



CdTe THIN FILM SOLAR CELLS WITH NANOCRYSTALLINE ZnSe BUFFER LAYER

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ABSTRACT

Nanocrystalline ZnSe films were prepared by close space sublimation method on SnO₂/ glass substrates to fabricate ZnSe/CdTe heterojunctions. The SnO₂: F film had a thickness of 500 nm, sheet resistance of <10 Ω/sq. The SEM and XRD studies of ZnSe thin films on SnO₂/glass substrates show that the structure is cubic and nanograins sizes depend on the substrate temperature. The lattice parameter showed a dependence on substrate temperature. Because it is difficult the low resistive nanocrystalline ZnSe films to grow the immersion in a solution of ZnCl₂:H₂O were used to dope with chlorine. Effect of annealing and chlorine doping on the composition, structural, optical and electrical properties was studied. The EMPA spectra of the immersed ZnSe films do not show the presence of chlorine in the films. Both ZnSe layers treated as well as untreated were Zn deficient. The transmission and energy band gap of nanocrystalline ZnSe films decrease after annealing and ZnCl₂:H₂O doping. Also, the decrease in resistivity was observed for all films. ZnSe/CdTe photovoltaic cells were characterized through light and dark temperature-dependent current–voltage (J–V) measurements. The photovoltaic parameters of ZnSe/CdTe thin film solar cells improved after the immersion in a solution of ZnCl₂:H₂O and annealing at 350°C. The cell parameters obtained for the best device are $V_{oc} = 640$ mV, $FF = 45\%$, $J_{sc} = 20.5$ mA/cm², and $\eta = 5.9\%$.

Keywords: ZnSe thin films, ZnCl₂:H₂O doping, ZnSe/CdTe thin film photovoltaic cells