Hydrothermal deposition of CdS on vertically aligned ZnO nanorods for photoelectrochemical solar cell application

ABSTRACT

CdS/ZnO nanorods composite nanofilms were successfully synthesized via hydrothermal method on indium doped tin oxide glass substrates. Sequentially deposited CdS formed cauliflower like nanostructures on vertically aligned ZnO nanorods. The morphological, compositional, structural and optical properties of the films were characterized by field emission scanning electron microscopy, energy dispersive X-ray analysis, X-ray diffraction and ultraviolet–visible spectroscopy. Photoelectrochemical conversion efficiencies were evaluated by photocurrent measurements in a mixture of Na_2S and Na_2SO_3 akaline aqueous solution. The amount of deposit, as well as the diameter and crystallinity of the CdS cauliflower were found to increase with growth time. CdS/ZnO nanorods composite exhibited greater photocurrent response than ZnO nanorod arrays. Besides, the composite film with 90 min of growth duration displayed the highest photocurrent density which is nearly four times greater than plain ZnO nanorods under the illumination of halogen light. The result exhibited remarkable photoconversion efficiency (η) of 1.92 %.

Keyword: Growth; Time photocurrent; Density HMTA; Photoconversion; Efficiency; Photoelectrochemical performance