Supplementary Information (SI) for RSC Advances.
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Supplementary Material

Hybrid microwave annealing induced formation of α-Fe_2O_3/$ZnWO_4$ interface for photoelectrochemical water splitting and study of its charge transport mechanism

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Supplementary Figures and Tables

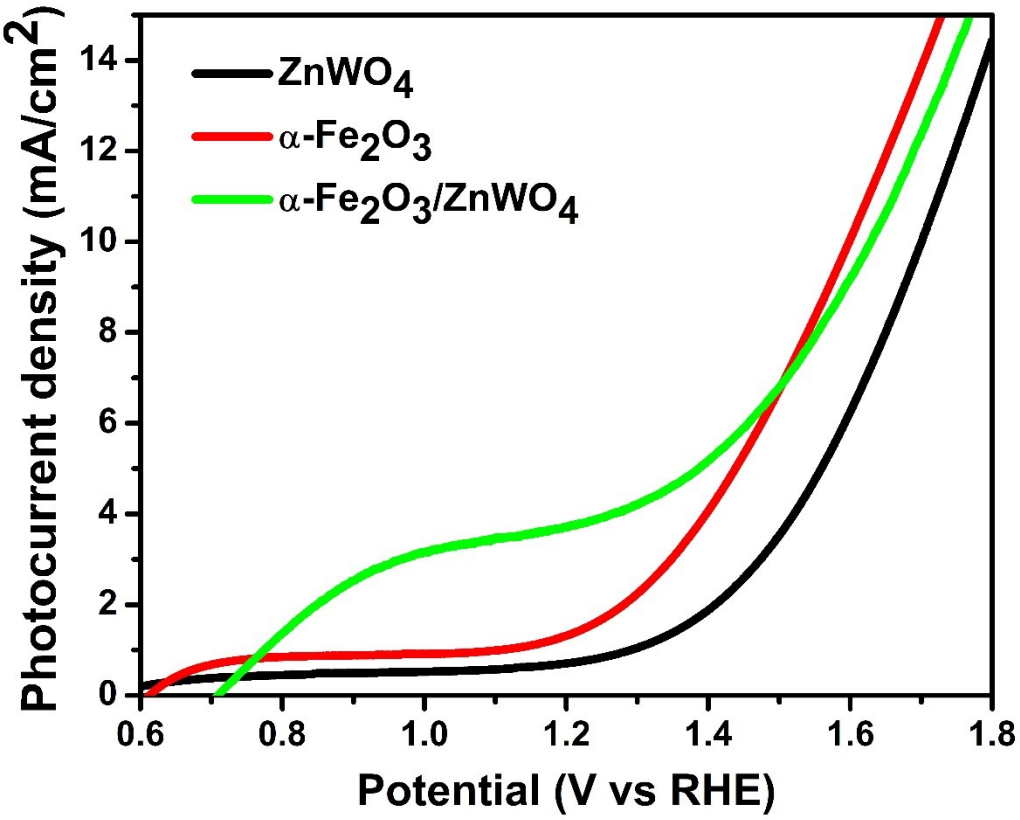

Fig. S1. Photocurrent density measurement in the presnce of H_2O_2 of $ZnWO_4$, α-Fe_2O_3 and α-Fe_2O_3/$ZnWO_4$ heterojunction photoanodes.

