Supporting Information

Construction of Fe-doped CoP with hybrid nanostructures as a bifunctional catalyst for overall water splitting

Qinghua Yang[1], Haojiang Dai,[2] Wenhao Liao,[2] Xianfeng Tong,[2] Yingyan Fu,[2] Min Qian,[2] Tianyun Chen[2]*

[1]School of Food and Biological Engineering, Hefei University of Technology, Hefei, Anhui 230009, P. R. China

[2]School of Chemistry and Chemical Engineering, Hefei University of Technology, Hefei, Anhui 230009, P. R. China

Supplementary Figures and Tables

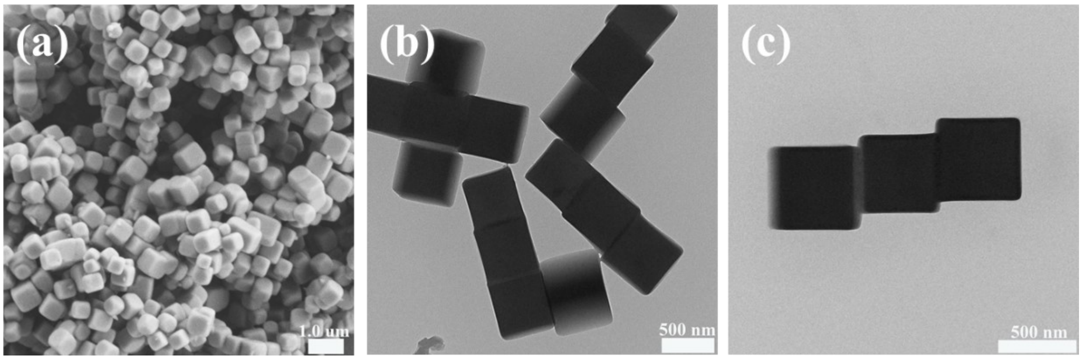


Fig. S1 (a) SEM and (b, c) TEM images of Co-PBA

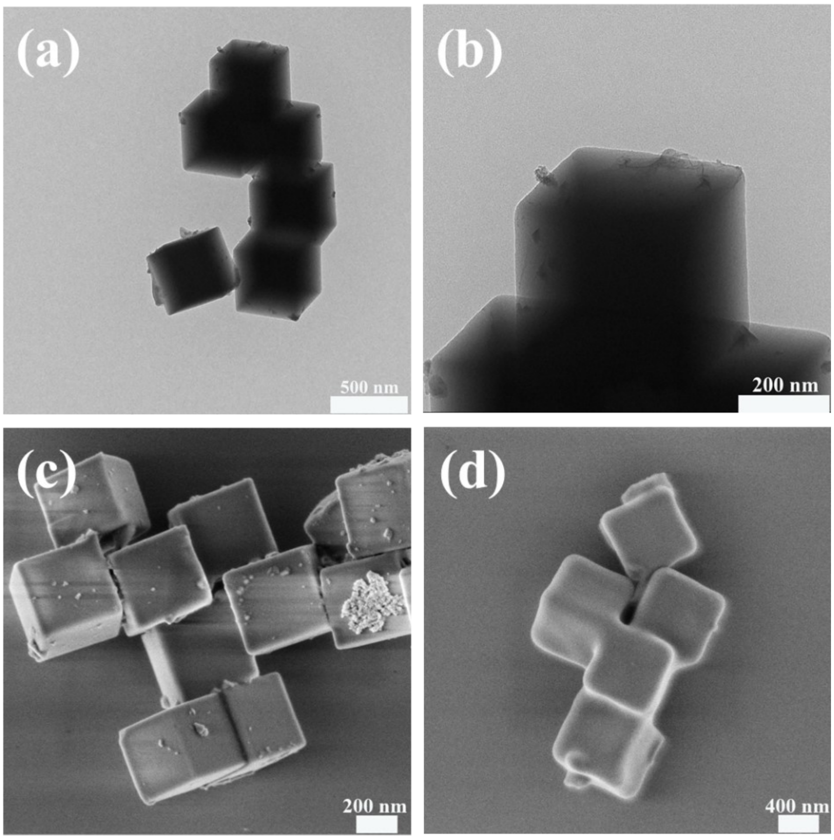


Fig. S2 (a, b) TEM and (c) SEM images of HIP and (d) SEM image of CoP without doping of Fe^{3+}

