SnSe thin film electrodes prepared by vacuum evaporation: enhancement of photoelectrochemical efficiency by argon gas condensation method

Abstract

The effect of argon gas condensation (AGC) on crystallinity, surface morphology and photoelectrochemical (PEC) characteristics of SnSe thin films, prepared by thermal vacuum deposition onto ITO/glass substrates, has been investigated. The focal theme was to improve growth process of SnSe thin films and consequently enhance their PEC characteristics, by including argon gas during film manufacturing. For comparison purposes, the films grown With- and Without-AGC were characterized using various techniques such as X-ray diffractometry, UV-VIS spectroscopy, and SEM. The results indicate enhancement in film crystallinity and surface morphology by inclusion of argon gas. Such enhancement has been attributed to slower deposition rate due to argon gas presence. Photoelectrochemical property of SnSe thin film electrodes was studied using linear sweep voltammetry in dark and under illumination. The With-AGC electrodes showed higher photoactivity than the Without-AGC counterparts. Enhancement of PEC characteristics of SnSe With-AGC thin film electrodes is consistent with their crystallinity and surface uniformity. Inclusion of AGC in thermal vacuum deposition processes is potentially valuable to prepare enhanced SnSe thin film electrodes even without the need for further treatment such as etching or annealing.

Keyword: Argon gas condensation; Photoelectrochemical; Photoactivity; Tin selenide