Nanostructured $CuInSe_2$ thin films prepared by chemical methods

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$CuInSe_2$ (CIS) has been a promising compound semiconductor material for solar energy conversion by photovoltaic effect. The main impediment in the efficient solar conversion in the case of CIS is due to its not so suitable band gap (1.1 eV). This limits to attain higher efficiencies. Recent, explosive growth in nanomaterial and devices technology has brought new opportunities for the development of nanoelectronic devices for solar cell applications. Crystals with dimensions in nanometer range show characteristics which are substantially different from the characteristics of bulk materials and thin films. An effective increase in band gap is observed in nanocrystalline CIS due to quantum confinement effects. CIS can be band gap-tuned by adjusting its particle size.

In this study we report the synthesis and characterization of nanostructured CIS thin films for photovoltaic and photoelectrochemical application. The CIS nano-films were deposited by the potentiostatic pulsed electrodeposition and chemical deposition. These films were characterized by X-ray diffraction (XRD), scanning electron (SEM) and atomic force microscopy (AFM), optical and opto-electronic techniques. The formation of the nanostructures were confirmed by the above analytical techniques. Nanostructures with particle size of the order of a few 10s of nanometers were attained by this method. A noticeable change in the band gap was observed by the optical techniques.

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