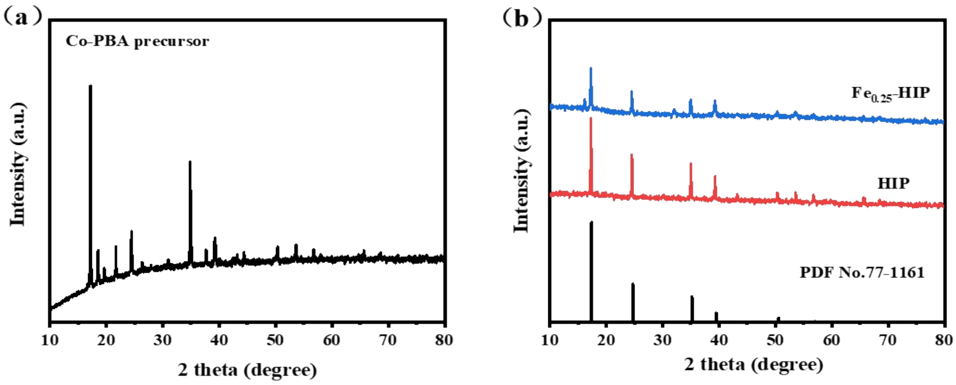
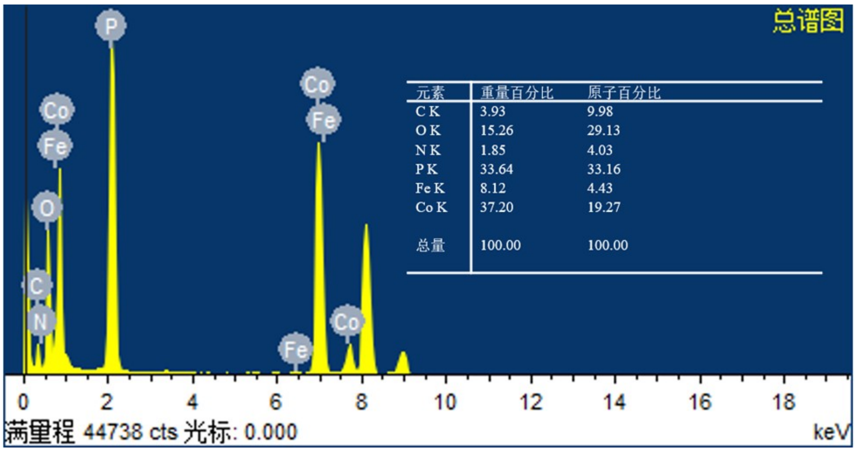


Fig. S3 XRD pattern of Co-PBA, HIP and $Fe_{0.25}$-HIP



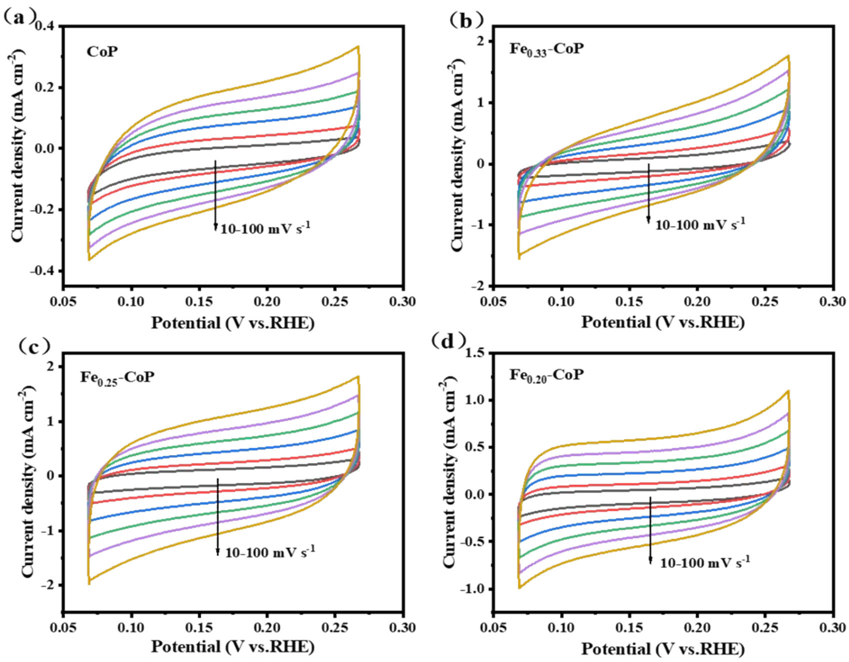


Fig. S4 The elemental composition and contents of $Fe_{0.25}$-CoP

Fig. S5 CV curves of (a) CoP, (b) $Fe_{0.33}$-CoP, (c) $Fe_{0.25}$-CoP and (d) $Fe_{0.20}$-CoP for HER

