Shivaji M Sonawane et al., J Nanomed Nanotechnol 2017, 8:6(Suppl)
DOI: 10.4172/2157-7439-C1-058

Electrochemical synthesis of ZnTe and Cu-ZnTe thin films for low resistive ohmic back contact for CdS/CdTe solar cells

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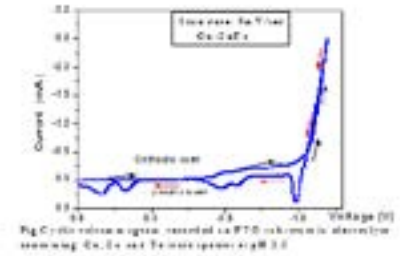
CdTe thin film photovoltaic solar cells are amongst the promising technology for large scale solar electricity production. ZnTe are intensively studied as an interface layer for CdTe absorber in CdS/CdTe thin film photovoltaic devices. ZnTe is direct band gap; P-type semiconductor with high absorption coefficient of the order of 104 cm-1 is suitable for solar cell development. It can be used as a low resistive ohmic contact to CdS/CdTe or tandem solar cell application. ZnTe and Cu-ZnTe thin film have been electrochemically synthesized on to fluorine-doped tin oxide coated glass substrates using three electrode systems containing Ag/AgCl, graphite and FTO as reference, counter and working electrode respectively was used to deposit the thin films. The aqueous electrolytic solution consist of 0.5M TeO_2, 0.2M $ZnSO_4$, and 0.1M $Na_3C_6H_5O_7$:$2H_2O$, 0.1M$C_6H_8O_7$:H_2O and 0.1mM$CuSO_4$ with PH 2.5 at room temperature was used. The reaction mechanism is studied in the cyclic voltammetry to identify the deposition potentials of ZnTe and Cu-ZnTe.The potential was optimized in the range -0.9 to -1.1 V vs. Ag/AgCl reference electrode. The effect of depositon potential on the structural properties was studied by using X-ray diffraction. The X-ray diffraction result reveled cubic crystal structure of ZnTe with preferential (111) orientation with cubic structure. The surface morphology and film composition were analyzed by means of Scanning Electron Microscopy (SEM) and Energy Dispersive Analysis of X- Rays (EDAX). The optical absorption measurement has been analyzed for the band gap determination of deposited layers about 2.26 eV by UV-Visible spectroscopy. The drastic change in resistivity has been observed due to incorporation of copper probably due to the diffusion of Cu in to grain boundaries.



Biography

Shivaji M Sonawane is currently an Assistant Professor of Physics at B J S Arts Science and Commerce College in Pune, India. He is working as Research Fellow in Department of Physics, Savitribai Phule Pune University for pursuing his PhD. He has published more than 15 papers in reputed journals and presented at international conferences. His main research interests are development of semiconductor thin films for CdS/CdTe solar cell.

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