Electronic Supplementary Material (ESI) for Dalton Transactions.
This journal is © The Royal Society of Chemistry 2024

Supporting Information

ZIF-derived Oxygen Vacancy-rich Co_3O_4 for Constructing Efficient Z-scheme Heterojunction to Boost Photocatalytic Water Splitting

Susu Han [a,b], Zejin Wang[a,b], Wenbo Zhu[a,b], Huaizhi Yang, [a,b], Le Yang[a,b], Ying Wang[a,b,*], Zhigang Zou[b]

[a] School of Chemistry and Chemical Engineering, Nanjing University, Nanjing, 210023, PR China
[b] Eco-materials and Renewable Energy Research Center (ERERC), National Laboratory of Solid-State Microstructures, Kunshan Innovation Institute of Nanjing University, Jiangsu Key Laboratory for Nanotechnology, Nanjing University, Nanjing, 210023, PR China

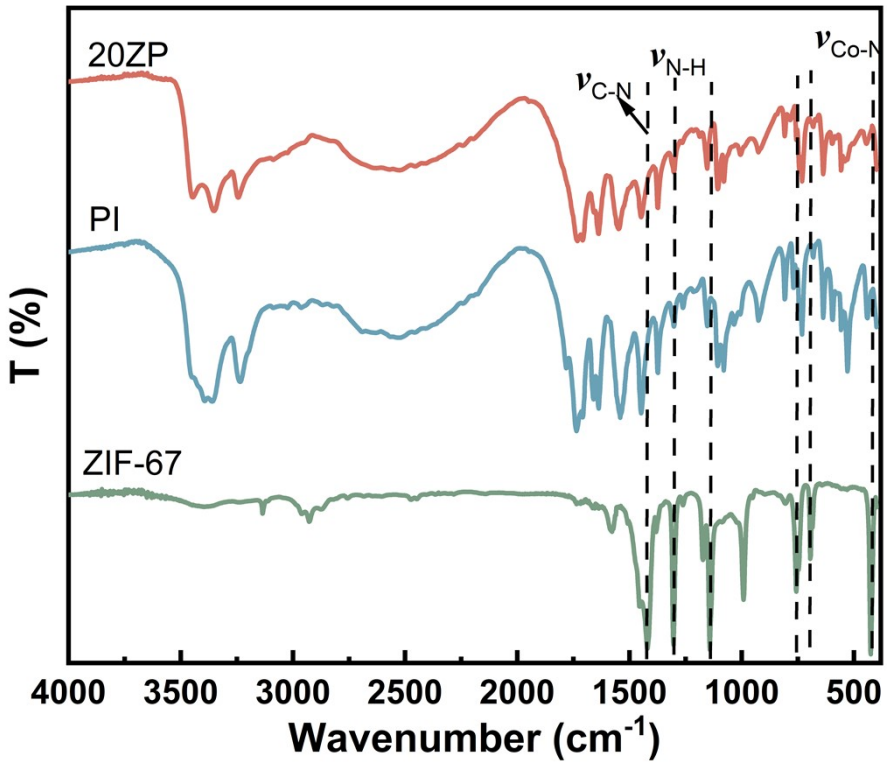

Figure S1. FT-IR spectra of PI ,20ZP and ZIF-67 samples

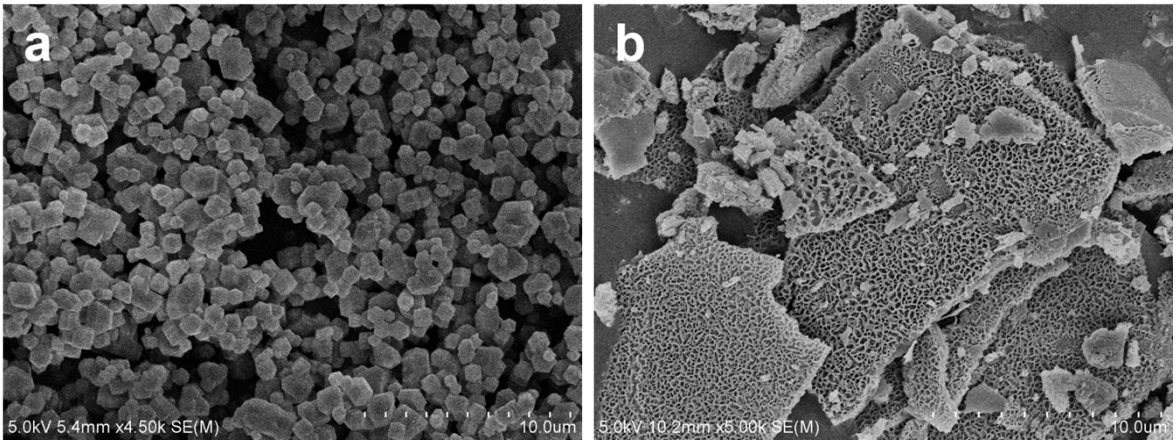

Figure S2. SEM images of ZIF-67(a) and 320ZP(b)

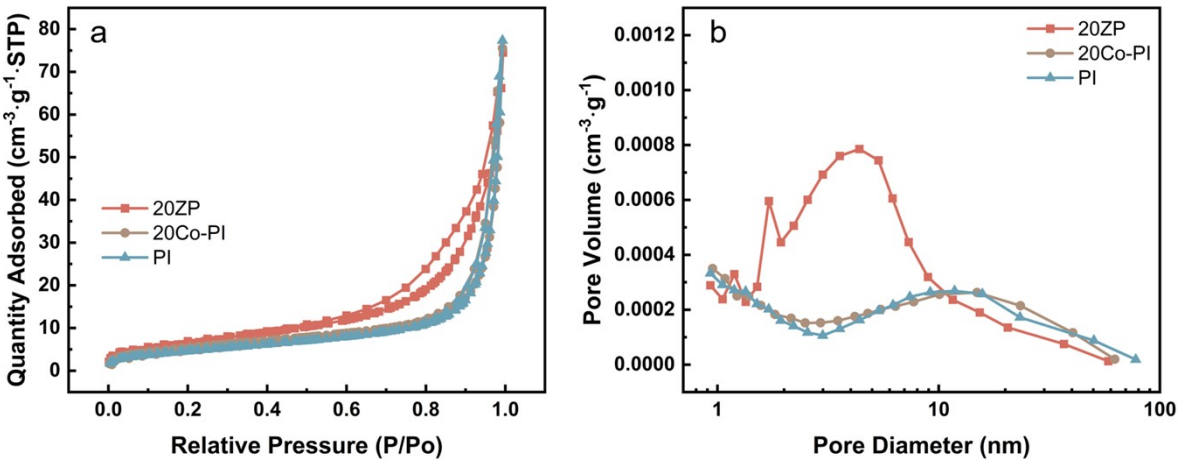

Figure S3. N_2 adsorption-desorption isotherm (a) and the pore distribution curves (b) of PI, 20ZP and Co^{2+}-PI samples.

