Aukšta sisteminė fotoelektrocheminio (PEC) vandens skaidymo kinetika naudojant plazmoninius nanokompozitus $BiVO_4$.

High System Kinetics of Photoeletrochemical (PEC) water splitting using Plasmonic Nanocomposites of $BiVO_4$.

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Carbon-free fuel or green hydrogen production by photoeletrochemical water splitting is a promising way to replace the usage of fossil fuels on a large scale. However, green hydrogen is not cost-friendly in comparison with fossil fuels due to the average energy efficiency[1-2]. In this project, photoanodes based on nanocomposites of monoclinic $BiVO_4$ by incorporating the nanoparticles of plasmonic metals (Au & Ag), reduced graphene Oxide (RGO), and carbon nanotubes (CNT) were fabricated for photoeletrochemical water splitting. Four different photoanodes were prepared by using drop-casting and electrochemical deposition techniques. Scanning electron microscopy (SEM), X-ray diffraction (XRD), and Energy-dispersive X-ray spectroscopy (EDS) analysis confirmed the surface morphology, structural details, and concentration of carbon nanotubes, graphene sheet, and $BiVO_4$, Au, and Ag nanoparticles in photoanodes.Ultraviolet-Visible spectroscopy revealed the increasing trend in absorption edge, for RGO/CNT/$BiVO_4$, RGO/CNT/Ag/$BiVO_4$, RGO/CNT/Au/$BiVO_4$, and RGO/CNT/Ag/Au/$BiVO_4$, photoanodes respectively. The photoeletrochemical (PEC) catalytic response of these fabricated photoanodes was determined through linear sweep voltammetry (LSV) during oxygen evolution reaction (OER) and hydrogen evolution reaction (HER). The incorporation of reduced graphene oxide and carbon nanotubes revealed an increasing trend in current density through fast transportation of electrons. RGO/CNT/Ag/Au/BiVO4 photoanode exhibited high system kinetics with the lowest over-potential of 200 mV with the great ABPE% of 6.62%.

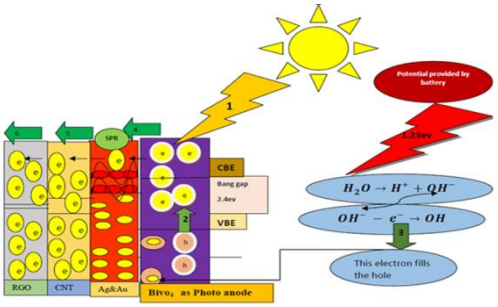

Figure 1 working principle of Photoelectrochemical water splitting

Key words: photoeletrochemical, water splitting; hydrogen evolution reaction, oxygen evolution reaction

Literature

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