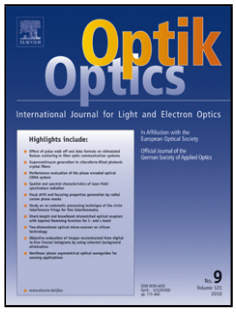

Title: Study of Silicon Films Deposited by EB-PVD and the Effect of Applying Annealing Conditions on Them

Authors: Shahrokh Ahangarani, Meysam Zarchi

PII: S0030-4026(17)31259-7
DOI: https://doi.org/10.1016/j.ijleo.2017.10.052
Reference: IJLEO 59788

To appear in:

Please cite this article as: Shahrokh Ahangarani, Meysam Zarchi, Study of Silicon Films Deposited by EB-PVD and the Effect of Applying Annealing Conditions on Them, Optik - International Journal for Light and Electron Optics https://doi.org/10.1016/j.ijleo.2017.10.052

Study of Silicon Films Deposited by EB-PVD and the Effect of Applying Annealing Conditions on Them

Shahrokh Ahangarani*, Meysam Zarchi

Advanced Materials & Renewable Energies Department, Iranian Research Organization for Science and Technology, Tehran, Iran

Author for correspondence (sh.ahangarani@gmail.com)
*

TEL:++989125335039

Abstract: This paper investigates structural, electronic, and optical silicon poly-crystalline coatings created in high vacuum condition (10^{-6} torr) by Electron Beam Physical Vapor Deposition (EB-PVD). Samples were annealed after deposition in neutral gas environment of 800 °C temperature. Results of microscopic images, micro Raman analysis and Grazing Incidence X-ray Diffraction (GIXRD) showed that phase change happened from amorphous structure to crystalline structure in initial amorphous context which could be significantly enhanced by increasing annealing temperature. Aggregation and accumulation of silicon nano-crystals were also observed. Moreover, applying temperature of 800 °C in one-hour resulted in complete crystallization and homogeneity of films. The situation caused the increase of SP2 SP3 bonds formed with more free electrons producing higher conductivity of electric film in the layers. Finally, because of increased density of film structure, light reflectance decreased from %12 to %3 due to poly-crystalline structure created in initial amorphous context.

Keywords: Poly Silicon; Film; Annealing; Structure Morphology; Optical, Electrical

Introduction.

Amorphous silicon coatings are considered as special substances in making electronic and optic devices because of the possibility of fundamental changes in different contexts and because they are physically and chemical neutral, [1,2] and specially because applying coating by EB-PVD method is cheap in terms of expense and is industrial in terms of