

**FABRICATION AND CHARACTERIZATION OF ZINC OXIDE THIN  
FILM AT DIFFERENT DEPOSITION TEMPERATURE BY THERMAL  
CHEMICAL DEPOSITION**

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## ABSTRACT

The Zinc oxide (ZnO) thin films were deposited on the silicon substrate by thermal chemical vapor deposition (CVD). The deposition temperatures were varied from 400°C to 600°C. This present work aims to study the affect of deposition temperature on the structural, surface morphology and electrical properties. In general, the preparation conditions of ZnO thin films by a thermal CVD can strongly affect the surface morphology and electrical properties of the ZnO thin films. The characterization consists of two parts which is the physical properties and electrical properties due to different deposition temperature. The physical properties of the ZnO thin film has been studied using the Scanning Electron Microscope (SEM). The structural morphology from SEM showed the relationship between deposition temperatures to the crystal structure. For the electrical properties, the IV characteristic has been studied using I-V probe station. I-V characteristic showed that the resistivity decreased with higher deposition temperature up to 600°C.

# TABLE OF CONTENTS

CHAPTER	LIST OF TITLE	PAGE
	DECLARATION	i
	DEDICATION	ii
	ACKNOWLEDGEMENT	iii
	ABSTRACT	iv
	TABLE OF CONTENTS	v
	LIST OF FIGURES	viii
	LIST OF TABLES	x
	LIST OF ABBREVIATIONS	xi
<b>1</b>	<b>INTRODUCTION</b>	
	1.1 Introduction	1
	1.2 Project Overview	2
	1.3 Project Objectives	2
	1.4 Scope of Project	2
	1.5 Organization of the Thesis	4
<b>2</b>	<b>THEORETICAL BACKGROUND</b>	
	2.1 Zinc Oxide (ZnO)	5
	2.1.1 Physical properties of ZnO	5
	2.1.2 The band structure of ZnO	6
	2.2 Thin Film	9
	2.3 P-N Junction	9
	2.3.1 Introduction	9
	2.3.2 Forward Bias	12
	2.3.3 Reverse Bias	13

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Zinc oxide (ZnO) is a one of the most interesting compound semiconductors and multifunctional materials that received more attention during last few years due to its unique properties such as non-toxicity, good electrical properties, high luminous transmittance and low cost [1, 2, 3]. Its wide direct band gap of 3.3eV at room temperature makes ZnO most suitable material that use for short wavelength optoelectronic devices, including light emitting diodes, displays, surface acoustic wave devices and laser diodes [2, 4, 5]. ZnO also has an excitation binding energy of 60meV higher than ZnSe (22meV) and GaN (25meV). It is well known that the excitation binding energy must be greater than the thermal energy at room temperature if efficient excitation laser action is to be shown at room temperature. So the low growth temperature, low threshold intensity and high chemical stability make ZnO a good candidate for making UV laser devices [5].

Recently, there are many techniques have been used to fabricate ZnO thin film such as chemical vapor deposition (CVD), molecular beam epitaxy (MBE), sol-gel deposition, RF magnetron sputtering, spray pyrolysis and pulse laser deposition (PLD) [6]. The central part of the work described in this project is the fabrication of ZnO thin film samples by thermal chemical vapor deposition (CVD). This project briefly describes the fabrication and structure of ZnO thin film. The ZnO thin film has been coating with platinum (Pt) to measured the I-V characteristic of ZnO thin film. The effect of the deposition process at different temperature also had been studied.