

**SYNTHESIS AND CHARACTERIZATION OF ZINC-LAYERED
2, 4, 5-TRICHLOROPHENOXYBUTYRIC ACID UNDER AQUEOUS
CONDITION**

NUR HANI BINTI AB RAHMAN

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

JANUARY 2016

This final Year Project Report entitled “**Synthesis and Characterization of zinc-Layered 2,4,5-trichlorophenoxybutyric acid (2,4,5-TBA) under aqueous conditions**” was submitted by Nur Hani Binti Ab Rahman in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry, in the Faculty of Applied Sciences and was approved by

Tn. Sheikh Ahmad Izaddin Sheikh Mohd Ghazali
Supervisor
School of Chemistry and Environmental Studies
Faculty of Applied Sciences
Universiti Teknologi MARA
72000 Kuala Pilah
Negeri Sembilan

Tn. Sheikh Ahmad Izaddin
Sheikh Mohd Ghazali
Project Coordinator
B. Sc. (Hons.) Chemistry
Faculty of Applied Sciences
Universiti Teknologi Mara
72000 Kuala Pilah
Negeri Sembilan

Mazni Musa
Programme Coordinator
School of Chemistry and
Environmental Studies
Faculty of Applied Sciences
Universiti Teknologi Mara
72000 Kuala Pilah
Negeri Sembilan

Date: _____

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	II
TABLE OF CONTENTS	III
LIST OF TABLES	V
LIST OF FIGURES	VI
LIST OF ABBREVIATIONS	VII
ABSTRACT	VIII
ABSTRAK	IX
CHAPTER 1 INTRODUCTION	1
1.1 Background of study	1
1.1.1 Nanomaterials	1
1.1.2 Zinc layered hydroxide	2
1.1.3 2, 4, 5-trichlorophenoxybutyric acid	3
1.1.4 Intercalation process	4
1.2 Problem Statement	5
1.3 Significance of Study	6
1.4 Objectives	7
CHAPTER 2 LITERATURE REVIEW	8
2.1 Clay Materials	8
2.2 Layered Double Hydroxide	9
2.3 Layered Hydroxide Salts	11
2.4 Zinc oxide	12
2.5 Phenoxy herbicides	13
CHAPTER 3 METHODOLOGY	14
3.1 Materials	14
3.1.1 Chemicals	14
3.2 Instrumentation	14

3.2.1	Powder X-ray diffraction (PXRD)	14
3.2.2	Fourier Transform Infrared (FTIR) Spectroscopy	15
3.2.3	Carbon, Hydrogen, Nitrogen and Sulfur (CHNS) Elemental Analyzer	16
3.2.4	Field Emission Scanning Electron Microscopy (FESEM)	16
3.2.5	Thermal Analysis (TGA/DTG)	16
3.3	Synthesis of ZTBA	17
3.3.1	Synthesis of ZTBA under aqueous condition	17
CHAPTER 4 RESULTS AND DISCUSSIONS		19
4.1	X-ray diffraction (XRD)	19
4.2	Fourier transform infrared (FTIR)	22
4.3	Surface morphology and surface area (FESEM)	25
4.4	Elemental analysis (CHNS)	27
4.5	Thermal analysis	28
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS		29
5.1	Conclusion	29
5.2	Recommendations	29
CITED REFERENCES		31
APPENDIX		35
CURRICULUM VITAE		47

ABSTRACT

SYNTHESIS AND CHARACTERIZATION OF ZINC-LAYERED 2, 4, 5-TRICHLOROPHENOXYBUTYRIC ACID (ZTBA) UNDER AQUEOUS CONDITIONS.

The synthesis of zinc-layered 2, 4, 5-trichlorophenoxybutyric acid (ZTBA) and the characterization of the nanohybrid compound by using powder x-ray diffraction (PXRD), Fourier Transform Infrared (FTIR), Thermogravimetric and Derivative Thermogravimetric Analysis (TGA/DTG) and Elemental Analysis (CHNS) has been developed. The synthesis of the ZTBA nanohybrid compound was successfully prepared by using anion-exchange method. The pure phase and well-ordered zinc-layered 2, 4, 5-trichlorophenoxybutyric acid was synthesized at 0.1 M 2, 4, 5-trichlorophenoxybutyric acid (TBA) and with a basal spacing of 13.0 Å. The FTIR spectra show resemblance of TBA with ZnO absorption characteristics. The percentage loading of guest anions, TBA in the zinc layered hydroxide was calculated to be about 51.92 % .The total weight loss by using TGA / DTG is calculated to be at about 63.5 % in the range of 90 - 1000°C.