ELECTRICAL PROPERTIES OF NANOSTRUCTURED ZINC OXIDE THIN FILM PREPARED BY SOL-GEL METHOD FOR HUMIDITY SENSOR APPLICATIONS

This thesis is presented in partial fulfillment for the award of the

Bachelor of Electrical (Hons.)Engineering

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ACKNOWLEDGEMENTS

In the name of Allah S.W.T, the Most Beneficent and Merciful.

First and foremost, I am very much indebted to my project supervisor Dr. Zulfakri Bin Mohamad and Co-supervisor Prof. Assoc. Dr. Mohamad Rusop Bin Mahmood for their invaluable guidance, advice and support in this project.

My sincerest gratitude goes to the entire senior in the Solar Cell Laboratory at Faculty of Electrical Engineering especially Mrs. Rosalena, Mr. Hafiz and Mr. Zainizan for
their technical advices and encouragement upon finishing this project. Thank you very much to all the colleagues in the laboratory and En. Suhaimi as the technician in the laboratory for
the assistance, understanding, and being very helpful during the project.

Last but not least for my beloved family, friends and lecturers
for their love, support and prayers to me until the materialized of this thesis.

ABSTRACT

This technical paper investigates the electrical properties of the ZnO nanostructures that have been prepared by the sol-gel method. The influence of annealing temperature on the surface morphologies and electrical properties of the nanostructured ZnO was characterized by Scanning Electron Microscopy (SEM) and I-V measurement. The sol-gel method produced the nanostructured ZnO that have the single nanorods particles mixed with some cluster of rods. The size of particles was decreasing as the temperature of the annealing process was higher. The I-V measurement studies demonstrate that the current measured for sample that have been annealed at 700°C was high compared to the other samples that have been annealed at 500°C and 600°C. This studies also shows that the 0.002M of concentration having higher sensitivity than 0.004M of concentration.

LIST OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Humidity is the amount of water vapor in the air. Humidity sensor is a device consisting of a special material whose electrical characteristics change according to the amount of humidity in the air. Sensing of relative humidity plays important role in various fields especially for human life. Therefore, humidity sensors had been studied and used intensively. For example, a humidity sensor was fabricated to equip a multisensor Microsystems for pulmonary functions diagnosis and in food industry, the humidity sensors had been used to control and monitor the process environment [1]. Other applications of humidity sensors including the meteorological services, chemical and food industry, civil engineering, air conditioning, agriculture and electronic processing. Humidity sensors are of increasing interest in electronic control systems [2]. There are three main operating principles of humidity sensors that are capacitive, resistive and thermal conductive. In this project the operating principle of resistive has been studied. The sensitivity of the samples in this project was depended by the resistance of the samples. Over the past decade, there has been a rapid development of new materials for usage in humidity sensor. It is well known that humidity sensitivity has been greatly improved since the sensors are made of nanoscale oxides. Recently, a high sensitivity of humidity sensor has been obtained from feather-like Zinc Oxide (ZnO) nanostructures. ZnO also is a high means bright light emission characteristic for ultraviolet (UV) light emitters, gas sensors, transparent electronics and surface acoustic wave devices applications [5, 6]. This shows that ZnO is a semiconductor with numerous applications ranging from optoelectronics to chemical sensors [1, 9]. ZnO nanostructures demonstrate an essential quality of quantum mechanics known as quantum confinement. The idea behind confinement is all about keeping electrons trapped in a small area. The size of the nanostructures to have the quantum confinement should be less than 30 nm for effective confinement. Quantum confinement is divided into three types. A 2-D