Supporting information

Light-Driven Enhancement of Oxygen Evolution for Clean Energy Conversion: Co_3O_4–TiO_2/CNTs p–n Heterojunction Catalysts Enabling Efficient Carrier Separation and Reduced Overpotential

Weicheng Zhang [1], Taotao Zeng [1], Yi Yu [1], Yuling Liu [1], Hao He [1,*], Ping Li [3,*] and Zeyan Zhou [2,*]

[1] College of Material Science and Engineering, Changsha University of Science and Technology, Changsha, 410114, China.

[2] College of Materials Science and Engineering, Hunan University, Changsha 410082, China,

[3] College of Science, Xinjiang Institute of Technology, Aksu 843100, China

Table S1 Comparison of electrocatalytic performance in the literature

System	η_{OER} **(V)**	***Ref.***
Co-TiO_2/CNTs	0.39	This work
Fe/Co-N4-C468	0.55/0.38	[1]
Isolated nickel atom supported on β_{12} boron monolayer (Ni_{12}-BM)	0.4	[2]
Nitrogen-doped triphenylene-graphdiyne (N@TP-GDY)	0.49	[3]
Sub@Fe/Co/Ni/CuN_4	1.35/1.1/1.6/1.9	[4]
$Co(OH)_2$	0.45	[5]
α-$CoMoO_4$	0.43	[6]

Reference

[1] Chen, F.; Zhang, X.; Jia, B.; Zhang, C.; Wu, G.; Yuan, Y.; Ma, Y.; Li, Y.; Yu, J.; Guan, X.; et al. TM-N4 doped in 4,6,8-biphenylene as an efficient trifunctional electrocatalyst for oxygen reduction reaction, oxygen evolution reaction and hydrogen evolution reaction. *Applied Surface Science* **2025**, *687*, 162279, doi:https://doi.org/10.1016/j.apsusc.2024.162279.

[2] Ling, C.; Shi, L.; Ouyang, Y.; Zeng, X.C.; Wang, J. Nanosheet Supported Single-Metal Atom Bifunctional Catalyst for Overall Water Splitting. *Nano Letters* **2017**, *17*, 5133-5139, doi:10.1021/acs.nanolett.7b02518.

[3] Fan, Y.; Wang, J.; Zhang, Z.; Ma, X.; Zhao, M. Nitrogen-Doped Triphenylene-Graphdiyne as Metal-Free Multifunctional (Photo)Electrocatalysts for Overall Water Splitting. *ACS Applied Nano Materials* **2023**, *6*, 13037-13047, doi:10.1021/acsanm.3c01701.

[4] Xie, L.; Zhou, W.; Qu, Z.; Huang, Y.; Li, L.; Yang, C.; Li, J.; Meng, X.; Sun, F.; Gao, J.; et al. Edge-doped substituents as an emerging atomic-level strategy for enhancing M–N4–C single-atom catalysts in electrocatalysis of the ORR, OER, and HER. *Nanoscale Horizons* **2025**, *10*, 322-335, doi:10.1039/D4NH00424H.

[5] Zhan, Y.; Du, G.; Yang, S.; Xu, C.; Lu, M.; Liu, Z.; Lee, J.Y. Development of Cobalt Hydroxide as a Bifunctional Catalyst for Oxygen Electrocatalysis in Alkaline Solution. *ACS Applied Materials & Interfaces* **2015**, *7*, 12930-12936, doi:10.1021/acsami.5b02670.

[6] Rodriguez, M.; Stolzemburg, M.C.P.; Bruziquesi, C.G.O.; Silva, A.C.; Abreu, C.G.; Siqueira, K.P.F.; Oliveira, L.C.A.; S. Pires, M.; Lacerda, L.C.T.; Ramalho, T.C.; et al. Electrocatalytic performance of different cobalt molybdate structures for water oxidation in alkaline media. *CrystEngComm* **2018**, *20*, 5592-5601, doi:10.1039/C8CE01073K.