Lublin University of Technology, Poland

9th International Conference

New Electrical and Electronic Technologies and their Industrial Implementation

NEET 2015

Zakopane, Poland, June 23–26, 2015

Tempus

Development of Training Network
for Improving Education in Energy Efficiency
Nr. 530379-TEMPUS-1-2012-1-LVTEMPUS-JPCR

ENERGY

Analysis of Composition, Morphology and Wettability of Mo Thin Layers Deposited on Glass

Igor Tashlykov[1], Oleg Mikhalkovich[1], Pawel Zukowski[2]
[1]Belarusian State Pedagogical University, Minsk, Belarus, E-mail: tashl@bspu.unibel.by
[2]Lublin University of Technology, Faculty of Electrical Engineering and Computer Science, Department of Electrical Devices and High Voltage Technology, 38a, Nadbystrzycka Str., 20-618 Lublin, Poland

Molybdenum thin films are often considered as suitable back contact at manufacture of solar cells. At this study the Mo thin films were deposited on glass substrate using self-ion assisted deposition (SIAD) technique. The original SIAD method provides ion-beam-mixing of substrate atoms and growing thin film atoms within of atomic collisions cascades generated by accelerated Mo^{+} ions. Therefore it can be expected that this process creates new unknown physical properties of Mo/glass construction obtained at different growth condition.

SIAD experiments were perfomed using a resonance vacuum arc ion source. A negative potential of substrate with respect to the ion source was 5 or 10 kV. Film deposition was carried out in a vacuum chamber with a pressure 10^{-2} Pa. A rate of film deposition was 0.1-0.2 nm/min. The Rutherford backscattering (RBS) technique was employed for investigation of surface composition and for depth profiling of components in films. Concentration profiles of components were evaluated using the RUMP code computer simulation. The surface morphology of the samples was investigated by means of atomic force microscope "NT-206" using cantilevers CSC21. Scaning probe microscopy images were analized using the program "Surface Xplorer 1.3.11". The wetting behaviour is characterized by the value of the contact angle (CA). CA was measured automatically. A specially designed program "Angle" filters the image of the system "water drop-film surface-air" so that the gas phase was selected and the image of the system was projected onto a plain. CA measurements were based on the sensible drop method described in [1]. The wetting agent was doubly distilled water.

It was found out that the thickness of Mo films was up to 50 nm. As appears from RBS spectra, the films include Mo, O, C, H atoms. Mutual diffusion of elements of substrate (Si, O, Na, Ca) and coating has been observed. The average roughness of surfaces depends on thickness of thin films, decreases at first and then saturates. Contact angle measurements showed that the deposition of the Mo thin films on glass makes the surface more hydrophobic.

References

[1] Tashlykov I., Turavets A., Zhukowski P.: Acta Physica Polonica A 123, no. 5, 2013, p. 840-842.