

## Effects of pH value on the electrodeposition of Cu<sub>4</sub>SnS<sub>4</sub> thin films.

### ABSTRACT

Copper tin sulfide thin films were electrodeposited on the indium tin oxide substrates in a bath containing CuSO<sub>4</sub>, SnCl<sub>2</sub> and Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> solutions. Various pH values ranging from 1.1 to 1.5 were attempted in order to determine the optimum condition for electrodeposition process. The structure and morphology of the films were studied by using X-ray diffraction and atomic force microscopy, respectively. The band gap energy and absorption properties were determined using UV-VIS spectrophotometer. The thin films produced were polycrystalline in nature. The XRD patterns showed that the most intense peak at  $2\theta = 30.2^\circ$  which belongs to (221) plane of Cu<sub>4</sub>SnS<sub>4</sub>. As the pH was increased, the grain size of this film was much smaller and has complete coverage over the substrate surface. The film showed good uniformity and produced higher absorbance value at pH 1.5. The band gap energy of this film was found to be 1.5 eV.

**Keyword:** Bandgap energy; Electrodeposition method; X-ray diffraction; Thin films