

**A STUDY ON CLAY MINERALS AND MAJOR ELEMENT OXIDES IN  
SURFACE RIVERINE ESTUARINE SEDIMENTS FROM SELECTED RIVERS  
OF TERENGGANU, MALAYSIA**

**LINA IDAYU BINTI ABDULLAH**

**Thesis Submitted in Fulfillment of the Requirement for the Degree of Master of  
Science in the School of Marine and Environmental Sciences Universiti Malaysia  
Terengganu**

**December 2015**

## **DEDICATION**

*Alhamdulillah  
To Him who had given me dreams to look forward to.  
To my beloved husband  
To my parents  
To my lecturers  
To my siblings  
and  
To all my friends  
This humble work is a sign of my appreciation to you!*

## **ABSTRACT**

Abstract of thesis presented to the Senate of the Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science.

### **A STUDY ON CLAY MINERALS AND MAJOR ELEMENT OXIDES IN SURFACE RIVERINE ESTUARINE SEDIMENTS FROM SELECTED RIVERS OF TERENGGANU**

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**School: School of Marine and Environmental Sciences**

The clay mineralogy deposition and major oxide elements distribution of the surface estuarine sediments from the selected estuaries of Terengganu was studied in order to know the types of clay minerals and the source of sediments. A total of 68 sampling stations were collected from the estuaries of Terengganu River, Kemaman River, Dungun River and Besut River. The sediments were examined using X-ray Diffractometer (XRD) and Scanning Electron Microscope with Electron Dispersive X-ray Spectroscopy (SEM-EDS) methods for the clay minerals present and major oxides composition. Results

show that the clay minerals found from the Holocene sediments are dominated with Kaolinite in Terengganu and Besut river estuaries while illite/muscovite are abundant in Kemaman and Dungun river estuaries with minor amounts of chlorite and smectite. Silicon dioxide ( $\text{SiO}_2$ ) is the most abundant mineral with an average percentage 50%, followed by Aluminium oxide ( $\text{Al}_2\text{O}_3$ ) with an average percentage of 22.5% and Iron oxide ( $\text{FeO}$ ) with 12%. Analysis using SEM-EDS shows an abundance of kaolinite clay group and illite with a strong correlation of Al:Si, Al:Fe, and Al:K ratio. The abundance of kaolinite and illite is attributed to the weathering product of granite or igneous rocks which contain feldspar and mica. Thus, the mineralogy of the Terengganu River estuary and Besut River estuary in the north of Terengganu state is similar while Kemaman River estuary and Dungun River estuary in the south are quite similar to each other.

## **ABSTRAK**

Abstrak thesis yang dikemukakan kepada senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk Ijazah Sarjana Sains.

### **KAJIAN KE ATAS MINERAL LEMPUNG DAN ELEMEN OKSIDA UTAMA DI DALAM SEDIMEN PERMUKAAN MUARA DI BEBERAPA SUNGAI DI TERENGGANU**

**LINA IDAYU BINTI ABDULLAH**

**Disember 2015**

**Penyelia : Dr. Nor Antonina Binti Abdullah**

**Penyelia Bersama: Prof. Emeritus. Dr.Noor Azhar Bin Mohamed Shazili**

#### **Pusat Pengajian: Pusat Pengajian Sains Marin dan Sekitaran**

Mineral lempung di dalam sedimen permukaan muara di beberapa sungai di Terengganu telah di kaji untuk mengetahui jenis mineral lempung, asalan dan taburan. Sebanyak 68 stesyen persampelan mineral lempung di ambil di dalam sedimen muara Sungai Terengganu, Sungai Besut, Sungai Dungun dan Sungai Kemaman. Sampel telah diuji dengan menggunakan mesin pembelauan X-Ray (XRD) dan Mesin Pengimbas Elektron (SEM-EDS) untuk mengetahui jenis mineral lempung yang hadir dan taburan mineral oksida di dalam sampel

permukaan muara sungai. Keputusan menunjukkan mineral lempung yang terdapat di dalam sedimen Holosin ini adalah didominasi oleh Kumpulan Kaolinite di muara Sungai Terengganu dan Besut manakala illite/muskovit mendominasi sedimen di muara Sungai Kemaman dan Dungun serta beberapa jumlah kecil kehadiran mineral klorit dan smektit. Elemen oksida menunjukkan silikon oksida ( $\text{SiO}_2$ ) mempunyai peratusan tertinggi di dalam sampel sedimen secara keseluruhan dengan peratusan sebanyak 50% diikuti oleh Aluminium oksida ( $\text{Al}_2\text{O}_3$ ) 22.5% dan Iron oksida ( $\text{FeO}$ ) 12%. Hasil analisa seterusnya melalui analisa menggunakan SEM-EDS mendapati bahawa Kaolinite dan Illite adalah merupakan mineral lempung yang dilihat dominan dengan nisbah korelasi positif Al:Si, Al:Fe dan Al:K di dalam korelasi unsur oksida. Keadaan ini adalah terhasil daripada proses luluhawa batuan granit ataupun batuan igneus yang mempunyai kandungan utama mineral mika dan feldspar. Oleh itu, mineralogi muara Sungai Terengganu dan muara Sungai Besut di bahagian utara Terengganu menunjukkan persamaan manakala muara Sungai Kemaman dan muara Sungai Dungun di bahagian Selatan menunjukkan kesamaan di antara satu sama lain.