ELECTRICAL PROPERTIES OF ZnO THIN FILM PREPARED ON SEEDED CATALYST

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"THERE'S LIGHT AT THE END OF THE TUNNEL".

ABSTRACT

This study focuses on the preparation ZnO thin film and effect on the surface morphology and electrical properties of ZnO thin film. The seeded ZnO catalyst was prepared by spin-coating technique using zinc acetate dehydrate (ZnAc) as starting material, 2-methoxyethanol as solvent, aluminium nitrate ($Al(NO_3)_3 \cdot 9H_2O$) as dopant and monoethanolamine (MEA) as stabilizer to coat onto silicon substrates. The ZnO thin films were deposited by thermal chemical vapor deposition (TCVD) method using zinc acetate dehydrate as a precursor and nitrogen as the carrier gas. The ZnO template as-deposited and post-annealed thin films are deposited and annealed at various temperatures from 400°C to 600°C. The effect of the surface morphology and electrical properties of ZnO thin film were investigated. Field gun emission scanning electron microscopy (FESEM) used to view the surface morphology of the samples. The surface morphology obtained from FESEM results showed the relationship between deposition temperatures for as-deposited and post-annealed thin films to the crystal structure and it also influenced the electrical properties of the ZnO thin films. The electrical properties are characterized using solar simulator measurement unit. This indicates that the electrical properties are improved in terms of conductivity for as-deposited thin film.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

The semiconductor oxide materials e.g ZnO and TiO_2 have received considerable much attention in recent years due to their unique advantages: stable, inexpensive, wide band gap etc. Among them, ZnO is a unique material that exhibits both semiconducting properties which are intensively studied and applied in various applications such as gas sensor, dye sensitized solar cell, laser diodes (LDs) and light emitting diodes (LEDs) [1]. ZnO is an inorganic compound which that often called a II – VI semiconductor because zinc and oxygen belong to the 2nd and 6th groups of the periodic table respectively. This metal oxide semiconductors with a wide direct bandgap energy of 3.37eV and a larger free-exciton binding energy of 60meV at room temperature . The advantages of a wide band gap include higher breakdown voltages, ability to sustain large electric fields, lower electronic noise, and high-temperature and high-power operation. It is also high electron mobility can produce a higher current that achieve possible to reduce voltage supply operating [2]. The property of ZnO is dependent partly on the crystallinity, crystallographic orientation, crystallite size and morphology. Due to various applications in electronic field, research has been focused to prepared ZnO thin films which are not only good in the optoelectronic an structural properties, non-toxicity, high lumineous transmittance, low cost [3,4] but also good in electrical properties.