

ZnS ASSISTED Zn DOPING IN CdZnS ELECTRODEPOSITION

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Received: 27th January 2019 / Accepted 25th February 2019

ABSTRACT

Many reports have been published elsewhere on making thin films of cadmium zinc sulphide (CdZnS) using different techniques. This article summarizes a method developed to form CdZnS by incorporating electrodeposited Cd and S atoms simultaneously to the chemically formed ZnS material in the electrolytic bath at the conducting surface of fluorine doped tin oxide (FTO) coated glass substrate. Moreover, the mechanism of formation of CdZnS is proposed as a solid state reaction between electrodeposited Cd and S atoms on the glass/FTO substrate with adsorbed ZnS particles from the electrolytic bath. The precursors used for Cd, S and ZnS in the electrolyte were aqueous solutions of CdCl₂, ZnCl₂ and Na₂S₂O₃.

Two different methods were tested to form ZnS within the electrolyte bath where one forming ZnS in the bath at the beginning of electrodeposition of Cd and S and in the other one, ZnS is formed before the electrodeposition of Cd and S. The results of the band gap measurements show an undulation which is closer to the band gap energy of CdS indicating probable codeposition of one or more materials such as CdS, (2.42 eV), ZnS (3.7 eV), CdO (2.2 eV), and ZnO (3.2 eV) along with CdZnS.

The Tauc plot resulted by the material produced in method 1 has shown an undulation at the onset of Tauc plot which is near the band gap energy of CdS indicating the codeposition of CdS with CdZnS, but the Tauc plot of CdZnS electrodeposited from method 2 has shown clear separation in band gaps from 2.44 – 2.52 eV, when the annealing temperature, the Zn²⁺ ion concentration in bath and the electrodeposition pH were varied. These thin films were also characterized by photoelectrochemical (PEC)

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