Doping Effect of M-doped $BiVO_4$ (M=Mo,W) for Water Oxidation under Visible Light

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Water oxidation to obtain oxygen and proton is one of the key processes for artificial photosynthesis that produce liquid fuel like methanol from carbon dioxide and water. Bismuth vanadate ($BiVO_4$) is one of the best photocatalysts for it.

In this work, photoelectrochemical properties and photoactivity for oxygen evolution of pure monoclinic M-doped $BiVO_4$ (M=Mo, W) powders were investigated to find out the origin of their high performance. Morphology, structure and phase, and band gap energy are measured by scanning electron microscope, X-ray diffraction spectroscopy, and UV-vis diffuse reflectance spectroscopy. Photoelectrochemical measurements which are I-V curve and electrochemical impedance spectroscopy were performed with the fabricated photoanodes on FTO glass, and they showed increased photocurrent density and dramatically decreased impedance, which means enhanced conductivity. The origin of enhanced photoactivity behavior is further investigated using first principle electronic structure calculations, and the results fully accord with experimentally observed photoactivity results.