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Tuning the morphology of electrosprayed $BiVO_4$ from nanopillars to nanoferns via pH control for solar water splitting

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ABSTRACT

Electrosprayed $BiVO_4$ 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 $BiVO_4$ was altered by adding ammonium hydroxide, thereby inducing a drastic change in the morphology of $BiVO_4$. The previously demonstrated nanopillar morphology of electrosprayed $BiVO_4$ was transformed into a nanofern structure that increased the photocurrent density of $BiVO_4$ from 0.82 to 1.23 $mA \cdot cm^{-2}$ 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, $BiVO_4$, Nanopillar, Nanofern, Solar water splitting, Photocurrent density

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