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# Electrosprayed BiVO<sub>4</sub> Nanopillars Coated with Atomic-Layer-Deposited ZnO/TiO<sub>2</sub> as Highly Efficient Photoanodes for Solar Water Splitting

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## Abstract

We report the fabrication and the performance in photoelectrochemical water splitting of thin films of electrostatically sprayed nanotextured bismuth vanadate (BiVO<sub>4</sub>) pillars coated with thin ZnO/TiO<sub>2</sub> passivation layers formed by atomic layer deposition. The thin ZnO and TiO<sub>2</sub> layers deposited on the BiVO<sub>4</sub> nanopillars formed a heterostructure that promoted electron-hole separation and the migration of electrons toward the ITO substrate. The photocurrent density (PCD) of the ZnO/TiO<sub>2</sub> coated BiVO<sub>4</sub> was 2.5 times higher (2.25 mA/cm<sup>2</sup> at 1.2 V (versus Ag/AgCl)) than that of pristine BiVO<sub>4</sub> (0.9 mA/cm<sup>2</sup> at 1.2 V (versus Ag/AgCl)). We present incident/absorbed photon-to-current efficiency and electrochemical impedance measurements confirming that this improvement is a result of the heterojunction produced by the conformal ZnO/TiO<sub>2</sub> coating and discuss the mechanism of this dramatic enhancement of PCD.

**Keywords:** Bismuth vanadate nanopillar, Photoanode, Water splitting, Photocurrent density, Atomic layer deposition, Heterostructure

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