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Boosting photoelectrochemical activities of heterostructured photoanodes through interfacial modulation of oxygen vacancies

Xiaoqiang An^a, Le Zhang^b, Bo Wen^b, Zhenao Gu^{a,d}, Li-Min Liu^{b,*}, Jiu-hui Qu^{a,d}, and Huijuan Liu^{c,d,*}

^a Key Laboratory of Drinking Water Science and Technology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China.

^b Beijing Computational Science Research Center, Beijing 100193, China.

^c State Key Laboratory of Environmental Aquatic Chemistry, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, China

^d University of Chinese Academy of Sciences, Beijing 100049, China

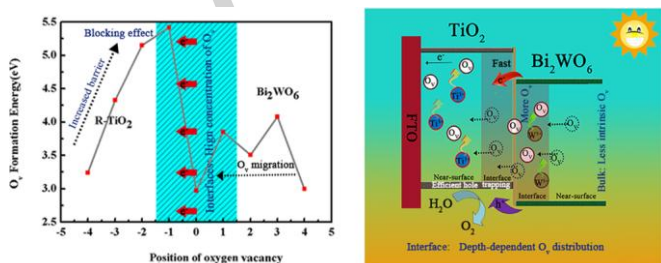
limin.liu@csr.ac.cn

hjliu@rcees.ac.cn

Abstract:

Oxygen deficiency control has become an on-coming strategy for improving the catalytic ability of semiconductors, while the impact of defect distribution on the separation of charge carriers is still an open question. Herein, TiO₂/Bi₂WO₆ heterostructures are used as a typical model to demonstrate the hypothesis of boosting photoactivity of photoanodes through modulating the spatial distribution of oxygen vacancies. Compared to pristine TiO₂, significantly improved photoelectrochemical performance is achieved through suppressing intrinsic defects in Bi₂WO₆ and tuning the formation sites of interfacial oxygen vacancies. Both experimental and theoretical investigations demonstrate that the distribution of interfacial oxygen vacancies around interface of Bi₂WO₆ and in the TiO₂ side is beneficial for the efficient extraction of photogenerated electrons toward counter electrodes. This research shed atomic-level insight into the interfacial modulation of defect distribution. Therefore, it provides a new principle to develop efficient heterostructures for photoelectrochemical and photocatalytic applications.

Graphical Abstract



Keyword: Photoelectrochemical, photoanodes, interfacial structure, oxygen vacancy, defect distribution.

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