ZnO nanofilms obtained by magnetron sputtering deposition to improve the properties of *CIGS* solar cell

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INTRODUCTION

ZnO exhibits semiconducting and piezoelectric dual properties and is a material that has diverse structures, whose configurations are much more rich than any of the known nanomaterials including carbon nanotubes.

The method to obtain ZnO films are variate, and can be used differend substrates such as glass, sapphire and quartz, :

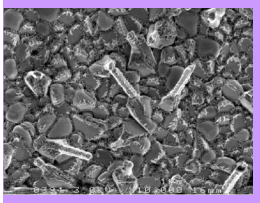
-By using a solid-state thermal sublimation process , and by controlling the growth kinetics, local growth temperature and the chemical composition of the source materials, a wide range of nanostructures of ZnO have been synthesized.

-Sputtering parameters for ZnO film deposition have been optimized, and the ZnO films with different thickness from 1 micron to 5.5 microns were prepared.

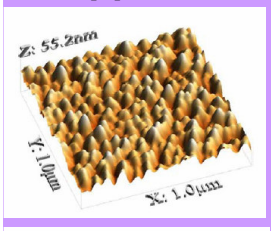
-Sol gel and chemical-vapor deposition

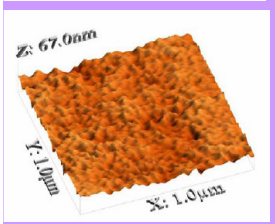
-Zn polycrystalline film by electron sputtering of the metallic zinc in vacuum (10-4 Torr) and then oxidizing it to ZnO polycrystalline film in air [20].

- Standard RF-magnetron sputtering using ZnO targets in the argon atmosphere at a gas pressure of 10-3 Torr. The substrate temperature and RF-power were fixed at 300 ^{0}C and 100 W, respectively. [1-8]

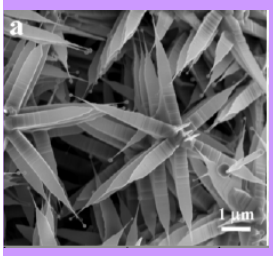


The micrograph of the surface of the sample I obtained using the scanning electron [6].

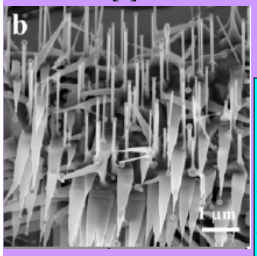




AFM visualization of investigated samples III (a) and II (b) [6].



SEM image of the ZnO consisting of sets of axial nanowires [7]

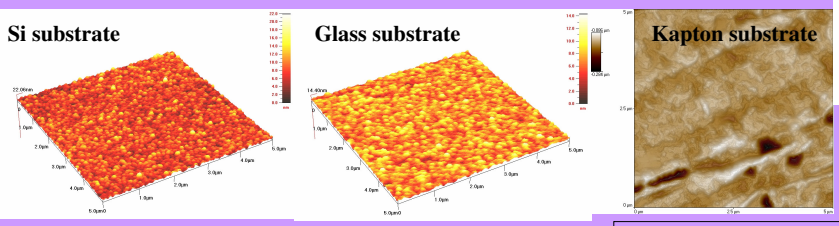


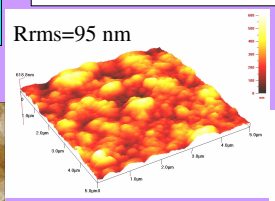
SEM of secondary growth on these propeller surface leads to aligned nanowires ZnO [7]

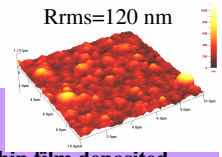
EXPERIMENTS

In the present paper are presented recent researches about ZnO nano films doped and undoped, to be used in CIGS solar cell fabrication. The targets for magnetron sputtering deposition of films were prepared in our laboratories. For substrate were used glass optical polished and flexible Kapton. Depositions were made in 30 sccm Ar, at 3x10-4torr-5x10-3torr , room temperature, distance between target and substrate was about 100mm. The obtained films were characterized by using XPS, and XRD, for structure and stoichiometry. In odder to improve the resistivity of the ZnO films Al was added/ diffused in the following amount 0.2-0.8% wt. Were measured the transmission spectra UV-VIS-IR and resistivity of the films.

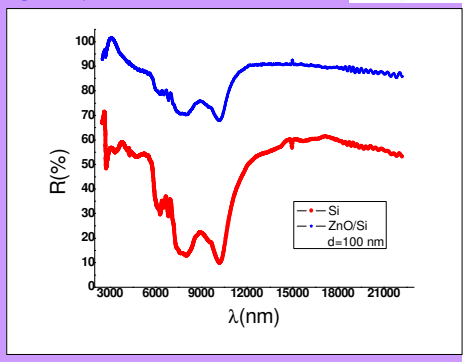
❖AFM of theZnO thin films deposited on different substrates: Si, glass and kapton,



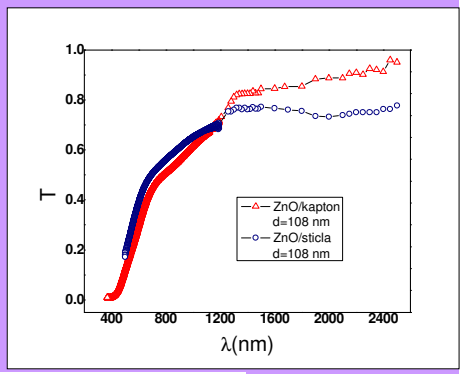




AFM of a CuInGa/ZnS thin film deposited kapton substrate



Results of resistivity of ZnO film on Si are presented in the following figure.



Thin film preparation

Thin films were obtained by magnetron sputtering (RF) ion layer gas reaction. ZnO, ZnS and CuInGa thin films were deposited on substrates at temperatures as low as 300°C. By RF magnetron sputtering deposition are made layers having the thickness h=1.7=2.4nm.

Conclusions

From targets made in our laboratory were obtained thin films of ZnO , that were used for CIGS solar cell fabrication. The ZnO films resistivity was improved by Al addings.

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