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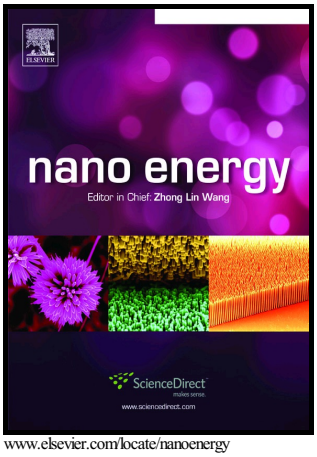

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Boosting photoelectrochemical activities of heterostructured photoanodes through interfacial modulation of oxygen vacancies

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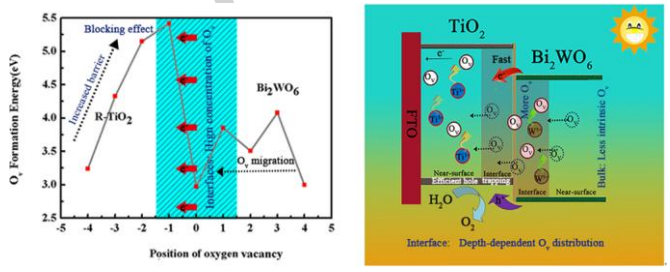
Abstract:

Oxygen deficiency control has become an on-looming 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, TiO_2/Bi_2WO_6 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 TiO_2, significantly improved photoelectrochemical performance is achieved through suppressing intrinsic defects in Bi_2WO_6 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 Bi_2WO_6 and in the TiO_2 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.