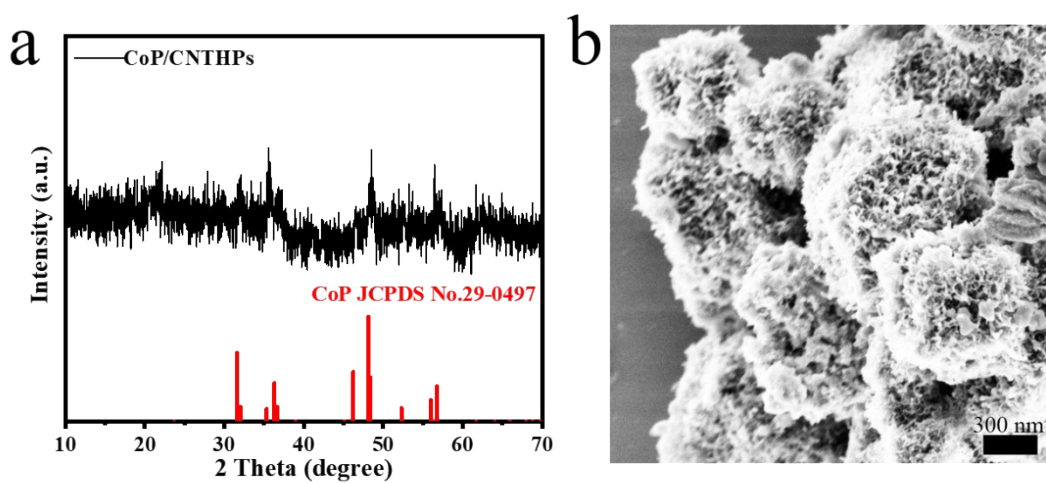


Fig. S9 (a) XRD pattern and (b) SEM image of CoP/CNTHPs after HER test

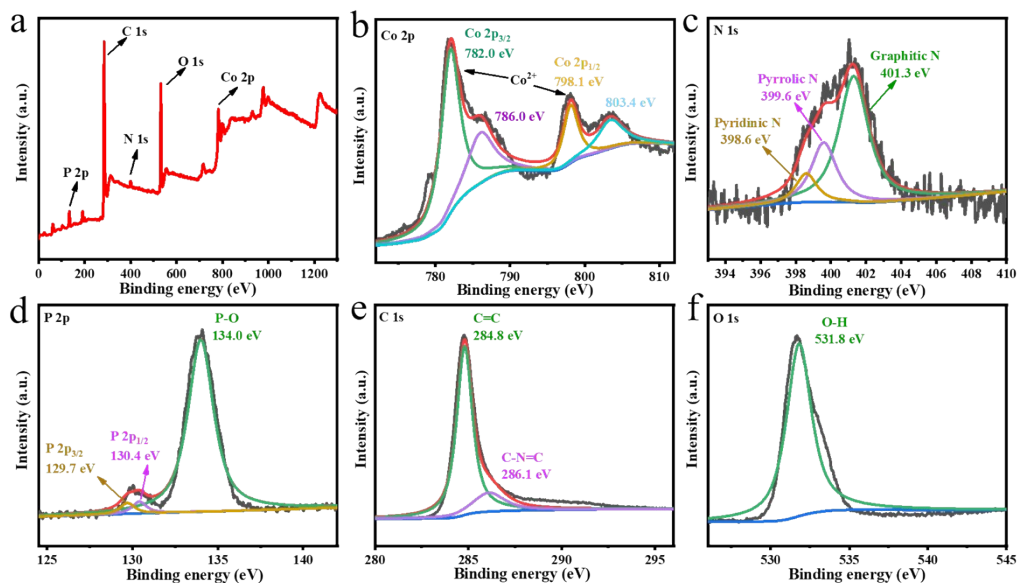


Fig. S10 XPS spectra of CoP/CNTHPs after HER durability test (a) survey, (b) Co 2p, (c) N 1s, (d) P 2p, (e) C 1s and (f) O 1s

