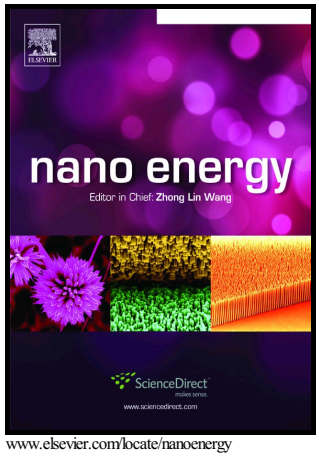

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Multi-Electric Field Modulation for Photocatalytic Oxygen Evolution: Enhanced Charge Separation by Coupling Oxygen Vacancies with Faceted Heterostructures

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Abstract:

A fundamental challenge of photocatalysis is developing efficient strategies to suppress the recombination of photogenerated charge carriers. Herein, ZnO/$BiVO_4$ hierarchical nanostructures were exemplified to demonstrate new concept of multi-electric field-assisted charge separation. The contribution of both facet engineering and defect modulation to the facilitated photocatalysis was confirmed by both experimental observations and theoretical calculations. Such integration of built-in fields in faceted $BiVO_4$ and anisotropic ZnO nanorods, together with the possible Z-scheme at the interfaces resulted into 1.36 mmol•h^{-1}•g^{-1} O_2 produced under visible light irradiation, and more than one order of magnitude enhanced apparent quantum yield at 450 nm. This work not only provides fundamental insights into the facet-dependent distribution of interfacial defects, but also offers a strategy for the design of faceted heterojunctions with controlled vacancies for significantly enhanced charge separation.

Graphical abstract: