Pulsed current co-electrodeposition of kesterite Cu2ZnSnS4 absorber material on fluorinated tin oxide (FTO) glass under galvanostatic conditions

Patamaporn Termsaithong, Ratiporn Munprom, Akeel Shah, Aphichart Rodchanarowan

PII: S0257-8972(18)30406-7
DOI: doi:10.1016/j.surfcoat.2018.04.045
Reference: SCT 23329

To appear in: *Surface & Coatings Technology*

Received date: 16 November 2017
Revised date: 24 March 2018
Accepted date: 10 April 2018

Please cite this article as: Patamaporn Termsaithong, Ratiporn Munprom, Akeel Shah, Aphichart Rodchanarowan , Pulsed current co-electrodeposition of kesterite Cu2ZnSnS4 absorber material on fluorinated tin oxide (FTO) glass under galvanostatic conditions. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Sct(2017), doi:10.1016/j.surfcoat.2018.04.045

Pulsed Current Co-electrodeposition of Kesterite Cu_2ZnSnS_4 Absorber Material on Fluorinated Tin Oxide (FTO) Glass under Galvanostatic Conditions

Patamaporn Termsaithong[a], Ratiporn Munprom[a], Akeel Shah[b], Aphichart Rodchanarowan[a]*

[a]Department of Materials Engineering,Faculty of Engineering, Kasetsart University,

50 Ngamwongwan Rd., Ladyao, Chatuchak, Bangkok 10900, Thailand

[b]School of Engineering, University of Warwick, Coventry, CV4 7AL, UK

* Corresponding author: fengacrw@ku.ac.th

Abstract

The film of kesterite Cu_2ZnSnS_4 (CZTS) was prepared on a fluorinated tin oxide (FTO) substrate by a galvanostatically pulsed electrodeposition. The effect of duty cycles on electrodeposition was investigated at 33%, 50%, and 67% duty cycle. For the characterization, the prepared films were analyzed by scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), x-ray spectroscopy (XRD), UV-vis spectroscopy, Raman spectroscopy, and an atomic emission elemental analyzer. According to the experiments, surface morphologies of the CZT precursor appear to be uniform with fewer pores. After sulfurization, the morphologies of CZTS film become more uniform. When considering duty cycles, a higher duty cycle resulted in the surface being denser, more compact, more uniform, and smoother. Based upon the XRD and EDS, the film's composition consists of copper, zinc, tin, and sulfur. The compound formulae is also proved to be copper zinc tin sulfide.

Keywords: Kesterite; Cu_2ZnSnS_4 (CZTS); Duty cycle; Pulsed electrodeposition (PED); Galvanostatic conditions