Nanocomposites and nanomaterials

Highly efficient photocatalytic conversion of solar energy to hydrogen by core-shell heterojunction nanorods

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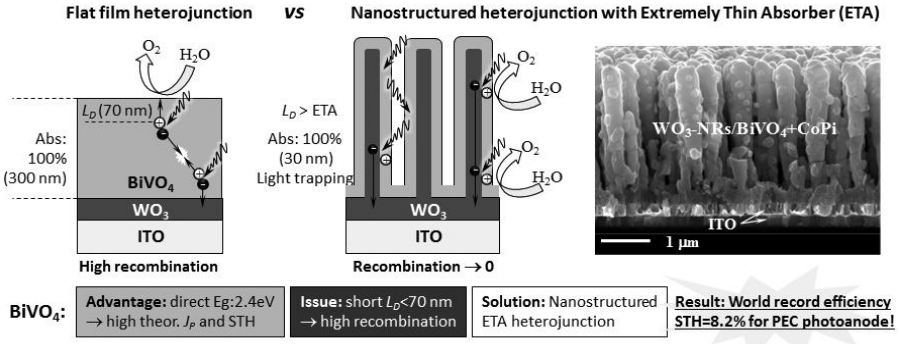
$BiVO_4$ is one the most promising photocatalytic materials for water splitting with moderate and direct bandgap of 2.4 eV and high theoretical solar-to-hydrogen conversion efficiency (STH) of 9.2%. Unfortunately, $BiVO_4$ has a carrier diffusion length L_D of only 70 nm, shorter than the optical absorption thickness, that results in high recombination of photocarriers in the film and drop of the photocurrent (J_P). I will demonstrate how nanostructured $WO_3/BiVO_4$ heterojunction with extremely thin absorber (ETA) $BiVO_4$ layer (thinner than the L_D) avoids recombination losses and achieves almost theoretical J_P, thus leading to the world record STH of 8.2% in a water splitting photoelectrochemical cell (PEC) [1, 2]. I will also generalize conceptual advantage of the ETA structure in photocatalysis.



1. *Kosar S., Pihosh Y., Turkevych I., et.al.* // J. J. Appl. Phys.-2016.-**55**.-P 04ES01.
2. *Pihosh Y., Turkevych I., Mawatari K., Uemura J., Kazoe Y., Kosar S., et.al.* // Nature Sci. Rep.-2015.-**5**.-P. 11141.