

GEOCHEMISTRY CHARACTERIZATION OF ORGANIC SOIL

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To my beloved parents and sibling

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ABSTRACT

The behaviour of organic soil was found to be governed by its chemical properties rather than its physical properties. Hence, it is important to determine the geochemistry properties of organic soils besides its physical properties. The main objective of this study was to characterize the geochemistry properties of organic soils for civil engineering applications. The organic soil specimens were retrieved from three different locations at Batu Pahat, Johor, namely Parit Nipah, Parit Sidek and Batu Puteh using peat auger and undisturbed sampler. The top layer of the peat soil which is rich in non-humified matters was excluded from this study. The geochemistry properties of the organic soils underneath the peat soil were determined through laboratory tests; Total Organic Carbon (TOC), Loss of Ignition (LOI) and etc. Besides it, this study also highlighted the correlation of geochemistry properties of organic soils with its physical behaviors namely strength, moisture content, specific gravity, and Atterberg limits. This study provided a good understanding of organic soils which enable the designer to identify and investigate the effect of geochemical properties towards the soil behaviour.

ABSTRAK

Kelakuan tanah organik adalah ditetapkan oleh sifat-sifat kimia dan bukan sifat fizikalnya. Oleh kerana itu, adalah penting untuk menentukan sifat geokimia dari tanah organik selain sifat fizikalnya. Tujuan utama untuk kajian ini adalah untuk mengkarakterisasi sifat geokimia dari tanah organik bagi kegunaan dalam bidang kejuruteraan awam. Spesimen tanah organik yang diambil dari tiga lokasi yang berbeza di Batu Pahat, Johor, iaitu Parit Nipah, Parit Sidek dan Batu Puteh dengan menggunakan auger khas untuk tanah gambut. Lapisan atas tanah gambut yang mengandungi non-humified adalah dikecualikan daripada kajian ini. Sifat geokimia ini dari tanah organik di bawah tanah gambut ditentukan melalui ujian makmal seperti *Total Organik Carbon (TOC)*, *Loss of Ignition (LOI)* dan lain-lain. Selain itu, kajian ini juga menghubungkan sifat geokimia tanah organik dengan sifat fizikal iaitu kekuatan tanah, kelembapan tanah, gravity tentu, dan Keplastikan tanah. Kajian ini memberikan pemahaman and pengetahuan tentang tanah organik and juga membolehkan jurutera untuk mengenal pasti dan menyiasat pengaruh sifat geokimia terhadap kelakuan tanah.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	THESIS TITLE	i
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF FIGURES	xi
	LIST OF TABLES	xiii
	LIST OF APPENDICES	xv
1	INTRODUCTION	1
	1.1 Background of Study	1
	1.2 Problem Statement	2
	1.3 Objectives	3
	1.4 Scope of Study	3

2	LITERATURE REVIEW	4
2.1	Introduction	4
2.2	Background of Organic Soil	5
2.3	Soil Organic Matter	7
2.4	The Important of Organic Matter	9
2.5	Properties of Organic Soil	11
	2.5.1 Physical Properties	11
	2.5.2 Chemical Properties	15
2.6	Classification of Organic Soil	17
2.7	Determination of Organic Carbon	19
3	METHODOLOGY	22
3.1	Introduction	22
3.2	Soil Sampling	24
3.3	In-situ Test	27
	3.3.1 Vane Shear Test	27
	3.3.2 Soil Colour Chart	28
3.4	Laboratory Test	29
	3.4.1 Physical Properties Test	31
	3.4.1.1 Unconfined Compression Test (UCT)	31
	3.4.1.2 Specific Gravity Test	31
	3.4.1.3 Atterberg Limits	33
	3.4.1.4 Moisture Contents	34
	3.4.1.5 Particle Size Distribution	35
	3.4.2 Chemical Properties Test	36
	3.4.2.1 Loss of Ignition (LOI)	36
	3.4.2.2 pH value	37

