

Effect of under nitrogen annealing on photo-electrochemical characteristics of films deposited from authentic Cu_2SnSe_3 sources by thermal vacuum under argon gas condensation

ABSTRACT

This communication describes how annealing under nitrogen affects photo-electrochemical characteristics of films deposited from authentic Cu_2SnSe_3 sources by vacuum evaporation under argon gas (low flow rate $5 \text{ cm}^3/\text{min}$) using substrate 300°C . Annealing lowered the photoresponse of the deposited film, by affecting crystallite structure, morphology, composition and pores in the films. Annealing at temperatures in the range $150\text{--}350^\circ\text{C}$ improved crystallinity of the film but lead to pore formation between adjacent, which lowered photoresponse by increased resistance across the electrode/redox interface. Higher temperature (450°C) annealing lead to SnO_2 formation, as an additional phase, at the expense of Cu_2SnSe_3 decomposition. Porosity and mixed phases with SnO_2 presumably increased film internal resistance and resulted in poor charge transfer across the solid/redox couple interface. By affecting film characteristics, annealing lowered photoresponse for the deposited films.

Keyword: Argon gas condensation; Thermal evaporation; Photoelectrochemical characteristics; Photoactivity; Copper tin selenide film