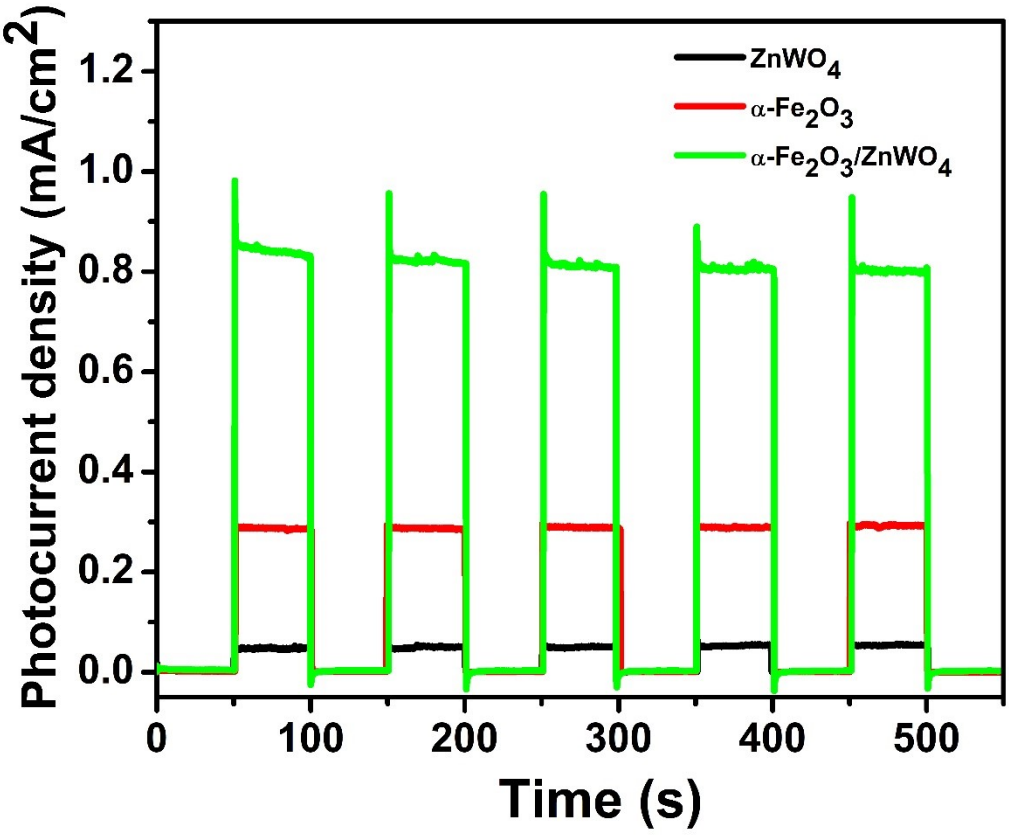

Fig. S2. Transient current (i-t curve) of $ZnWO_4$, α-Fe_2O_3 and α-Fe_2O_3/$ZnWO_4$ heterojunction photoanodes

Table S1. The photocurrent comparisons based on various Fe_2O_3 based heterojunctions reported recently.

Composited photoelectrode	**Electrolytes**	**Photocurrent density in (mA/cm^2) at 1.23 V *vs.* RHE)**	**Reference**
α-Fe_2O_3/ TiO_2	1 M NOH	1.79	[1]
α-Fe_2O_3/CuO	0.5 M Na_2SO_4	0.53	[2]
α-Fe2O3/In_2O_3	1 M KOH	2.2	[3]
α-Fe_2O_3/g-C_3N_4	0.5 M Na_2SO_4 buffered with a 1 M Na_2SO_3	0.76	[4]
α-Fe_2O_3/$BiVO_4$	0.5 M Na_2SO_4	1.3	[5]

ZnO/Fe_2O_3	1 M NOH	1.05	[6]
α-Fe_2O_3/CQDs	1 M NOH	0.35	[7]
WO3/α-Fe_2O_3	1 M NOH	0.58	[8]
α-$Fe_2O_3/ZnWO_4$	1 M NOH	0.86	This work

References

1 J. Deng, Q. Zhuo and X. Lv, Hierarchical TiO2/Fe_2O_3 heterojunction photoanode for improved photoelectrochemical water oxidation, *J. Electroanal. Chem.*, 2019, **835**, 287–292.

2 P. I. Kyesmen, N. Nombona and M. Diale, Heterojunction of nanostructured α-Fe_2O_3/CuO for enhancement of photoelectrochemical water splitting, *J. Alloys Compd.*, 2021, **863**, 158724.

3 Y. Zhou, R. Sun, H. Li, X. Liu, C. Song and D. Wang, Design and application of hierarchical α-Fe_2O_3/In_2O_3 heterojunction photoanode for enhanced photoelectrochemical water oxidation, *Int. J. Hydrogen Energy*, 2024, **83**, 236–245.

4 R. Wang, A. Dai, M. Vijayalakshmi, K. R. Reddy, H. Tang, B. Cheolho, J. Shim and C. V. Reddy, Fabrication of Z-scheme Fe_2O_3/g-C_3N_4 nanocomposite with improved visible light induced photodegradation of pharmaceutical pollutants and photoelectrochemical water oxidation, *J. Alloys Compd.*, 2024, **1005**, 176086.

5 S. Bai, H. Chu, X. Xiang, R. Luo, J. He and A. Chen, Fabricating of $Fe_2O_3/BiVO_4$ heterojunction based photoanode modified with NiFe-LDH nanosheets for efficient solar water splitting, *Chem. Eng. J.*, 2018, **350**, 148–156.

6 Y. R. Lu, Y. F. Wang, H. W. Chang, Y. C. Huang, J. L. Chen, C. L. Chen, Y. C. Lin, Y. G. Lin, W. F. Pong, T. Ohigashi, N. Kosugi, C. H. Kuo, W. C. Chou and C. L. Dong, Effect of Fe_2O_3 coating on ZnO nanowires in photoelectrochemical water splitting: A synchrotron x-ray spectroscopic and spectromicroscopic investigation, *Sol. Energy Mater. Sol. Cells*, 2020, **209**, 110469.

7 L. Li, C. Liu, Y. Qiu, N. Mitsuzak and Z. Chen, Convex-nanorods of α-Fe_2O_3/CQDs heterojunction photoanode synthesized by a facile hydrothermal method for highly efficient water oxidation, *Int. J. Hydrogen Energy*, 2017, **42**, 19654–19663.

8 N. Al-Aisaee, M. Alhabradi, X. Yang, M. Alruwaili, S. Rasul and A. A. Tahir, Fabrication of WO_3 /Fe_2O_3 heterostructure photoanode by PVD for photoelectrochemical applications, *Sol. Energy Mater. Sol. Cells*, DOI:10.1016/j.solmat.2023.112561.