

Structural and Optical Properties of ZnO Nanostructured Layers Deposited by Electrochemical Method on Conductive Multi-Crystalline Si Substrates*

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Abstract. In this work a study of the optical and structural properties of nanostructured un-doped and doped with Al ZnO layers electrochemically deposited on high conductive low cost poly-Si substrates is presented. The influence of the plating time on the structural and the optical properties of the obtained ZnO layers is investigated by Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM) and by spectra of optical reflection (specular and diffused). The spectra of haze ratio in reflection are calculated as well. It is demonstrated that ZnO have morphology consisting of nano-wiskers and hexagonal nano-rods. The size of the nanostructures increases with the plating time. The deposited ZnO layers have very low value of reflection ($< 1\%$) and can be used as an antireflection coating for Si based solar cells. Moreover, such ZnO based nanostructures deposited on highly doped low-cost Si substrates, can be considered as a supporting part with enhanced light harvesting properties for various types of thin film based solar cells.

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1 Introduction

The dimension reduction of materials to a nanometer scale gives rise to several advantages in terms of device applications. Crystalline nanostructures such as nano-wires, nano-rods, nano-wiskers, have received increasing attention due to their potential applications in solar cells, nanoscale electronics, optical devices, gas and bio-sensors, in pharmacology and medicine, *etc.* ZnO is recognized as one of the most promising oxide semiconductor materials, due to its useful optical, electrical and piezoelectric properties [1-5]. Recently, development of

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