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Influence of zinc acetate content on the photoelectrochemical performance of zinc oxide nanostructures fabricated by electrospinning technique

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Abstract

One-dimensional nanostructures have shown high photocatalytic efficiency due to their high surface area to volume ratio and charge transfer efficiency. In this work, we have studied the influence of zinc acetate content (zinc acetate to polyvinyl alcohol (PVA) mass ratio) on the photoelectrochemical performance of zinc oxide (ZnO) nanostructures. The nanostructures of ZnO were fabricated on fluorine-doped tin oxide glass substrate by electrospinning of aqueous solution containing different amounts of zinc acetate. The precursor nanofibers of zinc acetate/PVA were converted into polycrystalline ZnO nanostructures with hexagonal wurtzite crystal structure by calcination at 600°C for 3 h. It was found that by increasing the amount of zinc acetate, the diameter of the as-spun precursor fibers increased and their distribution became broader. The mean diameter of the ZnO nanoparticles forming the nanostructures ranged from 45 to 80 nm by increasing the amount of zinc acetate. The incident photon to current efficiency (IPCE) spectra of the ZnO nanostructures were measured in a three-electrode cell, using a platinum wire as a counterelectrode and silver/silver chloride as a reference electrode. The ZnO nanostructures fabricated with zinc acetate to PVA ratios of 2:3 and 1:1 exhibited approximately 31% and 28% IPCE, respectively, at about 350 nm compared with the ZnO nanostructures fabricated with zinc acetate to PVA ratios of 1:2 (7%) and 3:2 (4%) due to the increased number of nanostructures, resulting in the enhancement of light absorption and electron transfer rate.

Citations 0 **References** 1

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