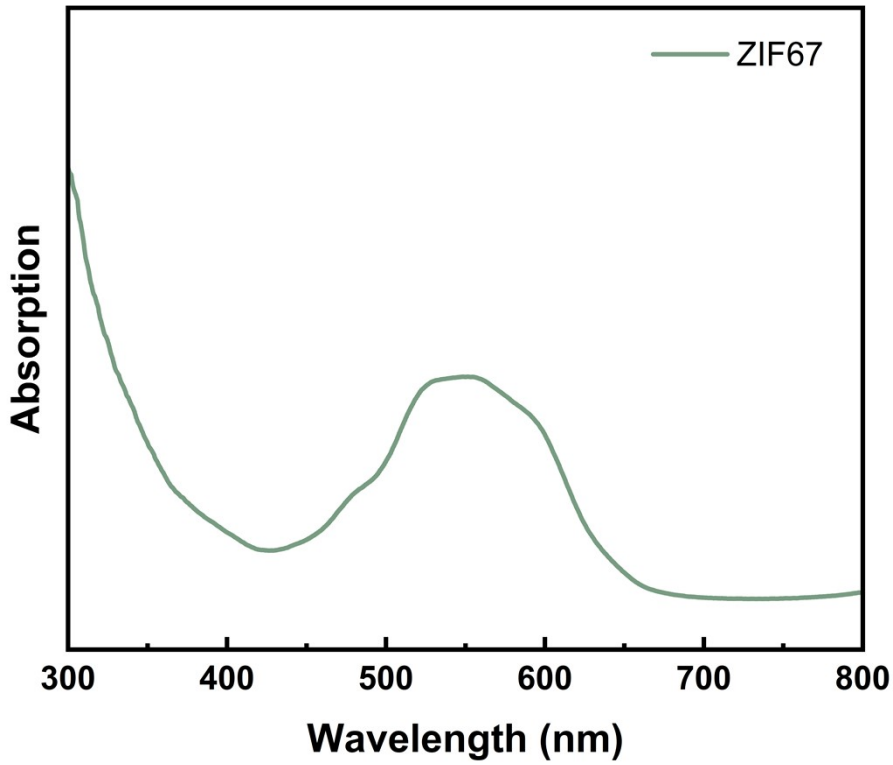

Figure S4. UV–vis DRS spectra of ZIF-67 samples.

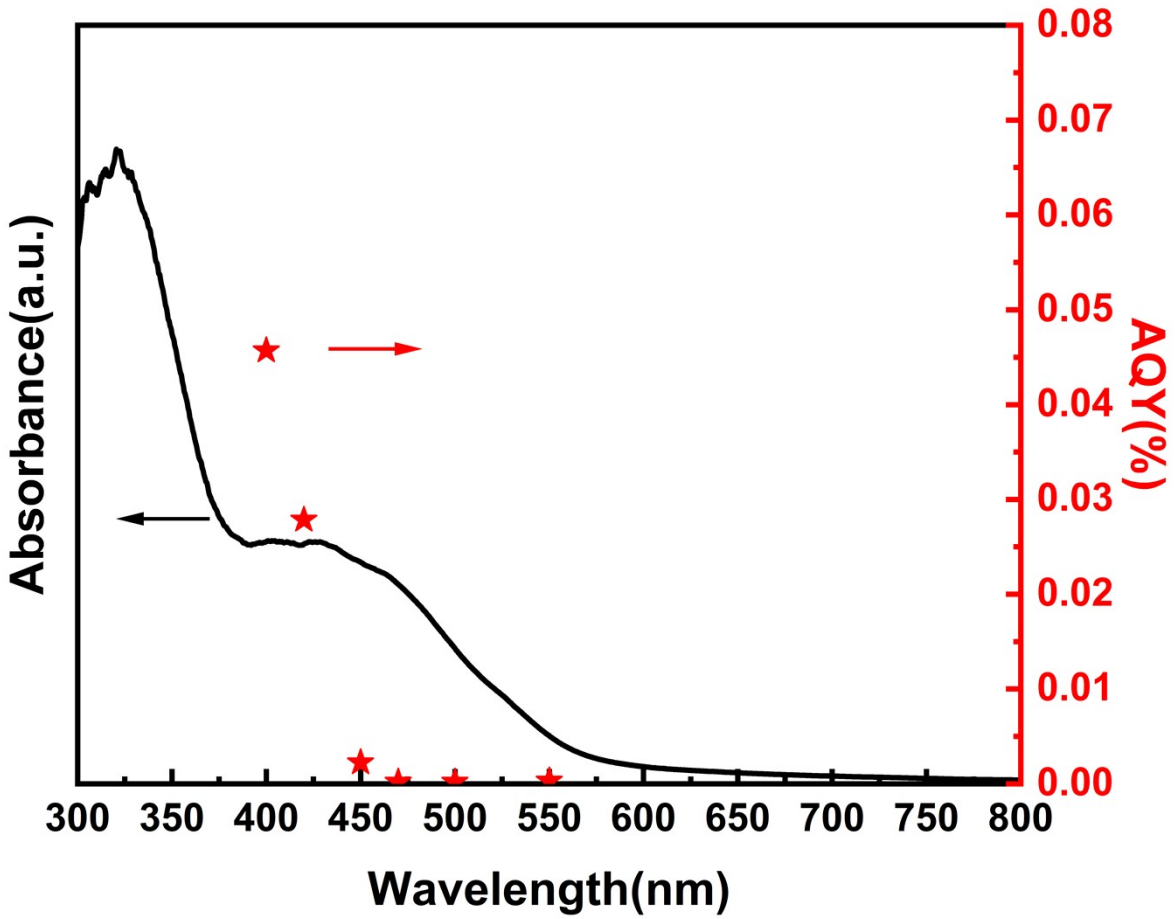

Figure S5. The wavelength dependent AQY of hydrogen evolution over 20ZP.

