617/E2

Growth of CdS layers for fabrication of electrodeposited CdS/CdTe thin film solar cells

A M B Chandima[1], K A S Pathiratne[1], I M Dharmadasa[2] and D S M De Silva[1]

[1] *Department of Chemistry, University of Kelaniya, Kelaniya*
[2] *Materials & Engineering Research Institute, Sheffield Hallam University, Sheffield S1 1WB, UK*

Cadmium sulphide is widely used as a heterojunction partner and a window layer material in the fabrication of polycrystalline CdTe thin film solar cells. Cadmium sulphide films were prepared by continuous bath deposition technique using $CdCl_2$ as cadmium precursor salt, and ammonium thiosulphate or thiourea as the sulphur precursor salt.

The growth of CdS was explored in the range of 1300-1600 mV cathodic voltage range using a two electrode cell setup with a graphite rod as the anode. Material was grown on glass/FTO substrates after cleaning in organic solvents (Acetone and Methanol) followed by rinsing in glacial acetic acid. The appearance and photoelectrochemical (PEC) signal measurements were used to determine the level of photovoltaic activity of the devices made through electrodeposition. The dependence of the level of photovoltaic activity on the pH of the solutions, temperature of the bath, the rate of stirring of solutions, annealing temperature and the annealing time were optimized. The electrochemical reactions in the plating bath have been studied by cyclic voltammetry. The deposition time was 2 hours. The pH of the solution was adjusted to 1.40 by adding appropriate amounts of dilute HCl and temperature was 47° C. Stirring speed was 125 rpm and volume of electrolyte was 800 ml. PEC measurements were carried out in order to determine the electrical conductivity type of electrodeposited CdS layers. The sign of the PEC signal determines the electrical conduction type, and all ED - CdS layers grown produced negative PEC signals indicating the growth of n- type semiconductors. In the present study, the CdS films prepared using ammonium thiosulphate shows higher photoactivity than the Cds prepared using thiourea as the sulphur precursor salt. Upon heat treatment, the material layers show enhanced PEC signal indicating improved optical properties of the material.

kaspathi@kln.ac.lk Tel: (0)11- 2903256