A photoelectrochemical methodology to obtain nanorods of crystalline hexagonal trigonal selenium

Dyovani Coelho, Giuliana M. Luiz, Sergio A.S. Machado

PII: S1572-6657(18)30310-2
DOI: doi:10.1016/j.jelechem.2018.04.050
Reference: JEAC 4037

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 4 December 2017
Revised date: 19 April 2018
Accepted date: 24 April 2018

Please cite this article as: Dyovani Coelho, Giuliana M. Luiz, Sergio A.S. Machado , A photoelectrochemical methodology to obtain nanorods of crystalline hexagonal trigonal selenium. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jeac(2017), doi:10.1016/j.jelechem.2018.04.050

A photoelectrochemical methodology to obtain nanorods of crystalline hexagonal trigonal selenium

Dyovani Coelho[a,b], Giuliana M. Luiz[b], Sergio A. S. Machado[b*]

[a]Federal University of São Carlos, 13565-905, São Carlos, SP, Brazil.

[b]São Carlos Institute of Chemistry, University of São Paulo, 13560-970, São Carlos, SP, Brazil.

*Corresponding author: sasmach@iqsc.usp.br

ABSTRACT. The conditions for trigonal selenium film deposition on gold substrate (f-Se) was investigated using cyclic voltammetry, chronoamperometry, optical microscopy, scanning electron microscopy and X-ray diffraction, which showed the production of a highly crystalline and homogeneous film formed of hexagonal microrods structures with diameters between 300 and 600 nm. However, the film with such characteristics was formed only by deposition into 0.1 mol L^{-1} HNO_3 at 80 °C containing 0.02 mol L^{-1} SeO_2 with potential deposition of –0,45 V *vs* SCE, under illumination with halogen lamp 100 W, irradiance of 200 mW cm^{-2}, magnetic stirring and deposition time of 600 seconds or higher. It believed that the mechanism of t-selenium growth is associated with a (photo)electrocorrosion process, where the combination between the incident light and applied potential cause the dissolution of amorphous selenium and favoring the growth of the crystalline faces making them more conductive with the light absorption. The optical characterization of the films determined a band gap of 1.74 ± 0.03 eV, photoelectrochemical activity, flat band potential of 0.63 ± 0.17 V *vs* SCE and charge carriers density of 4.97 ± 0.90 $\times 10^{15}$ cm^{-3}.

KEYWORDS. Selenium, photoelectrodeposition, semiconductor, trigonal selenium.