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Photoelectrochemical characterization of ZnSe coated copper indium sulphide thin film electrodes

Copper Indium Sulphide thin films were prepared by sulphidation of Cu-In alloy on Ti substrate. Cu-In alloy was potentiostatically electrodeposited at – 1.4 V Vs SCE in an aqueous bath containing 5 mM $CuCl_2$, 37.5 mM $InCl_3$, 1% (v/V) TEM and. 75% (V/V) ammonia>

Sulphidation was carried out in saturated H_2S gas at 550 ^oC for 30 min. XRD measurement reveals that the crystal structure of the films is $CuIn_{11}S_{17}$. ZnSe was deposited on CuInS electrode by electrodeposition in an aqueous bath of 0.1 M $ZnSo_4$ and 10^{-5} M SeO_2 at -).5 V Vs SCE for 90 min. XRD measurement reveals that the ZnSe films are amorphous.

Ti/ CuInS/ ZnSe thin film system in a PEC cell containing KI produces n-type photoconductivity. Dark and illuminated I-V measurement shows the existence of a main junction. However, some departure is also evident suggesting the possibility of existence of another junction. Spectral response of the Ti/CuInS/ZnSe system in a pPEC cell shows the photoresponse of both n-CuInS/p-ZnSe znd p-ZnSe/ electrolyte interfaces. Normally, for shorter wavelength the spectral response is p-type while for the long wavelength it is n-type.

The preliminary results of the study suggest the possibility of utilizing electrodeposited n-CuInS in combination with electrodeposited p-ZnSe in developing a low-cost thin film solar cell.