Influence of bath temperature and PH value on properties of chemically deposited CU4SNS4 thin films.

ABSTRACT

Thin films of Cu4SnS4 semiconductors were prepared by chemical bath deposition technique in aqueous solutions. The effects of various bath temperatures (40, 50 and 60 °C) and pH values (pH 0.5, pH 1.0 and pH 1.5) on growth of films were reported. The structure and morphology characteristics of thin films of Cu4SnS4 grown on indium tin oxide glass substrates were investigated by X-ray diffraction and atomic force microscopy techniques. The optical properties were measured to determine the transition type and band gap value. The thin films produced were found to be polycrystalline with orthorhombic structure. The X-ray diffraction data showed that the most intense peak at 20 = 30.2° which belongs to (221) plate of Cu4SnS4. The films deposited at 50 °C were found to have the best photoresponse activity and smaller crystal size. At pH 1.5, the film showed well-covered entire substrate surface and the highest absorption values in AFM and optical study, respectively. The best condition to prepare good quality thin films can be carried out at 50 °C with pH 1.5. The bandgap value was found to be 1.4 eV with direct transition.

Keyword: Semiconductor; Thin films; Band gap; Chemical bath deposition.