**Influence of Annealing Temperature on the Properties of CZTS Thin Films Formed by Electrodeposition**

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**ABSTRACT**

The chalcogenide based absorber materials for solar cell applications has gained more interest among the research community. The chalcogenide copper zinc tin sulfide (CZTS) is found to be an ideal non-toxic, earth abundant material for the solar cell applications. It has a direct band gap energy and higher absorbance coefficient of 1.5 eV and 104 cm-1 respectively. The desired stoichiometry of CZTS is 2:1:1:4 for Cu, Zn, Sn and S respectively. Single step electrochemical deposition of CZTS on gold substrate has been studied using glycine as the complexing agent. The influence of annealing temperature on the properties of the obtained CZTS films has been investigated. Analysis of the samples by energy dispersive X-ray analysis showed that with increase in annealing duration the sulfur content dropped and the stoichiometry changed to a lesser extent. Annealing at 400 ºC for 30 min was found to give composition closer to the desirable composition. Morphology analysis using scanning electron microscopy showed that the morphology of the samples changed significantly with the annealing conditions. Analysis of the samples by UV-vis spectroscopy revealed that the optical band gap (*E*g) increased with increase in annealing temperature. The optical band gap was found to range between 1.50 eV and 2.60 eV. The Mott-Schottky analysis of the CZTS films showed that the particles formed showed p-type conductivity. The current-voltage (I-V) characteristics in the presence and the absence of light showed increased conductivity in the presence of light which shows that sample is suitable for solar cell applications.

*Keywords: Chalcogenide, absorber material, CZTS, annealing temperature, electrochemical deposition.*