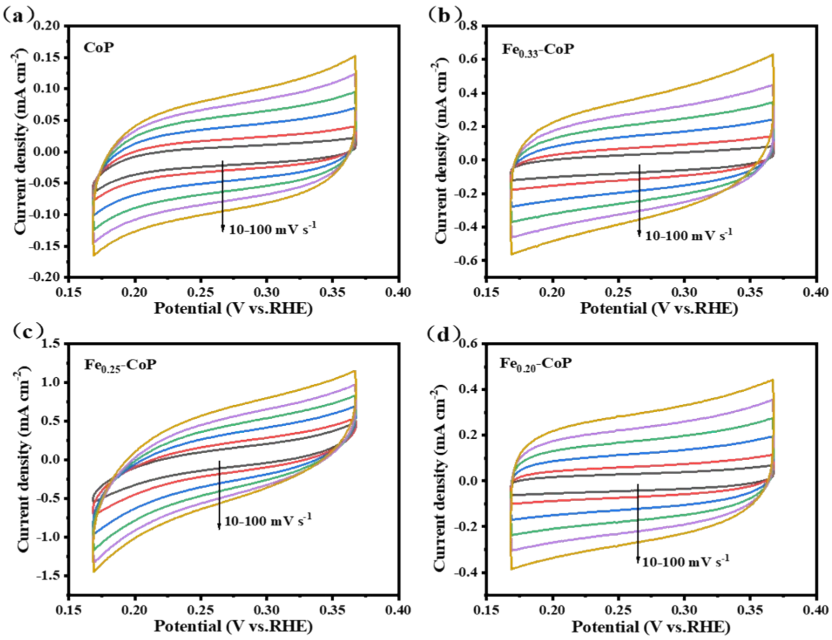


Fig. S6 CV curves of (a) CoP, (b) $Fe_{0.33}$-CoP, (c) $Fe_{0.25}$-CoP and (d) $Fe_{0.20}$-CoP for OER

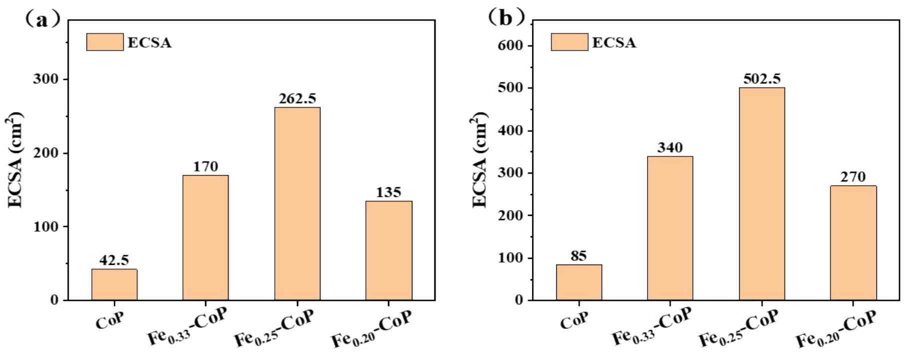


Fig. S7 The electrochemical surface area (ECSA) of CoP, $Fe_{0.33}$-CoP, $Fe_{0.25}$-CoP and $Fe_{0.20}$-CoP

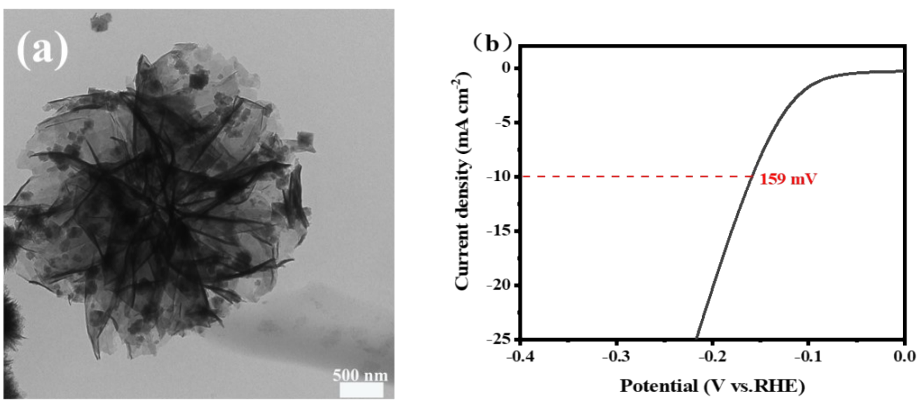


Fig. S8 (a) TEM image and (b) polarization curves of the phosphide which was prepared without the addition of Co-PBA

