

Accepted Manuscript

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PII: S0925-8388(18)32668-9

DOI: [10.1016/j.jallcom.2018.07.167](https://doi.org/10.1016/j.jallcom.2018.07.167)

Reference: JALCOM 46883

To appear in: *Journal of Alloys and Compounds*

Received Date: 26 March 2018

Revised Date: 12 July 2018

Accepted Date: 14 July 2018

Please cite this article as: M.-W. Kim, E. Samuel, K. Kim, H. Yoon, B. Joshi, M.T. Swihart, S.S. Yoon, Tuning the morphology of electrospayed BiVO_4 from nanopillars to nanoferns via pH control for solar water splitting, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.07.167.

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Tuning the morphology of electrosprayed BiVO₄ from nanopillars to nanoferns via pH control for solar water splitting

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ABSTRACT

Electrosprayed BiVO₄ adopts a nanopillar structure formed by diffusion-limited aggregation, which maximizes the surface area of the nanopillars. However, increasing the interfacial area between an electrode and the electrolyte through nanostructuring enhances the overall interfacial activity for solar water splitting. For this purpose, the pH of the precursor solution used for electrospraying BiVO₄ was altered by adding ammonium hydroxide, thereby inducing a drastic change in the morphology of BiVO₄. The previously demonstrated nanopillar morphology of electrosprayed BiVO₄ was transformed into a nanofern structure that increased the photocurrent density of BiVO₄ from 0.82 to 1.23 mA·cm⁻² at 1.2 V vs. Ag/AgCl. The produced films were characterized by scanning electron microscopy, X-ray photoelectron spectroscopy, Raman spectroscopy, and electrochemical impedance spectroscopy.

Keywords: Electrostatic spray deposition, BiVO₄, Nanopillar, Nanofern, Solar water splitting, Photocurrent density

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