TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENT	iii
ABSTRACT IN THAI	iv
ABSTRACT IN ENGLISH	vi
LIST OF TABLES	xi
LIST OF ILLUSTRATION	xii
CHAPTER 1 INTRODUCTION	1
1.1 General introduction	1
1.2 Objective	5
1.3 Scope, planing and methodology	5
1.4 Education advantage	5
1.5 Previous investigations	6
1.5.1 Structural geology and tectonic setting	6
1.5.2 Sedimentology	6
1.5.3 Stratigraphy	7
1.5.4 Paleology and Palynology	8
CHAPTER 2 GEOLOGY	11
2.1 The area of study	11
2.1.1 Location	11
2.1.2 Physiography	11
2.2 Regional geologic setting of Thailand	11
2.3 Geologic setting of Tertiary basin in Thailand	14
2.4 Geologic setting of Mae Moh Basin	15
2.5 Stratigraphy	15
CHAPTER 3 SAMPLE COLLECTION AND ANALYTICAL	
METHODS	23
3.1 Sample collection	23
3.2 Analytical conditions	23
3.2.1 Sample preparation	23
3.2.2 Proximate and Ultimate analysis	25
3.2.2.1 Proximate analysis	25

3.2.2.2 Ultimate analysis	26
3.2.3 X- Ray Diffraction	27
3.2.3.1 Instrumental parameters	27
3.2.4 XRF analyses	27
3.2.4.1 Sample preparation	27
3.2.4.2 Instrumental parameters	29
3.2.5 ICP analyses	29
3.2.5.1 Sample preparation	29
3.2.5.2 Instrumental parameters	29
3.2.6 Coal petrography	30
3.2.6.1 Sample preparation	30
3.2.7 Sulfur isotope	31
3.2.7.1 Sample preparation	31
CHAPTER 4 RESULTS AND INTERPRETATION	32
4.1 Proximate and ultimate analysis	32
4.1.1 Result and interpretation	32
4.1 1.1 Proximate analysis	32
4.1.1.2 Ultimate analysis	33
4.2 X- Ray diffraction	43
4.2.1 Result, mineralogy and interpretation	43
4.3 X- Ray fluorescence	59
4.3.1 Result and interpretation	59
4.3.1.1 C-1 J zone	59
4.3.1.2 NEK, Q zone	59
4.3.1.3 NWK,Q zone	60
4.4 ICP analysis	65
4.4.1 Result and interpretation	65
4.4.1.1 Elements of environmental significance	65
4.4.1.2 Trace elements of no environmental significance	70
4.5 Coal petrography	77
4.5.1 Result and interpretation	77
4.6 Sulfur isotope	88
4.6.1 Result and interpretation	88

CHAPTER 5	CONCLUSIONS	91
REFERENCES	S	98
APPENDIX A	Sample description and collection location	108
APPENDIX B	Diagram from XRD showing qualitative of	f minerals 110
APPENDIX C	Major, minor element compositions for lig	nite and
	sediment samples	133
APPENDIX D	Concentration range for selected major and	d trace
	elements in the upper continental crust (1), global
	coal resources (2), U.S. coal resources (2	3), and
	global lignite resources (3)	136
APPENDIX E	Trace element compositions for lignite and	sediment
	samples	137
CURRICULU	M VITAE	139

LIST OF TABLES

TABLES		PAGE
1.1 History of stratigraphic nomenclature ap	pplied to the	
Cenozoic of the Mae Moh Basin (After	r Chaodumrong, 1985)	10
3.1 Showing the number of samples for geo	ochemical analysis	23
4.1 Proximate analyses of coal samples (air	dried basis)	35
4.2 Ultimate analyses of coal sample (air dr	ried basis)	36
4.3 Qualitative and semiquantitative data for	or the X-ray diffraction	
Traces (C-1 pit)		48
4.4 Qualitative and semiquantitative data for	or the X-ray diffraction	i e
Traces (NW pit)		48
4.5 Qualitative and semiquantitative data for	or the X-ray diffraction	
Traces (NE pit)		48
4.6 Sulfur isotopic composition of the gyps	sum and pyrite samples	89
5.1 Conclusion table of geochemical analys	sis of Mae Moh coal field	91