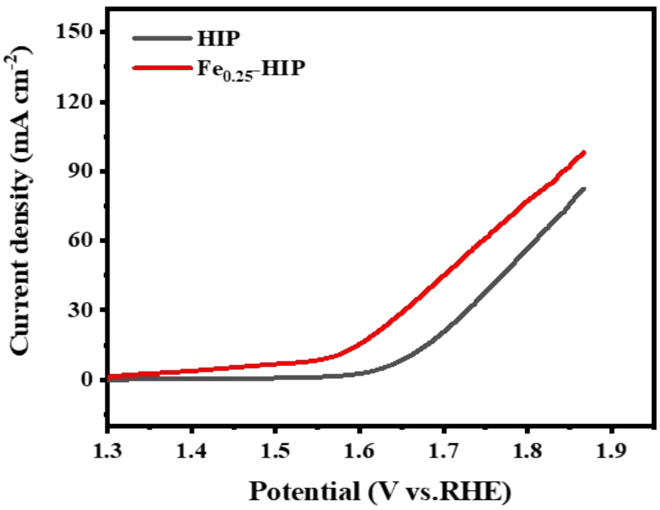


Fig. S9 Polarization curves of HIP and $Fe_{0.25}$-HIP measured in 1.0 M KOH electrolyte

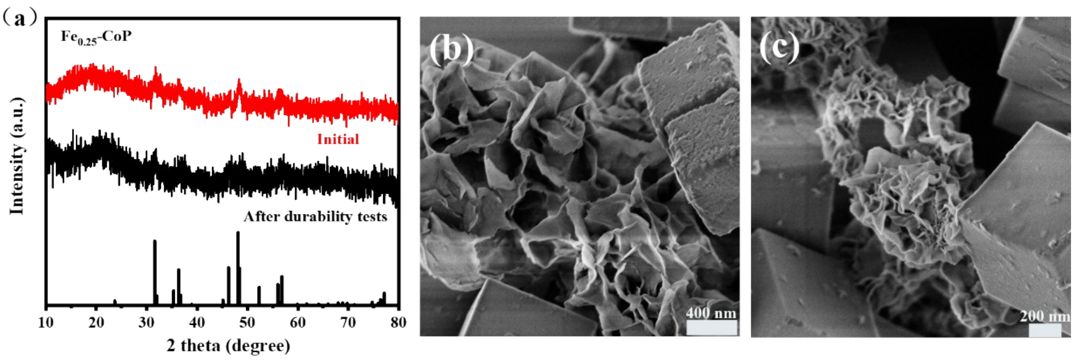


Fig. S10 (a) XRD pattern and SEM image (b) before and (c) after durability tests for $Fe_{0.25}$-CoP

