

CLAY MINERALOGY OF KWALA BAHU RIVER  
SEDIMENT

DONNE PATRICK BUN AMR

FACULTY OF SCIENCE AND TECHNOLOGY  
UNIVERSITY COLLEGE OF SCIENCE AND TECHNOLOGY MALAYSIA

2015

31/1994

1100034573

LP 6 FST 3 2005



1100034573  
Clay mineralogy of Kuala Ibai River sediment / Donnie Patrick  
Amir.



**PERPUSTAKAAN  
KOLEJ UNIVERSITI SAINS & TEKNOLOGI MALAYSIA  
21030 KUALA TERENGGANU**

1100034573		

Lihat sebelah

HAK MILIK  
PERPUSTAKAAN KUSTEM

**CLAY MINERALOGY OF KUALA IBAI RIVER SEDIMENT**

**By**

**DONNIE PATRICK BIN AMIR**

**Research report submitted in partial fulfillment of the requirements for the degree  
of Bachelor of Science (Marine Science)**

**Department of Marine Science  
Faculty of Science and Technology  
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA  
2005**

This project should be cited as:

DONNIE, P. A., 2005. Clay Mineralogy of Kuala Ibai River Sediment Final Year Project Report, Bachelor of Science, Marine Science, Faculty of Science and Technology, Kolej Universiti Sains Dan Teknologi Malaysia. 50 p

No part of this project may be reproduce by any mechanical, photograhpic, or electronic process, or in the form photographic, recording, nor may it be stored in a retrieval system, transmitted, or otherwise copied for public or private use, without written permission form from the author and the supervisor of the project.

## ACKNOWLEDGEMENTS

First of all, I would like to thank God for the guidance and blessing throughout the project. I would also like to thank my supervisor, Dr. Nor Antonina binti Abdullah for her precious guidance, advice and continuous support throughout the completion of this project. I really appreciate her for giving me the chance to do this great research. Besides that I am also felt very fortunate, to be able to experience the research work.

Thanks also to Prof. Madya Dr. Siti Zauyah, Head of Department of Soil Science in UPM in helping and guiding me, during the lab work in UPM. Thanks also goes to my fellow course mates especially, Nurul Adilla for her help, starting from the day of the sampling to the lab work, until the completion of this thesis, not forgetting also to Razif, Yoshi. My gratitude also goes to master students, Willy and Karthic who lend their help whenever they are needed. For sure, I would like to express my gratitude to my housemates and my best friends, Subhi, Zaidi, Chairil, Brian, Aszfi, Indra, Gladys, Jamilah, Tg. Mardiah and Siti Syairah to name a few. Thank you for the sharing and caring, it was a great memory to know and have you guys.

Thanks also goes to, the lab assistants of Oceanography Laboratory for allowing me to use the apparatus and instrument during my lab work. Last but not least, my deepest appreciation to my beloved family, you are always in my heart no matter where I am. This project will not be able to complete without the help of any one above.

Thank you very much.

## TABLE OF CONTENTS

CONTENTS	Pages
ACKNOWLEDGEMENT	ii
TABLE OF CONTENT	iii
LIST OF FIGURES	vi
LIST OF TABLES	vii
LIST OF ABBREVIATION	viii
LIST OF APPENDICES	ix
ABSTRACT	x
1.0 INTRODUCTION	1
1.1 Objectives	2
2.0 LITERATURE REVIEW	
2.1 Introduction	3
2.2.1 Sediments	3
2.2 Sedimentation Rate	4
2.3 Process affecting the mineralogy of the sediment in the study areas.	5
2.4 Minerals	6
2.5 Clay minerals	6
2.5.1 Chlorite	7
2.5.2 Illite	8
2.5.3 Kaolinite	9

2.5.4	Smectite	9
2.5.5	Feldspar	10
2.5.6	Micas	11
2.6	Types of Clay Minerals	11
2.7	The Genesis of Clay Minerals	14
2.8	Distribution of Clay Minerals	15
2.9	Texture of Sediment	16
<b>3.0</b>	<b>METHODOLOGY</b>	
3.1	Research Location	18
3.2	Description of the Study Area	18
3.3	Sampling	22
3.4	Sample Preparation	22
3.5	Laboratory Analysis	
3.5.1	Clay Mineralogy	23
3.5.2	Particle Size Analysis	
3.5.2.1	Wet Sieving Method (Texture Analysis)	26
<b>4.0</b>	<b>RESULTS</b>	
4.1	Mineralogy	28
4.2	Physical Characteristic	34