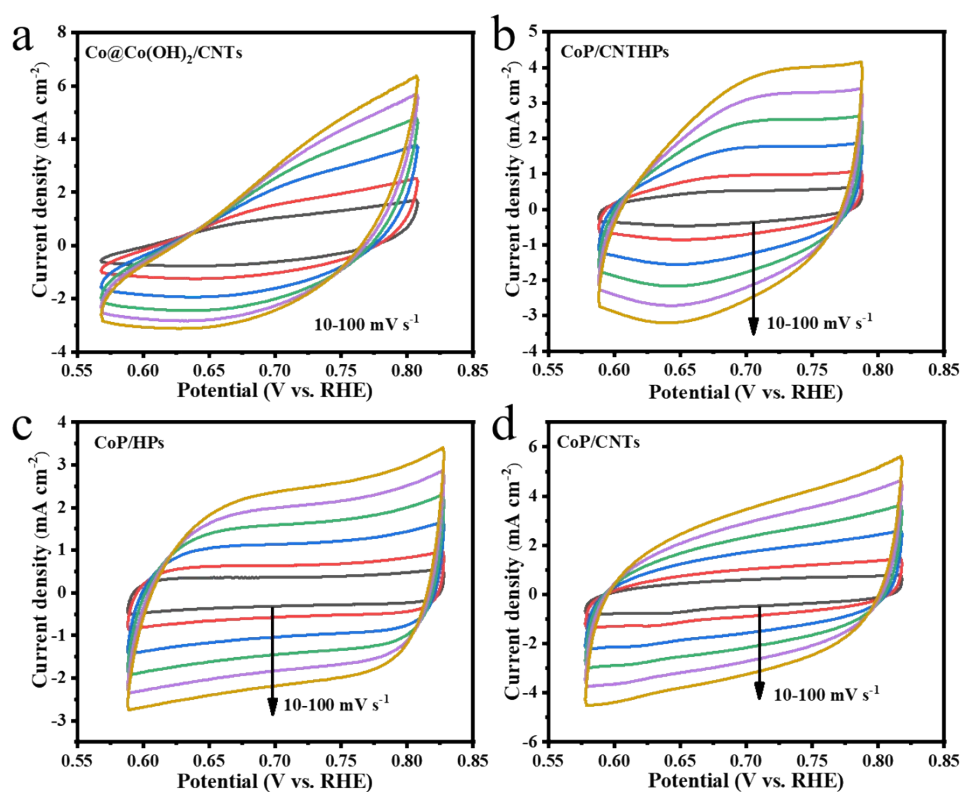


Fig. S11 Cyclic voltammetry curves (CVs) of (a) Co@Co(OH)₂/CNTs, (b) CoP/CNTHPs (c) CoP/HPs and (d) CoP/CNTs measured in 1.0 M KOH solution at scan rates of 10-100 mV s⁻¹ for OER

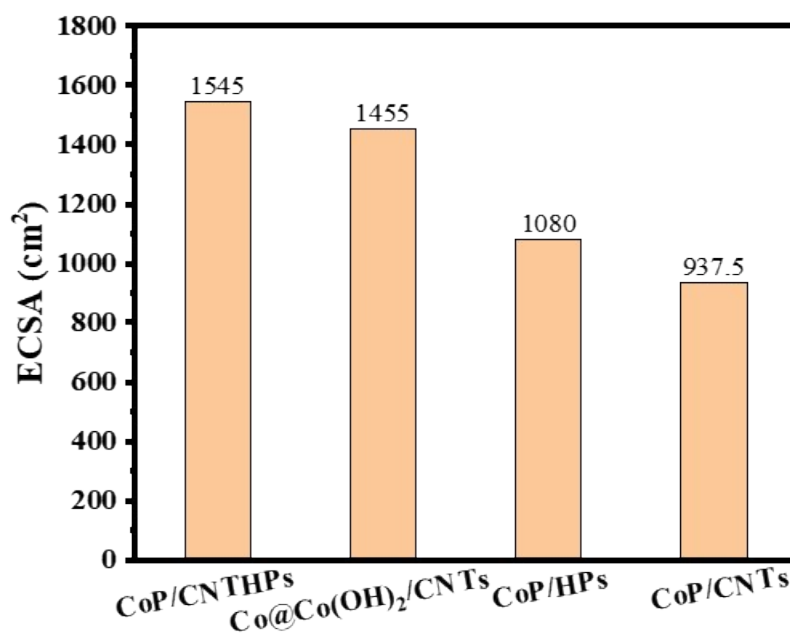


Fig. S12 The electrochemical surface area (ECSA) of CoP/CNTHPs, Co@Co(OH)₂/CNTs, CoP/HPs and CoP/CNTs for OER