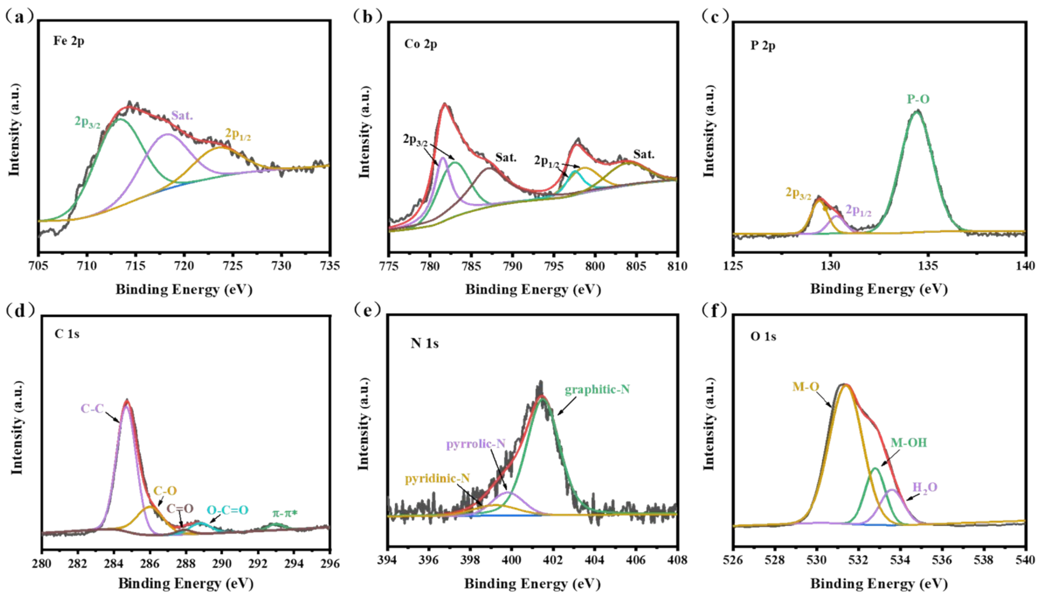


Fig. S11 XPS spectra of (a) survey, (b) Co 2p, (c) P 2p and (d) Fe 2p for $Fe_{0.25}$-CoP after the water oxidation

Table. S1 Comparison of the overall water splitting properties of $Fe_{0.25}$-CoP with some previously reported bifunctional catalysts

Catalyst	Voltage at 10 $mA\cdot cm^{-2}$(V)	Electrolyte	Reference
$Fe_{0.25}$-CoP	1.57	1.0 M KOH	[This work]
$(Ni_{11}(HPO_3)_8(OH)_6$	1.60	1.0 M KOH	1
Ni/NiS/NC	1.61	1.0 M KOH	2
C-(Fe-Ni)P@PC/(Ni-Co)P@CC	1.63	1.0 M KOH	3
MoS_2/LDH	1.57	1.0 M KOH	4
VOOH-3Fe	1.53	1.0 M KOH	5
E-Mo-NiCoP	1.61	1.0 M KOH	6
Co_4S_3/Mo_2C-NSC	1.62	1.0 M KOH	7
CoP NF	1.65	1.0 M KOH	8
P-CoS_2 HNA/CC	1.56	1.0 M KOH	9
$Ni/Ni(OH)_2$	1.59	1.0 M KOH	10

References

1. P. W. Menezes, C. Panda, S. Loos, F. Bunschei-Bruns, C. Walter, M. Schwarze, X. Deng, H. Dau and M. Driess, *Energy Environ. Sci.*, 2018, **11**, 1287-1298.
2. J. Ding, S. Ji, H. Wang, H. Gai, F. Liu, V. Linkov and R. Wang, *Int. J. Hydrog. Energy*, 2019, **44**, 2832-2840.
3. C.-N. Lv, L. Zhang, X.-H. Huang, Y.-X. Zhu, X. Zhang, J.-S. Hu and S.-Y. Lu, *Nano Energy*, 2019, **65**, 103995.
4. P. Xiong, X. Zhang, H. Wan, S. Wang, Y. Zhao, J. Zhang, D. Zhou, W. Gao, R. Ma, T. Sasaki and G. Wang, *Nano Lett*, 2019, **19**, 4518-4526.
5. J. Zhang, R. Cui, C. Gao, L. Bian, Y. Pu, X. Zhu, X. Li and W. Huang, *Small*, 2019, **15**, 1904688.
6. J. Lin, Y. Yan, C. Li, X. Si, H. Wang, J. Qi, J. Cao, Z. Zhong, W. Fei and J. Feng, *Nanomicro Lett*, 2019, **11**, 55.
7. Y. Liu, X. Luo, C. Zhou, S. Du, D. Zhen, B. Chen, J. Li, Q. Wu, Y. Iru and D. Chen, *Appl. Catal. B*, 2020, **260**, 118197.
8. L. Ji, J. Wang, X. Teng, T. J. Meyer and Z. Chen, *ACS Catal.*, 2019, **10**, 412-419.
9. Y. Li, Z. Mao, Q. Wang, D. Li, R. Wang, B. He, Y. Gong and H. Wang, *Chem. Eng. J.*, 2020, **390**.

10. L. Dai, Z. N. Chen, L. Li, P. Yin, Z. Liu and H. Zhang, *Adv Mater*, 2020, **32**, 1906915.