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*Thermochromic behaviors of boron–magnesium co-doped BiVO<sub>4</sub> powders prepared by a hydrothermal method*

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**Highlights**

- Pure BiVO<sub>4</sub> and all the doped samples has been successfully synthesized by hydrothermal method.
- Co-doping occurred structure deformation and lowering band gap energy than single doping in BiVO<sub>4</sub>.
- Improved the thermochromic behaviors of BiVO<sub>4</sub> by using B–Mg co-doping.

**Abstract<sup>1</sup>**

Pure BiVO<sub>4</sub>, B-doped BiVO<sub>4</sub>, Mg-doped BiVO<sub>4</sub>, and B–Mg co-doped BiVO<sub>4</sub> were prepared using a mixed aqueous solution of bismuth nitrate (Bi(NO<sub>3</sub>)<sub>3</sub>) and ammonium vanadate (NH<sub>4</sub>VO<sub>3</sub>) using a hydrothermal method. The crystal structure and thermochromic behaviors of BiVO<sub>4</sub> samples were investigated using X-ray diffraction, UV-Vis spectrophotometry, and in situ X-ray diffraction to compare the effects of the doping elements on the thermochromic behaviors of BiVO<sub>4</sub>. The results showed that B and Mg ions co-doped into the lattice of BiVO<sub>4</sub> led to lattice deformation, ehiger impurity levels, more new band gap states, a narrower band gap, and an improvement in thermochromic behaviors than either ion alone.

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<sup>1</sup> Abbreviations: XRD, X-ray diffraction; UV-Vis, ultraviolet-visible; DRS, diffuse reflectance spectra; RIR, reference intensity ratio

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