

## Study of Structural and Optical Properties of $\text{Cu}_2\text{ZnSnS}_4$ Thin films Synthesized by Spin Sol-Gel

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**Abstract:** In this study  $\text{Cu}_2\text{ZnSnS}_4$  (CZTS) thin films were deposited by sol-gel spin coating on glass substrates and the effect of metal salts ratio, annealing treatment with and without sulfur vapor on structural, morphological and optical properties of CZTS films were investigated. Our results were showed that all CZTS thin films have kesterite structure. Moreover increasing of zinc concentration and decreasing of copper content in deposition solution and annealing treatment improved crystallite quality and destructed secondary phases. The band gap energy of the annealed samples was in the range of 1.40 to 1.50 eV, which is convenient for application in solar-cells as an absorber layer. Comparison of the results showed that the morphology, structural and optical properties of annealed CZTS thin films in presence of sulfur are better than other samples.

**Keywords:**  $\text{Cu}_2\text{ZnSnS}_4$ (CZTS) thin films; Spin Sol-gel method; annealing treatment; Kesterite structure; Band gap energy.

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