3.4.2.3	Cation Exchange Capacity (CEC)	39
3.3.2.4	Chloride contents	42
3.3.2.5	Sulplate contents	43
3.3.2.6	Total Organic Carbon (TOC)	44
4	DATA ANALYSIS AND DICUSSION	46
4.1	Introduction	46
4.2	Physical test on Organic Soil	46
4.2.1	In-situ Vane Shear	47
4.2.2	Unconfined Compression Test (UCT)	48
4.2.3	Specific Gravity	51
4.2.4	Moisture Content and Atterberg limits	52
4.2.5	Soil Colour	56
4.2.6	Particle Size Distribution	57
4.3	Chemical Tests On Organic Soil	59
4.3.1	Total Organic Carbon	59
4.3.2	Loss on Ignition (LOI)	61
4.3.3	pH Value	62
4.3.4	Sulphate Content	63
4.3.5	Chloride Content	66
4.3.6	Cation Exchange Capacity (CEC)	68
4.4	Data Analysis	70
4.4.1	pH of soil and Sulphate Content	70
4.4.2	Organic Contents and Cation Exchange Capacity	72
4.4.3	Total Organic Carbon and Loss on Ignition	74
4.4.4	Organic Contents and Liquid Limit	75
4.4.5	Organic Content and Moisture Content	76
4.4.6	Organic Content and Specific Gravity	79
4.4.7	Chloride content and Atterberg limit	80
4.4.8	Organic content and Shear Strength	81
4.4.9	Specific Surface and Cation Exchange Capacity	83
4.5	Discussion	85

5	CONCLUSION & RECOMMENDATIONS	88
5.1	Conclusions	88
5.2	Recommendations	90

APPENDIX

LIST OF FIGURES

FIGURES NO.	TITLE	PAGE
2.1	Organic matter	8
3.1	Methodology flow chart	23
3.2	Sampling locations of Batu Puteh, Parit Sidek & Parit Nipah	24
3.3	Cross- sectional view peat sampler	25
3.4	Eijkelkamp's peat auger	25
3.5	Sampling of organic soil	26
3.6	Organic soil sample	26
3.7	Field pocket vane shear apparatus	27
3.8	Field vane shear test conducted at sampling location	28
3.9	Munsell soil colour chart	29
3.10	Laser particle size analyzer - CILAS 1180	36
3.11	Samples Preparation for loss of ignition Test	37
3.12	Sample preparation for pH determination	38
3.13	Electrometric method of pH determination	38
3.14	Soil Samples after centrifuge test	40
3.15	Overview of centrifuge device	41
3.16	Inside of centrifuge device	41
3.17	DR5000 spectrometer	43
3.18	Orbital mechanical shaker	44
3.19	Shimadzu Total Organic Carbon Analyzer	45
4.1	Soil samples for unconfined compressive test	50

4.2	Unconfined compressive strength analysis of organic soil	50
4.3	Atterberg limit and moisture content versus depth for Batu Puteh	52
4.4	Atterberg limit and moisture content versus depth for Parit Nipah	53
4.5	Atterberg limit and moisture content versus depth for Parit Sidek	53
4.6	Plasticity chart	55
4.7	Stage of soil consistency	55
4.8	Specific surface area versus clay content	58
4.9	Sulphate content at different cepth	64
4.10	Chlorite content at different depth	67
4.11	Organic content versus moisture content	78
4.12	Organic content versus shear strength	82

LIST OF TABLES

TABLE NO.	TITLE	PAGE
2.1	Extent and distribution of peat and organic soil in Malaysia	6
2.2	Functions of soil organic matter	10
2.3	Physical properties of peat and organic soil in Malaysia	12
2.4	Soil colors associated with soil attribute	13
2.5	Specific surface area of soil particles	13
2.6	Mineral of the soil and its color	14
2.7	Typical value of specific gravity	14
2.8	illustrates a practical relationship interpretation of CEC to soil texture	16
2.9	Cation exchange capacity of different soil particles	16
2.10	Organic Content Ranges	18
2.11	Converter factors for convert organic matter to organic carbon	21
3.1	Cation exchange capacity of organic soil	39
4.1	In-situ vane shear of organic soil	47
4.2	Shear strength of the organic soil	48
4.3	Shear strength for soil Sample from Parit Sidek	49
4.4	Specific gravity of organic soil	51
4.5	Atterberg limits of organic soil	54
4.6	Moisture content of the organic soil	54
4.7	Colour of the organic soil	56

