

Composition, structure and photoelectrochemical characterization of electrodeposited Cu₄SnS₄ thin films

ABSTRACT

Cu₄SnS₄ thin films were deposited on indium tin oxide glass substrate using the electrodeposition method. The thin films were obtained in a reaction bath at pH values of 1.1, 1.3, 1.5, 1.7 and 2.0. The structure and chemical composition of the thin films were studied by X-ray diffraction and energy dispersive analysis of X-ray, respectively. The photoresponse of the deposited films and their conduction types were evaluated using the photoelectrochemical technique. The X-ray diffraction data indicated that the of peaks increased as the pH was increased up to 1.5. However, the total Cu₄SnS₄ peaks reduced to three peaks as the pH was further increased to 2. Based on the energy dispersive analysis of X-ray analysis, the composition ratio Cu:Sn:S of the films was varied with pH. When the pH was lower or higher than pH 1.5, the content of Cu and Sn is slightly greater than that of elemental S. Therefore, the pH had significant influence on the composition of the deposited films.

Keyword: Electrodeposition method; X-ray diffraction; Photocurrent; Thin films