SYNTHESIS, CHARACTERIZATION AND CONTROLLED RELEASE PROPERTIES OF MAGNESIUM ALUMINIUM LAYERED DOUBLE HYDROXIDE 4-CHLOROPHENOXYACETIC ACID NANOCOMPOSITE

NUR SUHANA BINTI MOHD ALI

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

JULY 2017

This Final Year Project entitled **Synthesis, Characterization And Controlled Release Properties Of Magnesium Aluminium Layered Double Hydroxide 4-Chlorophenoxyacetic Acid Nanocomposite**" was submitted by Nur Suhana binti Mohd Ali, in partial fulfilment of the requirement for the Degree of Bachelor of Science (Hons.) Chemistry, in faculty of Applied Sciences, and was approved.

Dr Tuan Sheikh Ahmad Izaddin Sheikh Mohd Ghazali Supervisor School of Chemistry and Environment Studies Faculty of Applied Science Universiti Teknologi Mara 72000 Kuala Pilah Negeri Sembilan

Nurul Huda Abdul Halim Project Coordinator B. Sc. (Hons.) Chemistry Faculty of Applied Science Universiti Teknologi Mara 72000 Kuala Pilah Negeri Sembilan Mazni Musa Programme Coordinator School of Chemistry and Environment Studies Faculty of Applied Science Universiti Teknologi Mara 72000 Kuala Pilah Negeri Sembilan

Date :

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVATIONS	viii
ABSTRACT	Х
ABSTRAK	xi

CHAPTER 1 INTRODUCTION

1.1	Background of study	1
1.2	Problem statement	3
1.3	Significant of study	4
1.4	Objectives of study	5

CHAPTER 2 LITERATURE REVIEW

2.1	Nanomaterials					
2.2	Layered double hydroxide	7				
2.3	Synthesis of layered double hydroxide					
	2.3.1 Co-precipitate method	9				
	2.3.2 Anion-exchange method	11				
	2.3.3 Hydrothermal method	14				
2.4	Applications of layered double hydroxide	15				
	2.4.1 As catalyst	15				
	2.4.2 Water treatment	16				
	2.4.3 Pharmaceutical	17				
2.5	Intercalation process	18				
2.6	Controlled release properties					
2.7	Herbicide : 4-chlorophenoxyacetic acid					

CHATER 3: METHODOLOGY

3.1	Materials			
	3.1.1 Chemicals	24		
	3.1.2 Apparatus	25		
	3.1.3 Instruments	25		
3.2	Synthesis of MgAl-LDH	26		
3.3	Synthesis of MgAl-LDH intercalated with 4CPA via coprecipitation			
3.4	Characterizations			
	3.4.1 Powder X-Ray Diffraction (PXRD)	30		

	3.4.2	Fourier Transform Infrared Spectroscopy – Attenuated total reflectance (FTIR-ATR)	31
3.5	Releas	se study of 4CPA into aqueous solution	31
СЦ	А DTED	A DESULTS AND DISCUSSION	
	Chara	4 RESULTS AND DISCUSSION	
4.1		Powder X Pay Diffraction (PXPD)	32
	4.1.1	Fourier transform infrared-attenuated total reflection	52
		(FTIR-ATR)	35
4.2	Contro	olled release of 4CPA into aqueous solution	38
CH	APTER	5 CONCLUSION AND RECOMMANDATION	
5.1	Concl	usion	40
5.2	Recon	nmendation	41
CIT	'ED RE	FERENCES	42
APF	PENDIC	CES	47
CUI	RRICU	LUM VITAE	50

ABTRACT

SYNTHESIS, CHARACTERIZATION AND CONTROLLED RELEASE PROPERTIES OF MAGNESIUM ALUMINIUM LAYERED DOUBLE HYDROXIDE 4-CHLOROPHENOXYACETIC ACID NANOCOMPOSITE

Lavered double hydroxide (LDH)-based nanohybrid, created by interacting LDH nanocomposite with another nanoparticles, are come out in active area for environmental protection, healthcare, and storage of drugs or herbicides. In this study, Herbicides, 4-chlorophenoxyacetic acid were intercalated into MgAllayered double hydroxide (LDH) by using molar ratio 2 (R=2). It is synthesised via co-precipitation method at pH 10 (\pm 0.5). The intercalation compound (MgAl-4CPA), was characterised using PXRD and FTIR-ATR to confirm that guest anion are successfully intercalated into MgAl-LDH nanohybrids. The XRD pattern shows that at concentration 0.7 M, the basal spacing shift from 8.9 Å to 9.3 Å, which means the guest anion was successfully intercalated. The result supported by the FTIR-ATR spectrum that shows nitrate peak at wavenumber 1353.50 cm⁻¹ disappeared and carboxylate ion (COO⁻) band presence at wavenumber 1596.29 cm⁻¹. Meanwhile, the controlled release study of 4CPA from MgAl-LDH nanohybrids shows that carbonate aqueous salt solution released the percentage of 4CPA higher than tap water, which are 19.72 and 18.92 %, respectively. This study offered that controlled release of 4CPA from LDH can created safer agent of agrochemicals that can be used in agricultural fields.