

**PREPARATION OF ZINC OXIDE/SILVER NPS AND THE EFFECT OF
SOLUTION PH ON PHOTODEGRADATION OF METHYL ORANGE DYE**

NUR DALILA BINTI ROSLI

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

JULY 2017

ABSTRACT

PREPARATION OF ZnO/AgNps AND THE EFFECT OF SOLUTION pH ON PHOTODEGRADATION OF METHYL ORANGE DYE

Silver/ zinc oxide nanostructure were synthesized by the sol-gel method using conventional Hexamethylenetetramine (HMTA) reagent as the reducing agent. The as-prepared photocatalysts were characterized by XRD, EDX and FESEM. The doping of Ag was verified by the shifts in the XRD peak of the zinc oxide and also using EDX analysis. The average crystallite size of ZnO and Ag/ZnO were calculated to be 84.14 nm and 84.20 nm respectively. The photocatalytic activity was also evaluated for the degradation of methyl orange under UV irradiation. The effect of different pH in a range of 4 -11 of methyl orange solution were studied using ZnO and Ag/ZnO as catalyst. The evaluated photocatalytic activity shows a rapid degradation of methyl orange solution was at pH 11 which is in alkaline medium with degradation efficiency of 82 % and 98 % for ZnO and Ag/ZnO, respectively. This study shows that the degradation of methyl orange for Ag/ZnO was greater compare to pure ZnO samples towards alkaline medium.

TABLE OF CONTENT

	Page
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	ii-iv
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ABBREVIATION	vii
ABSTRACT	viii
ABSTRAK	ix
CHAPTER 1 INTRODUCTION	
1.1 Background study	1
1.2 Problem statement	2
1.3 Significant study	3-4
1.4 Objective of study	4
CHAPTER 2 LITERATURE REVIEW	
2.1 Introduction	5
2.2 Nanostructured materials	5-6
2.3 ZnO structure	
2.3.1 Fundamental Properties of ZnO	7
2.3.2 Crystal Structure of ZnO	7-8
2.3.3 Synthesis technique	9
2.3.4 Sol-gel method	10
2.3.5 HMTA	11
2.3.6 Doping of ZnO with Al	12
2.3.7 Effect of different pH concentration of methylene orange solution towards photodegradation of ZnO	13
2.4 ZnO as Photocatalyst for the catalytic photodegradation of dye application	14

CHAPTER 3 METHODOLOGY

3.1 Introduction	
3.1.1 List of materials	15
3.2 Experimental method	
3.2.1 Preparation of pure ZnO and Al-doped ZnO nanostructure	16
3.2.2 characterization of pure ZnO and Ag/ZnO	17
3.2.3 Photodegrataion measurements	18

CHAPTER 4 RESULTS AND DISCUSSIONS

4.1 Characterization of the ZnO and Ag/ZnO as photocatalysis	
4.1.1 XRD analysis	20-22
4.1.2 Morphological and elemental analysis	22-24
4.2 Photocatalytic degradation	25-26
4.2.1 Effect of pH on degradation of MO solution	27-31

CHAPTER 5 CONCLUSION 32

REFERENCES 33-37

APPENDICES

CURRICULUM VITAE 38-41

LIST OF TABLES

Table	Caption	Page
2.1	Synthesis technique of ZnO by vapor based and wet based technique.	9
4.1	Average crystallite size (D) of ZnO and AgZnO.	22
4.2	Weight and atomic percentage of Ag and Zn in Ag/ZnO sample.	24
4.3	The photodegradation rate constant, k of pure ZnO and Ag/ZnO at different pH value of MO dye solution	30