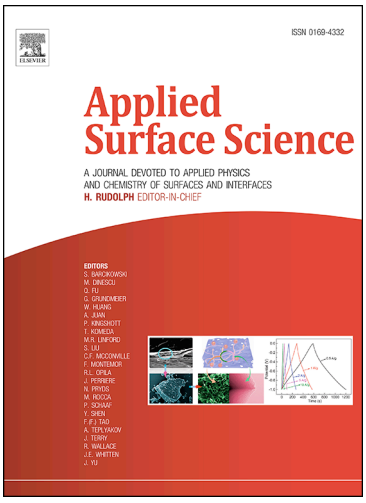


Full Length Article

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# Insight into phosphate doped $BiVO_4$ heterostructure for multifunctional photocatalytic performances: A combined experimental and DFT study

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**Abstract**

Doping with non-metals like phosphorous has been extensively investigated to extend radiation absorption and improve the photocatalytic efficiency of $TiO_2$. However, the effect of non-metal doping in $BiVO_4$, whose smaller bandgap (2.4 eV) allows for efficient visible light absorption, has been scarcely investigated. Visible light accounts for 45 % of solar energy (as compared to only 5 % of UV light) reaching the Earth's surface. Due to its high efficiency in absorbing visible radiation, $BiVO_4$ can, therefore, be a promising material to replace $TiO_2$. Here we demonstrate the synthesis of phosphate doped visible-light-active $BiVO_4$ by a microwave hydrothermal method as a promising alternative to $TiO_2$. Subsequently, we investigated its photocatalytic activity for the removal of p-amino salicylic acid and ibuprofen, two cases of major pharmaceutical waste, as well as disinfection of multi-drug resistance *Staphylococcus aureus* bacteria. In addition, the biofilm elimination efficiency of the undoped and phosphate doped $BiVO_4$ was studied by crystal violet staining method. A 70% reduction in the biofilm biomass by phosphate doped $BiVO_4$ was obtained. Also, a 4.1log reduction in the viable cells count was observed within 180 min when *Staphylococcus aureus* was