RESISTIVE SWITCHING BEHAVIOR OF SOL-GEL SPIN COATED ZINC OXIDE THIN FILMS ON ITO SUBSTRATES

AHMAD FAIZ BIN MOHAMAD ZOHAIMI

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

MALAYSIA

ACKNOWLEDGEMENT

AssalammualaikumWarahmatullahiWabarakatuh ;

First of all, praise be to Allah S.W.T because of His willingness. Alhamdulillah I had successfully finished my Final Year Project entitled “Resistive Switching Behavior of Sol-Gel Spin Coated Zinc Oxide On ITO Substrates”. I was very fortunate to have a number of wonderful experience people who had a given me assistance and direction toward completing this project.

First and foremost, I would like to express my deepest gratitude to my project supervisor CikRaudahBinti Abu Bakar for her advice and the logical opinion, motivation, guidance critics, suggestions and encouragement helped throughout this research. She has been kind enough to spend her time to check and give her positive feedback to my project and also always willing to be seen upon needed. Without her, it is impossible to finish my project and my final report on my own. I am also thankful to my panels DrSukreen Hana and Pn. Noorulhuda for their guidance, advices and also give positives criticism to my project. Without their support and interests, this project would not have been as good as presented in this thesis.

Finally, I would like to dedicate my gratitude to my parents, staff of NANO-ElecTronics Centre (NET) and PusatInovasi, lecturers of Faculty of Electricals Engineering, UniversitiTeknologi MARA Malaysia, and my classmates from EE241 and those who has helped me directly or indirectly in order to complete this project. Their encouragement and guidance mean a lot to me. Their sharing and experience foster my belief in overcoming every obstacle encountered in this project. I would like to thank and appreciate sincerely those people above for their guidance, co-operation and encouragement. Although I have no ability to repay the kindness from them, I would like to wish them to be well and happy always.

ABSTRACT

This work focuses on the resistive switching behavior of sol-gel spin coated zinc oxide (ZnO) thin films on ITO substrate. The deposited ZnO thin films were annealed at various temperatures from 350°C to 500°C in a furnace for 60 minutes in order to study the effect of annealing temperature on the memristive behavior of ZnO thin film. The electrical property of the thin film was characterized using 2-point probe current-voltage (I-V) measurement. The surface morphology and film thickness were examined and measured using AFM and surface profiler respectively. It was found that the samples were followed the memristive behavior as shown in I-V measurement graph.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

In 1971, the memristor was originally founded by circuit theorist Leon Chua as a missing non-linear passive two -terminal electrical component relating electric charge and magnetic flux linkage [1]. He also stated that more recently argued that the memristor definition could be generalized to cover all forms of 2-terminal non-volatile memory devices based on resistance switching effects [2] although some experimental evidence contradicts this claim since a non-passive "nanobattery" effect is observable in resistance switching memory [3]. He also urged that the memristor is the oldest known circuit elements with its effects on the resistor, capacitor and inductor [4].

Nowadays, the memristor is under development by various teams including Hewlett-Packard, SK Hynix, and HRL Laboratories. The memristor has a special behaviour, when current flows in one direction through a memristor, the electrical resistance increases and when current flows in the opposite direction, the resistance decreases. When the current is stopped, the memristor retains the last resistance that it had, and when the flow of charge starts again, the resistance of the circuit will be what it was when it was last active [5]. The memristor device described by HP is said to have a regime of operation with an approximately linear charge-resistance relationship as long as the time-integral of the current stays within certain bounds [6].