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Electrochemical deposition of $CuInTe_2$ layers for applications in Thin Film Solar Cells

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Copper indium ditelluride ($CuInTe_2$) is a promising semiconductor material for photovoltaic applications on account of its suitable optoelectronic properties. Among the various deposition techniques available for the preparation of $CuInTe_2$ thin films, method of electrodeposition is an attractive technique due to its simplicity, low cost and possibility of making large area thin films. In this investigation, potentiostatic electrodeposition of $CuInTe_2$ thin films on fluorine doped tin oxide (FTO) was studied using a three electrode electrochemical cell containing an aqueous solution of CuCl, $InCl_3$,TeO_2 and HCl. Cyclic voltammograms were obtained in order to investigate the growth parameters; deposition potential, concentration of CuCl, $InCl_3$ and TeO_2, pH, temperature and stirring speed of the bath. In order to grow the photoactive $CuInTe_2$ thin films, set of samples were prepared by slightly changing the deposition potential with aid of the growth parameters obtained from cyclic voltammetric curves. X-ray diffraction pattern shows that the material layers have polycrystalline chalcopyrite structure. Dark and light current voltage characteristics of the $CuInTe_2$ were measured by using 0.1 M $Na_2S_2O_3$ solution. Highest photoactivity is given when the film deposited at -600 mV Vs Ag/AgCl for 3 hrs in the electrolyte containing aqueous solution of 1 mM CuCl, 20 mM $InCl_3$ and 2 mM TeO_2. Depositions were carried out at room temperature. pH and the stirring speed of the bath were 1.5 and 125 rpm respectively. Gravimetric measurements carried out for depositions at – 600 mV over a period of 3 hours indicated that the thickness of the deposited layers was in the range of thickness of 1.8 μm - 2.1 μm. The layers were found to be photoactive and p-type in electrical condition.

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