

**FABRICATION OF ZINC OXIDE NANORODS CHEMICAL SENSOR**

**NURUL HADI BIN HARON MANSOR**

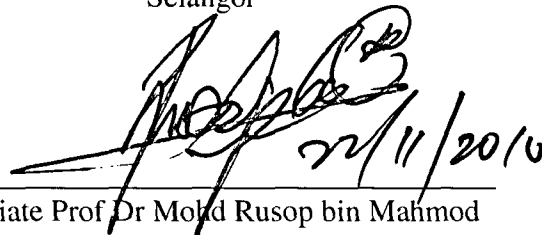
**Final Year Project Report Submitted in  
Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science (Hons.) Industrial Physics  
in the Faculty of Applied Science  
Universiti Teknologi MARA**

**NOVEMBER 2010**

This Final Year Project Report entitled “Fabrication of Zinc Oxide Chemical Sensor” was submitted by Nurul Hadi bin Haron Mansor, in partial fulfillment of the requirements for the Degree of Science (Hons.) Industrial Physics, in the Faculty of Applied Sciences, and was approved by

---

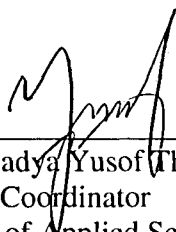
Prof Dr Saifollah bin Abdullah  
Supervisor  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
40450 Shah Alam  
Selangor



22/11/2010

---

Associate Prof. Dr Mohd Rusop bin Mahmud  
Co-Supervisor  
Faculty of Electrical Engineering  
Universiti Teknologi MARA  
40450 Shah Alam  
Selangor



---

Prof. Madya Yusof Theeran  
Project Coordinator  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
40450 Shah Alam  
Selangor

---

Tuan Haji Isa bin Mohd Yusof  
Head of Programme  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
40450 Shah Alam  
Selangor

Date: 22 NOV 2010

## ACKNOWLEDGEMENT

Praise to Allah, the Most Gracious and the Most Merciful for His Blessing

Upon completion of this thesis, first of all, I'm really grateful to the greatest Allah s.w.t for the blessing, strength and ability given to me to complete this thesis.

I would like to express my deepest appreciation to my supervisor Prof Dr. Saifollah Abdullah, who has the attitude and the substance of a genius: he continually and convincingly conveyed a spirit of adventure in regard to this thesis and excitement in regard to supervising. Without his guidance and persistent help, this thesis would not have been possible.

In addition, I also would like to thank for my co-supervisor Associate Prof Dr. Mohd Rusop bin Mahmud for allowed me to use the equipment and material in Lab Inovasi at UiTM Shah Alam. I would like to express my gratitude and sincere appreciation to Pn Zuraidah for her encouragement, guidance and friendship. Without her encouragement and constant guidance, I could not have finished this thesis.

A thank you to all the lecturers, my friends and everybody who had contributed for this thesis directly or indirectly with or without my concerns their contributions are gratefully acknowledged.

## TABLE OF CONTENTS

	Pages
<b>ACKNOWLEDGEMENTS</b>	iii
<b>TABLE OF CONTENTS</b>	iv
<b>LIST OF FIGURES</b>	vi
<b>LIST OF TABLES</b>	viii
<b>LIST OF ABBREVIATIONS</b>	ix
<b>ABSTRACT</b>	x
<b>ABSTRAK</b>	xi
<b>CHAPTER 1.0 INTRODUCTION</b>	
1.0 Introduction	1
1.1 Problem Statement	3
1.2 Objectives	3
1.3 Significant of Project	3
<b>CHAPTER 2.0 LITERATURE REVIEW</b>	
2.1 ZnO nanostructure properties	5
2.2 Synthesis ZnO nanorods	6
2.3 Zinc Oxide (ZnO) nanorods structures properties	7
2.4 The morphology of ZnO nanorods	8
2.5 The characterization of ZnO nanorods by Photoluminescence (PL) spectrum	9
2.6 Fabrication of sensor from nanomaterial	10
2.7 Zinc Oxide (ZnO) nanorods used as sensor	11
2.8 I-V Charecteristic of Zn nanorods sensor in ambient air	13
2.9 The ZnO nanorods sensor sensitivity for chemical gases	13
<b>CHAPTER 3.0 METHODOLOGY</b>	
3.1 Methods	15
3.2 Materials and Equipments	16
3.3 Glass slide as substrate	16
3.4 Synthesis of ZnO nanorods on glass substrate by used sol-gel method	17
3.5 Characterization of ZnO nanorods structure	18
3.6 Fabrication of chemical sensor by gold sputter coating	18
3.7 Preparation of different concentration of K <sub>2</sub> HPO <sub>4</sub> solution	20
3.8 ZnO nanorods sensor principle	22

## ABSTRACT

### FABRICATION OF ZINC OXIDE NANORODS CHEMICAL SENSOR

ZnO nanorods were synthesized by sol-gel method and applied as sensing material. This material, ZnO nanorods thin film was growth on the glass slide surface. The ZnO nanorods was characterized by using photoluminescence (PL) spectrometer. The sensor was fabricated by sputtering the gold on ZnO nanorods surface. The different concentration at a range of 0.2 M, 0.4 M, 0.6 M, 0.8 M and 1.0 M of  $K_2HPO_4$  solution was produces as a reagent to investigate a sensitive of ZnO nanorods sensor were. ZnO nanorods sensors showed the sensitivity to detect different concentration of  $K_2HPO_4$  solution. The sensitivity of the ZnO nanorods chemical sensor was determined by I-V measurements testing. Through this measurement the capability of sensor was determined which are sensitivity and selectivity.