<b>5.0</b>	<b>DISCUSSION</b>	
5.1	Mineralogy	36
5.2	Percentage of sand, silt and clay	38
<b>6.0</b>	<b>CONCLUSION</b>	40
	<b>REFERENCES</b>	40
	<b>APPENDICES</b>	43



## LIST OF FIGURES

### FIGURE

3.1:	Map of sampling site	19
4.1:	X- Ray diffractograms for station 1 and 2	30
4.2:	X- Ray diffractograms for station 3 and 4	30
4.3	X- Ray diffractograms for station 5 and 6	31
4.4	X- Ray diffractograms for station 7 and 8	31
4.5	X- Ray diffractograms for station 9 and 10	32

## LIST OF TABLES

### TABLE

3.1:	Coordinates of sampling location	19
3.5.1:	Settling time corresponds with suspension temperature	25
3.5.2:	Time gap corresponds with suspension temperature	27
4.1:	Relative abundance of minerals	33
4.2	Texture classes and percentage of sand, silt and clay, in the Kuala Ibai River sediment.	34

## LIST OF ABBREVIATION

°C	degree Celsius
μm	micrometer
mL	millimeter
L	liter
St.	station
HCL	Hydrochloric Acid
H <sub>2</sub> O <sub>2</sub>	Hydrogen Peroxide
NaHCO <sub>3</sub>	Sodium bicarbonate
Å	d – spacing

## LIST OF APPENDICES

### Appendix

1	Steps for preparing sand, silt and clay fraction for XRD analysis	44
2	Steps for particle size analysis (texture analysis)	46
3	List of apparatus, material and instruments used in the research	47
4	Instrument used in clay mineralogy analysis	48
5	Samples preparation for XRD analysis	48
6	Sample preparation for texture analysis	49
7	Texture Triangle	50

## ABSTRAK

Sebanyak sepuluh sampel telah diambil semasa penyempelan, dimana ia telah dijalankan di muara Sungai Ibai. Sampel sedimen telah dilakukan analisis untuk menunjukkan kandungan mineral liat dan juga tekstur sedimen untuk sedimen permukaan muara Sungai Ibai. Alat X-ray diffractometer (XRD), telah digunakan untuk menganalisis mineralogi manakala bagi tekstur sedimen, kaedah ayak basah telah digunakan. Secara umumnya, sedimen di Sungai Ibai didominasi oleh kuarza dimana peratusnya melebihi 70%. Selain itu, kajian juga menunjukkan sedimen dikawasan tersebut juga didominasi oleh mineral primer yang lain. Disamping itu, terdapat juga kehadiran mineral lain seperti micas, feldspar, kaolinite dan klorit, namun begitu, kewujudannya sangat sedikit. Seterusnya, bagi tekstur sedimen pula, tekstur berliat mendominasi kawasan penyempelan terutama di stesen 6, 7, 8, 9 dan 10. Namun begitu, tekstur berpasir mendominasi sedimen di kawasan muara Sungai Ibai.

## ABSTRACT

Ten sediment samples were collected from the Ibai River estuary. The sediments were analyzed to determine the clay mineral contents and to study the sediment texture in the Ibai River estuary surface sediment. The mineralogy was analyzed using the X-ray diffractometer (XRD) while the texture analysis was determined using the wet sieving method. Generally, the sediments in Ibai River are low in clay mineral contents, where quartz is dominant in the area, which was over 70%. Thus, the study also indicates that the study area, is dominated by primary minerals. In addition, trace amount of other minerals such as feldspar kaolinite micas and chlorite also revealed in this study. Texture analysis shows that the dominant texture in the sediment is clay especially at stations 6, 7, 8, 9 and 10. However, sand texture was dominant the sediment at the river mouth of the estuary.