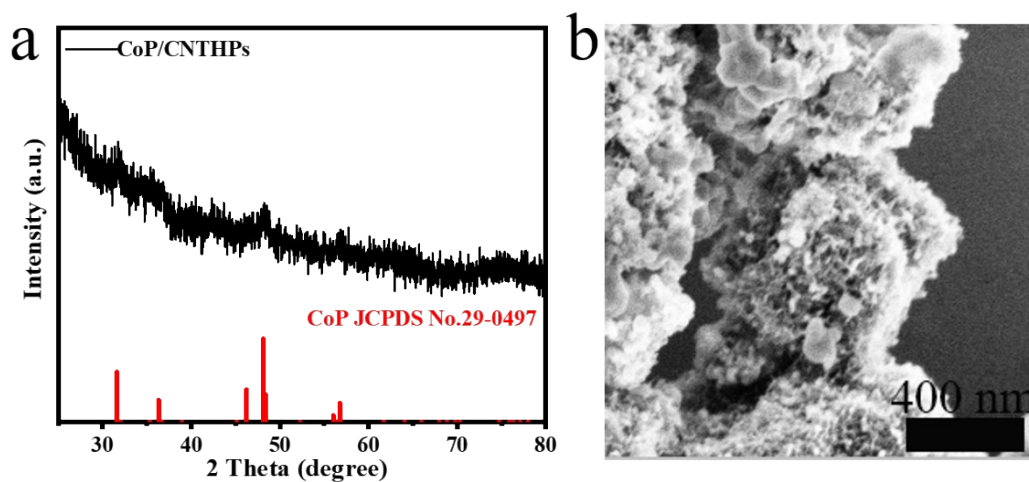


Fig. S13 (a) XRD pattern and (b) SEM image of CoP/CNTHPs after OER test

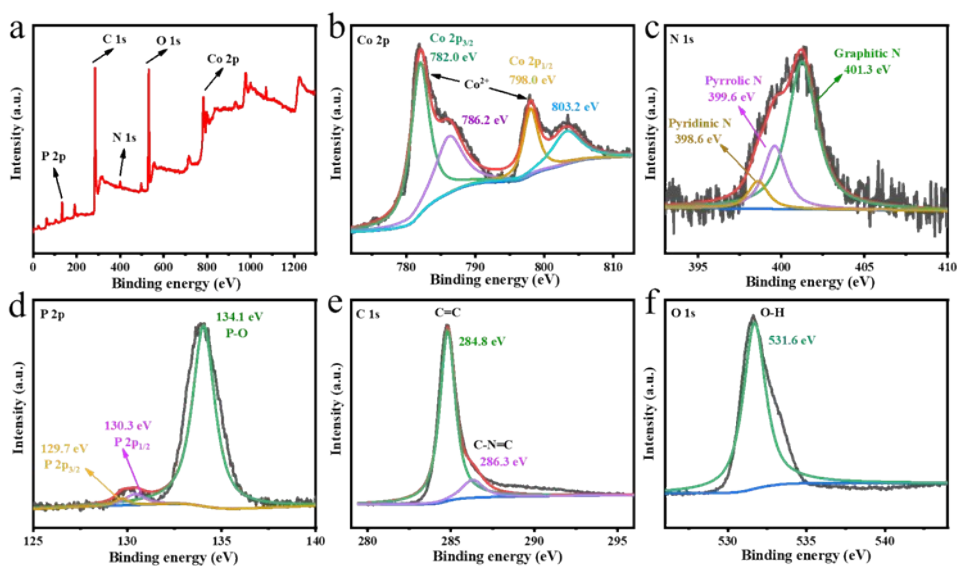


Fig. S14 XPS spectra of CoP/CNTHPs after OER durability test (a) survey, (b) Co 2p, (c) N 1s, (d) P 2p, (e) C 1s and (f) O 1s

Table. S2 Comparison of the overpotentials at 10 mA cm⁻² compared to previously reported catalysts in 1.0 M KOH electrolyte for HER

Electrocatalysts	Electrolyte	η_{10} (mV)	Tafel slope (mV dec ⁻¹)	Reference
CoP/CNTHPs	1.0M KOH	147	78.1	This work
CoP/CNFs	1.0M KOH	225	100.8	[1]
CoP(C/Z)	1.0M KOH	154	85.1	[2]
CoP/C NPs	1.0M KOH	138	95	[3]
CoP-NPC	1.0M KOH	318	97.5	[4]
Co@PCM	1.0M KOH	177	151.8	[5]
CoP@NPC-900	1.0M KOH	181	59	[6]
CoP NS/CNT	1.0M KOH	68	57	[7]
Zn-Co-P	1.0M KOH	172	116	[8]

Table. S3 Comparison of the overpotentials at 10 mA cm⁻² compared to previously reported catalysts in 1.0 M KOH electrolyte for OER

Electrocatalysts	Electrolyte	η_{10} (mV)	Tafel slope (mV dec ⁻¹)	Reference
CoP/CNTHPs	1.0M KOH	238	77.9	This work
CoP@HNC	1.0M KOH	327	81.3	[9]
CoP@NPCNF	1.0M KOH	266	70	[10]
CoP-HNTs@NCL	1.0M KOH	350	160	[11]
N/Mo-CoP@NPG	1.0M KOH	201	97.3	[12]
Co ₂ P/CoP@NPGC	1.0M KOH	340	116	[13]
CoP/BP	1.0M KOH	300	120	[14]
CoP@NC-3/1	1.0M KOH	298	68.3	[15]
NC-G-CoP/NF	1.0M KOH	255	80	[16]

Table. S4 Comparison of the overall water splitting performance at 10 mA cm⁻² compared to previously reported catalysts in 1.0 M KOH electrolyte

Electrocatalysts	Electrolyte	The overall water splitting(V)	Reference
CoP/CNTHPs	1.0M KOH	1.54	This work
Co ₂ P/CoP@Co@NCNT	1.0M KOH	1.56	[17]
Co(z)-NiMoS/NF	1.0M KOH	1.46	[18]
Mo ₂ N-CoxN	1.0M KOH	1.53	[19]
CoP-InNC@CNT	1.0M KOH	1.58	[20]
Co@CoP ₂ /CF	1.0M KOH	1.54	[21]
CoMnP/Ni ₂ P/NF	1.0M KOH	1.43	[22]

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