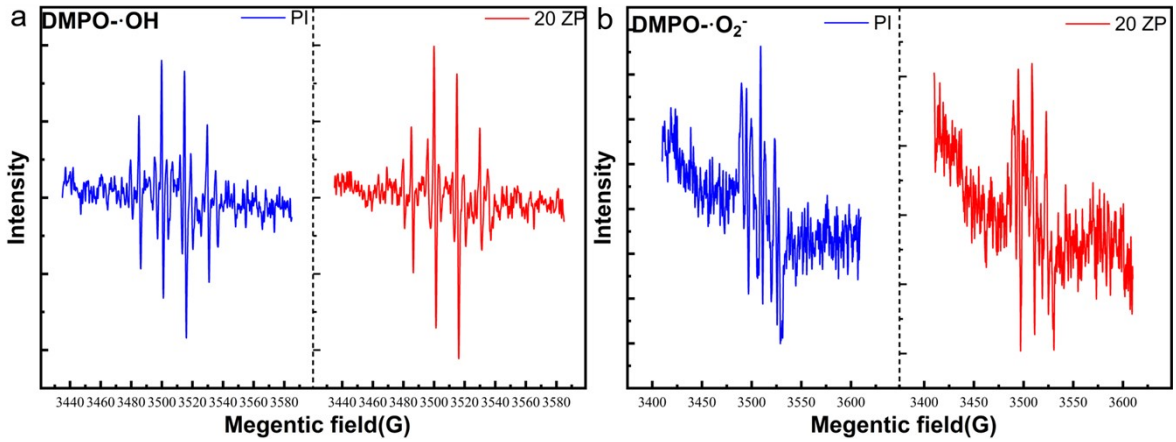

Figure S6. EPR spectra of ·OH and $\cdot O_2^-$ species detected by using DMPO as trapping reagent after light irradiation for 5 min.

