The effect of calcination time on the morphology and efficiency of $BiVO_4$ films in order to use as solar decomposition of water

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Received: 19.02.2018 Final revised: 01.12.2018 Accepted: 13.02.2019

Abstract

With the growth of science and technology, it is predictable that hydrogen will be the future fuel of human society. Chemical decomposition of water for fuel production through direct conversion of solar energy has been proposed as an interesting topic in science. In this experimental work, $BiVO_4$ thin film photoanodes were deposited on indium titanium oxide substrates by spray pyrolysis method. Cobalt oxide was used as a cocatalyst and was deposited on $BiVO_4$ films by a spin coating method. Five samples were calcined at 400^oC for 1-5 hours to study the effect of calcination time on the morphology of $BiVO_4$ films. The results showed that by increasing calcination time, the photocurrent rises. The SEM images clearly indicated that by increasing calcination time, atoms were able to move into low energy sites at the surface, and individual nanoparticles became more interconnected. Furthermore, the XRD patterns showed that there are no critical changes in the microstructure of the layers. The UV-VIS spectrum of samples depicted an increase in photo absorption which is related to the variation in grain size of $BiVO_4$ films.

Keywords: water decomposition, Solar energy, Bismuth vanadate, photocurrent, photoanode, calcination

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