

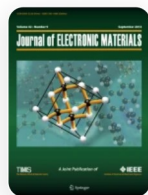
An Experimental and Theoretical Study of Cu_{0.2}Zn_{0.8}S Thin Film Grown by Facile Chemical Bath Deposition As an Efficient Photosensor

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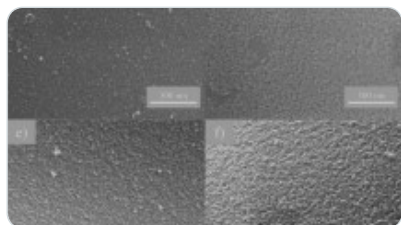
Abstract

We have successfully deposited Cu_{0.2}Zn_{0.8}S thin films onto a glass substrate by facile chemical bath deposition at 60°C. The structural, morphological, optical, electrical and electronic properties of the as-grown Cu_{0.2}Zn_{0.8}S thin film were studied. The x-ray diffraction pattern confirmed the formation of the Cu_{0.2}Zn_{0.8}S composition when compared with standard JCPDS

card. The Raman spectrum shows a major peak at 470 cm^{-1} along with few other which are attributed to Cu_{0.2}Zn_{0.8}S phase. The field emission scanning electron microscopy result shows the uniform growth of material over the entire glass substrate with dense morphology containing irregularly shaped grains. From the optical absorption spectrum, a clear band edge around $\sim 430\text{ nm}$ was observed which results in a wide energy band gap of $\sim 2.9\text{ eV}$. The obtained band gap is in good agreement with the earlier reports. The electrical properties were measured at room temperature in the voltage range $\pm 2\text{ V}$ and showed a drastic enhancement in current under light illumination with the highest photosensitivity of $\sim 91\%$ for 260 W . The electrical properties suggest its promising candidature for optoelectronic devices. The electronic properties like band structure, the partial and total density of states were studied with density functional theory formalism with generalized gradient approximation which suggests that Cu_{0.2}Zn_{0.8}S is a direct band semiconductor with a band gap of $\sim 1.64\text{ eV}$.

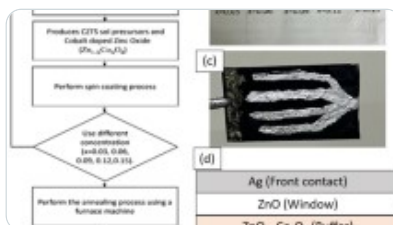
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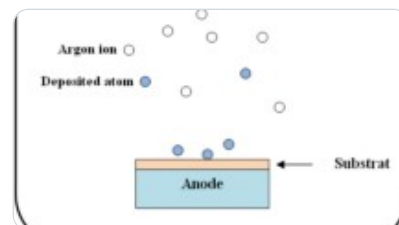
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