4.8	Particle size distribution of organic soil	58
4.9	Total organic carbon of organic soil	60
4.10	Organic content of organic soil (Loss on Ignition)	62
4.11	pH value of the organic soils	63
4.12	Sulphate content of organic soils	64
4.13	Sulphate content of organic soils at Parit Nipah with addition of humic acid	65
4.14	Chloride content of organic soils	66
4.15	Chloride content of organic soils with addition of humid acid	67
4.16	Cation exchange capacity of organic soil	69
4.17	pH and sulphate content of organic soils	70
4.18	pH and Sulphate content of organic soils with addition of humid acid	71
4.19	Organic content and CEC of organic soil	72
4.20	Organic content and CEC of organic soil with addition of humid acid	73
4.21	Total Organic Carbon & Loss on Ignition of Organic Soils	75
4.22	Organic content and liquid Limit of organic soils	76
4.23	Organic content and moisture content of organic soil	77
4.24	Organic content and specific gravity of organic soils	79
4.25	Chloride content and Atterberg limits of organic soil	80
4.26	Organic content and shear strength of organic soils	82
4.27	Specific surface and CEC of organic soils	84
4.36	The physico- chemical properties of the organic soil	87

LIST OF APPENDIX

APPENDIX	TITLE	PAGE
A	Moisture content & loss of ignition of organic soil	98
B	Moisture content test data	99
C	Specific gravity test data	101
D	Atterberg limit test data	103
E	Unconfined compression test data	117
F	Chemical properties of organic soil after addition of humic acid	133
G	Determination of pH value	134
H	Data for XRF analysis	135
I	Particle size distribution data	139
J	Data and calculation for CEC	186

CHAPTER 1

INTRODUCTION

1.1 Background of Study

This study focused on the Geochemistry Characterization of organic soil for geotechnical engineering in Johor state, Malaysia. Many of the researches about geochemistry characterization on the soil had been conducted previously, but most for the research done mainly for the agricultural purpose to improve the quality of soil for the plantation only. It is hardly and almost none of the similar type of research carries out for the engineering purpose especially for the organic soil.

Most of the researchers are more concern about the peat soil instead of the organic soil which consists of lower organic content. It is important to have geochemistry characterization on the organic soil especially in our country, Malaysia. Thus, a study of geochemistry characterization on organic soil was carried out to investigate its physical and chemical properties.

1.2 Problem Statement

Organic soil for example peat soil is one of family of the organic soil which is widely found in Malaysia. Generally, organic soil is a problematic soil to the construction which will cause possible shear failure, low bearing capacity and different settlement.

Due to these problems, removal of the organic soil is a normal practice for the civil engineer whenever this kind of soil is encounter at the site and this will then lead to the increase of the cost of the construction and delayed the duration of completion. Somehow it is impractical and uneconomic to have the removal work when there is more than 10 meters depth organic soil deposit below the existing ground surface.

Besides that, due to the rapid development of our country, many construction is undergo and the lacking of the suitable land cause the construction have to be construct on the organic soil and various construction techniques have been carried out to support embankments over peat deposits without risking bearing failures but settlement of these embankments remains excessively large and continues for many years.

In order to solve the organic soil problem a good understanding of the organic soil are needed and lot of researches are done to solve the problem for the organic soil and it is also important to indentify and investigate the effect chemical compound of organic soil to the soil properties to solve the problem.

1.3 Objectives

Objectives of this study are:

- 1) To determine the physical and geochemistry properties of organic soils.
- 2) To characterize the geochemistry properties of organic matter.
- 3) To correlate the geochemistry properties of organic soil and its physical properties.

1.4 Scope of Study

The study was conducted on organic soil which obtained from three different sites, namely Parit Sidek, Parit Nipah and Batu Puteh in Johore. The geochemical characterization of the organic soil was done on the soil through two type of the test, which was the physical test and chemical test. The physical test such as Atterberg limit test, moisture content, specific gravity test and etc were conducted to determine the physical parameter of the soil. On the other hand, the chemical tests such as Total organic carbon and loss on ignition were conducted to determine the organic content of the soil. Other chemical tests were carried out to determine the pH value, Cation Exchange Capacity (CEC), Sulphate content and Chloride content of the soil. The Sulphate and Chloride content of the soil determined in this study were the water soluble type. The insitu Vane Shear test was conducted to obtain the physical parameters for the soil at the site