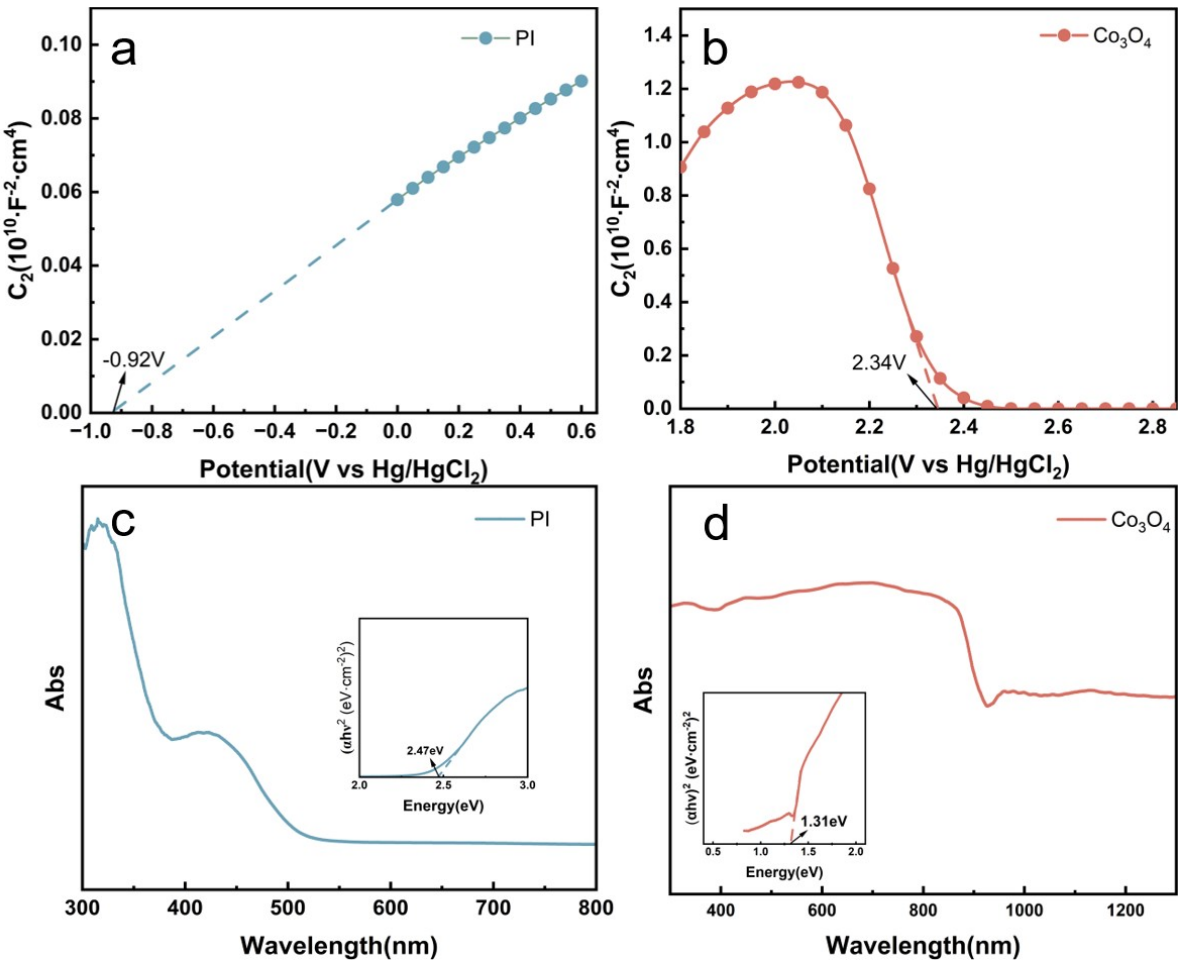

Figure S7. Mott–Schottky plots of PI(a) and Co_3O_4(b) samples at frequencies 1 kHz, UV–vis DRS spectra and the corresponding plots of $(\alpha h\nu)^2$ versus hν of PI(c) and Co_3O_4(d) samples.

Table S1. Comparison of the H_2-production rates of PI-based photocatalytic composite photocatalysts for water splitting.

Sample name	Photocatalyst	Irradiation source	Reaction conditions	Nobel metal cocatalyst	Activity $\mu mol \cdot g^{-1} \cdot h^{-1}$	Ref
1	PI-TC	300W Xe full arc light	200mg photocatalyst 400mL 10vol% methanol aqueous solution	Pt(1wt%)	150	[1]
2	3.0MoO_3/PI	300W Xe full arc light	20mg photocatalyst 400mL 10vol% methanol aqueous solution	Pt(3wt%)	450	[2]
3	1.0wt% MQDs/PI	300W Xe full arc light	200mg photocatalyst 400mL 10vol% methanol aqueous solution	/	600	[3]
4	0.5CO/SPI	300W Xe full arc light	50mg photocatalyst 100mL 10vol% triethanolamine aqueous solution	Pt(3wt%)	127.2	[4]
5	PI	300W Xe full arc light	50mg photocatalyst 100mL 10vol% methanol aqueous solution	Pt(1wt%)	720	This work
6	20ZP	300W Xe full arc light	50mg photocatalyst 100mL 10vol% methanol aqueous solution	Pt(1wt%)	2016	This work
7	Co7-NS-CN_{570}	150W Xe	50mg photocatalyst 120mL 10vol% TEOA aqueous solution	Pt(1wt%)	120	[5]
8	Co_3O_4(7)/C_3N_4NTs	300W Xe >420nm	40mg photocatalyst 40mL 10vol%	/	241.9	[6]

TEA aqueous
solution

[1] S. Chu, Y. Wang, Y. Guo, P. Zhou, H. Yu, L. Luo, F. Kong and Z. Zou, *Journal of Materials Chemistry*, 2012, **22**.

[2] C. Ma, J. Zhou, Z. Cui, Y. Wang and Z. Zou, *Solar Energy Materials and Solar Cells*, 2016, **150**, 102-111.

[3] C. Ma, H. Zhu, J. Zhou, Z. Cui, T. Liu, Y. Wang, Y. Wang and Z. Zou, *Dalton Transactions*, 2017, **46**, 3877-3886.

[4] D. Zhang, C. Ma, Z. Luo, M. Zhu, B. Li, L. Zhou and G. Zhang, *RSC Advances*, 2023, **13**, 853-865.

[5] M. Anagnostopoulou, A. Zindrou, T. Cottineau, A. Kafizas, C. Marchal, Y. Deligiannakis, V. Keller and K. C. Christoforidis, *ACS Applied Materials & Interfaces*, 2023, **15**, 6817-6830.

[6] Y. Zhu, T. Wan, X. Wen, D. Chu and Y. Jiang, *Applied Catalysis B: Environmental*, 2019, **244**, 814-822.