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GROWTH OF ZINC OXIDE THIN FILMS FOR SOLAR CELL APPLICATIONS

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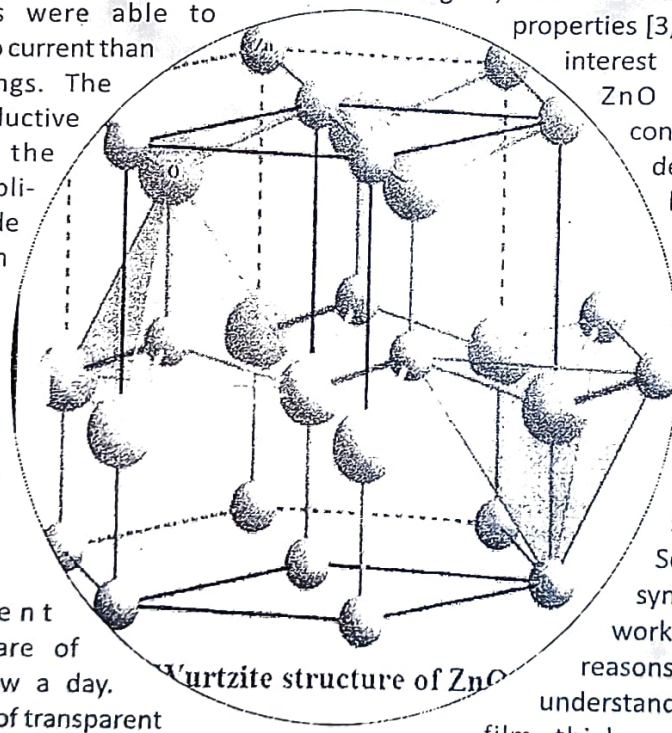
ABSTRACT:

In this paper, the effect of thin films thicknesses on the photoconductivity of the ZnO thin films deposited using sol-gel spin coating technique on glass substrates were observed for solar cell applications. The layer by layer method of film deposition was adopted to develop the thin films of different thickness. Present study showed that the coatings with larger thicknesses were able to generate more photo current than the thinner coatings. The verified photoconductive performance for the optoelectronic application of zinc oxide thin film makes them promising candidates for Solar Cells.

Key words: Zinc oxide, thin film, solar cell, photoconductivity.

INTRODUCTION:

Transparent conductive oxides are of great importance now a day. ZnO is also a member of transparent conductive oxides. Zinc Oxide has a large band gap (Eg=3.37 ev), large excitation energy of 60 meV and categorized as a semi-conductor material primarily used for manufacturing of LEDs, OLEDs, Liquid crystal displays, flat panel displays, front contact of thin film solar cells and many other photonic devices [1, 2]. In particular, ZnO forms a technologically important class of material, exhibiting exceptional UV attenuation characteristics: blocking 95% of all UV radiation, excellent transmittance in the long wavelength region, and outstanding antimicrobial properties [3, 4]. One area of great interest is the application of ZnO as a transparent conducting oxide. Many deposition techniques have been used to synthesize ZnO thin films, such as, sputtering, pulsed laser deposition. Physical vapor deposition [5], spray pyrolysis, evaporation and sol-gel technique [6]. Sol-Gel Spin Coating synthesis is used in our work. It is used for several reasons, low cost, easy to understand procedure, uniform film thickness and large area deposition. ZnO is non-toxic and abundantly available material [7, 8].



Wurtzite structure of ZnO

In this paper, the effect of thin films

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A Review On Applications Of Zinc Oxide Nanostructures

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Abstract

The present paper is a critical review of structural and optical, electrical properties along with nanostructure applications based on Zinc oxide. ZnO is an attractive material for applications in electronics, photonics, acoustics, and sensing. The XRD patterns of the nanostructured ZnO thin films showed the hexagonal wurtzite crystal structure that were preferably grown along the (002) or (101) planes. The optical properties, Band gaps, transmittance of films deposited on glass substrates were also studied with the various optical transmittance spectra. The band gap energy of the deposited ZnO thin films found varying from 3.18 to 3.85eV. Annealing of electrodeposited films decreased the band gap considerably. Depending on the crystal size, the transmittance of the ZnO thin film was found to be about 70 to 90%. Among the other promising areas of application for ZnO are acoustic wave devices, due to large electromechanical coupling in ZnO, and devices utilizing nanostructured such as biosensors and gas sensors and solar cells, since it is relatively easy to produce such forms of ZnO nanostructures, which have good charge carrier transport properties and high crystalline quality. Despite the significant progress made, there are still a number of important issues that need to be resolved before ZnO can be transitioned to commercial use.

Keywords: Zinc Oxide, Thin film, Nanostructure, Review.

1. INTRODUCTION

Zinc oxide is an inorganic compound which is a wide band gap semiconductor of the II-VI semiconductor group. This semiconductor is known for its several favorable properties, such as good transparency in the visible and high infrared spectrum, high electron mobility; wide and the direct band gap, large exciton binding energy, high thermal conductivity and strong room temperature luminescence. These properties are used in many applications such as transparent electrodes of thin film solar cells for light transmission and the extraction of photocurrent, heat-protecting windows, transparent oxide thin-film transistors, light-emitting diodes, varistors, piezoelectric devices, etc. Crystalline zinc oxide is thermochromic in nature