ELECTRICAL PROPERTIES OF NANOSTRUCTURED ZINC OXIDE THIN FILM FOR HUMIDITY SENSOR

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ABSTRACT

The work highlights the research on the electrical properties and the surface morphology of the nanostructured Zinc Oxide (ZnO) thin film for humidity sensor. The electrical properties is depends on the Current-Voltage (I-V) measurement while the surface morphology is characterized by using Scanning Electron Microscopy (SEM). The thin film were deposited on the glass substrate using spin coating technique while the nanostructured ZnO were prepared using Sol-gel method. The solutions for nanostructured ZnO are varies by using different starting material such as Zinc Acetate, Zinc Nitrate, Zinc Acetate doped with Aluminium and Zinc Nitrate doped with Aluminium based on the same molarities of 0.004M concentration. The surface morphology indicates that the size of nanostructured ZnO is increasing when doping with 1% of Aluminium. The I-V measurements result shows that, the sample Zinc Acetate doped with Aluminium is the suitable material for the humidity sensor since the sensitivity is higher than other samples.

Keywords: *Sol-Gel Method; Doped Aluminium; Humidity Sensor; Nanostructured Zinc Oxide Thin Film; Spin Coating Technique*

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

In electronics, the industry is moving very fast. Nowadays, there are a lot of technologies that happen and as a development country, research about new technology or new finding are very important. This project focused on the finding of the electrical properties and the surface morphology of the nanostructured zinc oxide thin film for the humidity sensor applications.

In the ambient air, water vapors or moistures are natural components and are also important affecting issues in our daily life. Humidity is one of the most commonly measured physical quantities. It is a fundamental concern in a wide variety of commercial and industrial applications. Humidity sensors are having increased the interest in electronic control system [2]. Humidity sensor has been widely used in many measurements and control applications including process control, meteorology, agriculture and medical equipment applications [6].

Zinc Oxide is a n-type semiconductor with a band gap around 3.3 eV at room temperature and a free-exciton binding energy of 60 meV[1]. Zinc Oxide (ZnO) has chosen for this research because of its simplicity, excellent compositional control, lower crystallization temperature and large area coating at low cost [10]. Besides that, ZnO also have versatile properties in optoelectronic devices, sensors, lasers, transducer and photovoltaic devices [10]. ZnO nanostructures believed to be non-toxic, bio-safe, and possibly biocompatible and have been used in many applications in our daily life [10]. Therefore, this project is used the Zinc Oxide as a material to investigate whether it can be used as efficient humidity sensors.