Accepted Manuscript

Electrochemical deposition and characterisation of ZnOS thin films for photovoltaic and photocatalysis applications

O.K. Echendu, S.Z. Werta, F.B. Dejene, V. Craciun

PII: S0925-8388(18)32828-7

DOI: 10.1016/j.jallcom.2018.07.327

Reference: JALCOM 47043

To appear in: *Journal of Alloys and Compounds*

Received Date: 15 June 2018

Revised Date: 23 July 2018

Accepted Date: 29 July 2018

Please cite this article as: O.K. Echendu, S.Z. Werta, F.B. Dejene, V. Craciun, Electrochemical deposition and characterisation of ZnOS thin films for photovoltaic and photocatalysis applications, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.07.327.

Electrochemical deposition and characterisation of ZnOS thin films for photovoltaic and photocatalysis applications

O. K. Echendu[a]*, S. Z. Werta[a], F. B. Dejene[a] and V. Craciun[b]

[a]Solar energy materials, Sensors and Luminescence materials group, Department of Physics, University of the Free State, Qwaqwa Campus, Private bag X13 Phuthaditjhaba, 9866, South Africa.

[b]Laser Department, National Institute for Laser, Plasma and Radiation Physics, Bucharest-Magurele, Romania

*Corresponding author's email: oechendu@yahoo.com Phone: +27848831818

Abstract

Electrochemical deposition of zinc oxysulphide (ZnOS) thin films for possible photovoltaic and photocatalysis applications has been carried out using zinc acetate and sodium thiosulphate precursors in a simple two-electrode deposition set-up. The deposited films were characterized for their structural, optical, morphological and compositional properties using glancing incidence X-ray diffraction (GIXRD), UV-Vis spectrophotometry, scanning electron microscopy (SEM) and energy-dispersive X-ray (EDX) spectroscopy respectively. The detailed characterization results show that the ZnOS materials grown at different cathodic potentials of 1450 mV, 1500 mV and 1550 mV display desirable properties for the intended applications. Structural analysis shows that the films were formed by a combination of hexagonal ZnS and ZnO crystal phases. The energy bandgap estimated for the films across the explored potentials is in the range (2.68 – 3.26) eV for as-deposited films and (2.90 – 3.10) eV after annealing. These values and the transmittance were also shown to be increased significantly by reducing the deposition duration. SEM images show very compact and densely packed grains in the films while EDX results show Zn/S values of approximately unity and Zn/O values of approximately 0.1 across the deposition potentials explored, in both as-deposited and annealed conditions.

Key words: ZnOS; electrochemical deposition; graded bandgap; solar cell; thin film.