

Study of Electrodeposited $\text{Cu}_2\text{ZnSnS}_4$ Thin Film Properties by a Modified Sulfurization Process

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Copper zinc tin sulfide (CZTS) is being related to the highly successful $\text{Cu}(\text{In,Ga})(\text{S,Se})_2$, and CuInS_2 materials, is fast becoming a key instrument for use in thin-film solar cells because of the low cost, environmentally friendly, large area deposition and room temperature growth, nontoxic of its constituent elements and abundance. CZTS is a direct band gap material with absorption coefficient greater than 10^4 cm^{-1} . Various routes are available for CZTS deposition or nanoparticle synthesis. High-energy demanding techniques such as atom beam sputtering, hybrid sputtering, RF magnetron sputtering, pulsed laser deposition, thermal evaporation etc., are useful in producing thin films of CZTS on desirable substrate. In the present work, we report an electrodeposition process to fabricate $\text{Cu}_2\text{ZnSnS}_4$ (CZTS) absorber film. This low energy processes is preferred because the technique offers advantages of low equipment cost, scalable deposits, room temperature process conditions.

This work highlights a CZTS thin film synthesis process that involves a single step deposition of CZTS without post annealing treatment in the presence of sulfur. The major objective of this study is to compare between CZTS thin films prepared by a sulfurization of electrodeposited Cu-Zn-Sn and CZTS thin films prepared by a single deposition from one bath that contains the four elements metal. The compositional, morphological, and optical properties of CZTS thin film prepared by different sulfur precursor were investigated.

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