LIST OF ILLUSTRATIONS

FIGURE	PAGE
	·
1.1 Cenozoic basins in Thailand	3
1.2 Major Cenozoic basins in northern Thailand	4
2.1 Location map of the Mae Moh coal field in northern Thai	iland 12
2.2 Topographic map of Mae Moh coal field and surrounding	g area 13
2.3 Tectonic map of SE Asia and South China showing the ca	rustal blocks in
response to the collision of India with the Asia plate	16
2.4 Geologic map of Mae Moh basin	17
2.5 Conozoic stratigraphy of Mae Moh basin	21
2.6 Schematic lithostratigraphy of Mae Moh Tertiary sedime	ntary sequences 22
3.1 Sample location map from Mae Moh coal field	24
4.1 Diagram of coal samples from C-1 pit plotted between m	oisture/
ash, moisture/fixed carbon and hydrogen/volatile matter	37
4.2 Diagram of coal samples from NE pit plotted between me	oisture/
ash, moisture/fixed carbon and hydrogen/volatile matter	38
4.3 Diagram of coal samples from NW pit plotted between m	noisture/
ash, moisture/fixed carbon and hydrogen/volatile matter	39
4.4 Diagram of coal samples from C-1 pit plotted between m	oisture/ash,
volatile matter/ash, fixed carbon/ash, hydrogen/ash and s	ulfur/ash 40
4.5 Diagram of coal samples from NE pit plotted between me	oisture/ash,
volatile matter/ash, fixed carbon/ash, hydrogen/ash and s	ulfur/ash 41
4.6 Diagram of coal samples from NW pit plotted between m	noisture/ash,
volatile matter/ash, fixed carbon/ash, hydrogen/ash and s	ulfur/ash 42
4.7 XRD patterns of clay mineral from C1RB (red bed) samp	ole 49
4.8 XRD patterns of clay mineral from C1Tran sample	50
4.9 XRD patterns of clay mineral from C1J6/K (overburden)	sample 51
4.10 XRD patterns of clay mineral from NWRB (red bed) sa	mple 52
4.11 XRD patterns of clay mineral from NWIB (interburden)	sample 53
4.12 XRD patterns of clay mineral from NWUB/Q4 (underbu	urden) sample 54

4.13	XRD patterns of clay mineral showing sequences from	
N	WUB/Q4 (underburden) sample- NWRB (red bed) sample	55
4.14	Diagram showing vertical variation of minerals in C-1 pit	56
4.15	Diagram showing vertical variation of minerals in NE pit	57
4.16	Diagram showing vertical variation of minerals in NW pit	58
4.17	Diagram showing vertical variation of major elements in J zone,	
	C-1 pit	62
4.18	Diagram showing vertical variation of major elements in K, Q zone	
	NE pit	63
4.19	Diagram showing vertical variation of major elements in K,Q zone	
	NW pit	64
4.20	Variation plot of trace elements in C-1 pit	72
4.21	Variation plot of trace elements in NE pit	73
4.22	Variation plot of trace elements in NW pit	74
4.23	Variation plot between Si/Ca, Sr/Ca and Ba/Ca ratio of Mae Moh	
	coal field	75
4.24	Variation plot of Co, Cr and V concentrations of Mae Moh	
	coal field	76
4.35	Showing sporinite and litodetrinite in J-1 coal seam	79
4.26	Showing piece of inertinite (scherotinite filling with exudatinite,	
	in exudaitnite baclground in J-5A coal seam	79
4.27	Photomicrograph showing framboidal pyrite and liptodetrinite	
	in densinite in J-6B coal	80
4.28	B Photomicrograph showing alginite, cutinite, sporinite and	
	liptodetrinite in J-6B coal	80
4.29	Photomicrograph showing colonies of alginite (Botryococcus type)	
	in J-6B coal	81
4.30	Photomicrograph showing pieces of sclerotinite filling with	
	exudatinite in K coal seam	81
4.31	Photomicrograph showing cutinite and sporinite in K coal seam	82
4.32	2 Photomicrograph showing sporinite and liptodetrinite in K coal seam	82
4.33	3 Photomicrograph showing densinite and white spots of pyrite	
	in K-1 coal seam	83

4.34 Photomicrograph showing association of alginite (Pila type-long	
yellowish, and lamaginite-short greenish yellow)	83
4.35 Photomicrograph showing liptodetrinite with some lamaginite,	
green colour is exudatinite in K-3 coal seam	84
4.36 Photomicrograph showing frambodal pyrite in densinite in K-3 coal seam	84
4.37 Photomicrograph showing lamginite (short greenish yellow) layer	
in K-3 coal seam	85
4.38 Photomicrograph showing thick cutinite in K-3 coal seam	85
4.39 Photomicrograph showing disintegrating thick cutinite in suberinite	
in Q-1 coal seam	86
4.40 Photomicrograph showing liptodetrinite layer which could derive	
from high essential oil woody tissue, in Q-3 coal seam	86
4.41 Photomicrograph showing textinite bounded by exsudatinite	
in Q-4 coal seam	87
4.42 Diagram showing sulfur isotope distribution in Mae Moh coal field	90