

Composite Electrodes of BiVO₄/WO₃ for Photoelectrochemical water splitting

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Heterojunctioned composite semiconductors are an efficient system for electron-hole separation to minimize the energy wasteful electron-hole recombination. In this work we introduce a kind of heterojunctioned composite electrodes for photoelectrochemical (PEC) cell application for enhancement of WO₃ efficiency. We have prepared WO₃ and BiVO₄ composite electrode by polymer-assisted deposition. All samples consisted of each layer of WO₃ and BiVO₄ and has thickness around 2~2.5μm. They were calcined at 550°C under air atmosphere. The prepared films were characterized using XRD, SEM, UV-Vis spectra and electrochemical analysis. The photocurrents were measured under AM 1.5G simulated solar light in 0.5M Na₂SO₄. In the IPCE data, WO₃ absorbed the light of 500nm due to band gap of 2.7eV. Thus, the onset of IPCE started at 500nm for WO₃ electrode. The BiVO₄ could absorb more light of longer wavelengths than WO₃ due to band gap of 2.5eV, so that BiVO₄ showed photoactivity at 540nm. Yet, its photoactivity for O₂ generation was much lower than that from WO₃. The WO₃-BiVO₄ composite electrode show a synergism showing higher activity than WO₃ and BiVO₄ combined.