MINERALOGY AND GEOCHEMISTRY INVESTIGATION OF KUANTAN BAUXITE

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Bauksit adalah batu atau pembentukan tanah yang terdiri terutamanya daripada mineral aluminium hidroksida. Bauksit terutamanya terdiri daripada campuran aluminium hidroksida. Gibbsite, boehmite dan pada tahap yang lebih rendah, diaspore adalah mineral aluminous utama. Komponen lain, penghapusan kepada pengeluaran alumina, adalah tanah liat (terutamanya kaolinit), oksida besi, kuarza, oksida titanium, air dan pelbagai mineral lain (Lozej, 1993). Kawasan bauksit terletak di Kuantan di negeri Pahang. Kawasan bauksit yang terkenal di Bukit Goh, Indera Mahkota dan Semambu. Kajian ini adalah untuk menentukan sifat-sifat geokimia mineral yang terdapat dalam bauksit. Siasatan dijalankan di tiga kawasan yang berlainan di Bukit Goh, Indera Mahkota dan Semambu. Ujian x-ray fluoresens (XRF) dilakukan untuk menentukan sifat-sifat geokimia mineral yang terdapat dalam bauksit di Kuantan. Unsur utama yang diperolehi dari ujian pendarfluor x-ray ialah aluminium (20.5843-25.5384%), besi (15.3052-21.7137%) dan silika oksida (9.0746-15.6503%).

ABSTRACT

Bauxite is a rock or soil formation that is composed primarily of aluminium hydroxide minerals. Bauxite consists primarily of a mixture of aluminium hydroxides. Gibbsite, boehmite and to a lesser extent, diaspore are the main aluminous minerals. Other components, deleterious to alumina production, are clay (mainly kaolinite), iron oxides, quartz, titanium oxide, water and a variety of other minerals (Lozej, 1993). The area of the bauxite lies in the Kuantan in the state of Pahang. The famous area of bauxites at the Bukit Goh, Indera Mahkota and Semambu. This study is to determine the the geochemistry properties of the mineral that contain in the bauxite. An investigation was carried out at three different site which are at Bukit Goh, Indera Mahkota and Semambu. X-ray fluorescence (XRF) test was carried out in order to determine the geochemistry properties of the mineral that contain in the bauxite at Kuantan. The major element that obtained from x-ray fluorescence test are aluminium (20.5843-25.5384%), iron (15.3052-21.7137%) and silica oxide (9.0746-15.6503%).

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LIST OF ABBREVIATIONS

XRF	X-ray fluorescence
BG1	Bukit Goh 1
BG2	Bukit Goh 2
BG3	Bukit Goh 3
IM1	Indera Mahkota 1
IM2	Indera Mahkota 2
IM3	Indera Mahkota 3
SM1	Semambu 1
SM2	Semambu 2
SM3	Semambu 3
Al_2O_3	Alumina
Fe	Iron
Ti	Titanium
SiO_2	Silica oxide
CaO	Calcium oxide
S	Sulfur
P_2O_5	Phosphorus oxide
K_2O	Potassium oxide
Mn	Mangan
Zr	Zirconium
V	Vanadium
Pb	Lead (Plumbum)
Nb	Niobium
Zn	Zinc
Ni	Nickel
Bi	Bismuth
Cu	Copper
Ta	Tantalum
Rb	Rubidium
Tl	Thallium
Cd	Cadmium
Y	Yttrium

Mo	Molybdenum
Ce	Cerium
Hf	Hafnium
Ag	Silver
Sr	Strontium
MgO	Magnesium oxide
Sn	Tin

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Bauxite is a rock or soil formation that is composed primarily of aluminium hydroxide minerals. In the industrial perspective point of view, Bauxite is considered as a natural material that which can extract alumina from it in a Bayer plant (Lozej, 1993). Bauxite consists primarily of a mixture of aluminium hydroxides. Gibbsite, boehmite and to a lesser extent, diaspore are the main aluminous minerals. Other components, deleterious to alumina production, are clay (mainly kaolinite), iron oxides, quartz, titanium oxide, water and a variety of other minerals (Lozej, 1993)

The way to extracted the alumina from bauxite are through the Bayer process. The procedure of the Bayer process are the ore is mixed with sodium hydroxide and then heat up inside a pressure chamber with temperature of 150 °C to 200 °C until the alumina dissolved and then being filtered out. This process will create waste by-product which is known as bauxite residue or what we called red mud, a heavy metal laden slurry with high alkalinity which can, contain naturally occurring radionuclides at times.

Bauxite can be found all around the world including in Malaysia. Major commercial deposits are found in Australia, China, Brazil, Guyana, Ghana, Guinea, Hungary, India, Indonesia, Jamaica and Suriname (Brown et al., 2015). The existence of bauxite in the Kuantan area, Peninsular Malaysia was first recognized by the Geological Survey in 1937 (Fitch,1952). The area of the bauxite lies in the Kuantan in the state of Pahang. The famous area of bauxites at the Bukit Goh, Indera Mahkota and Semambu. This area can be reach by the new Kuantan bypass that lead toward the highway to Terengganu.

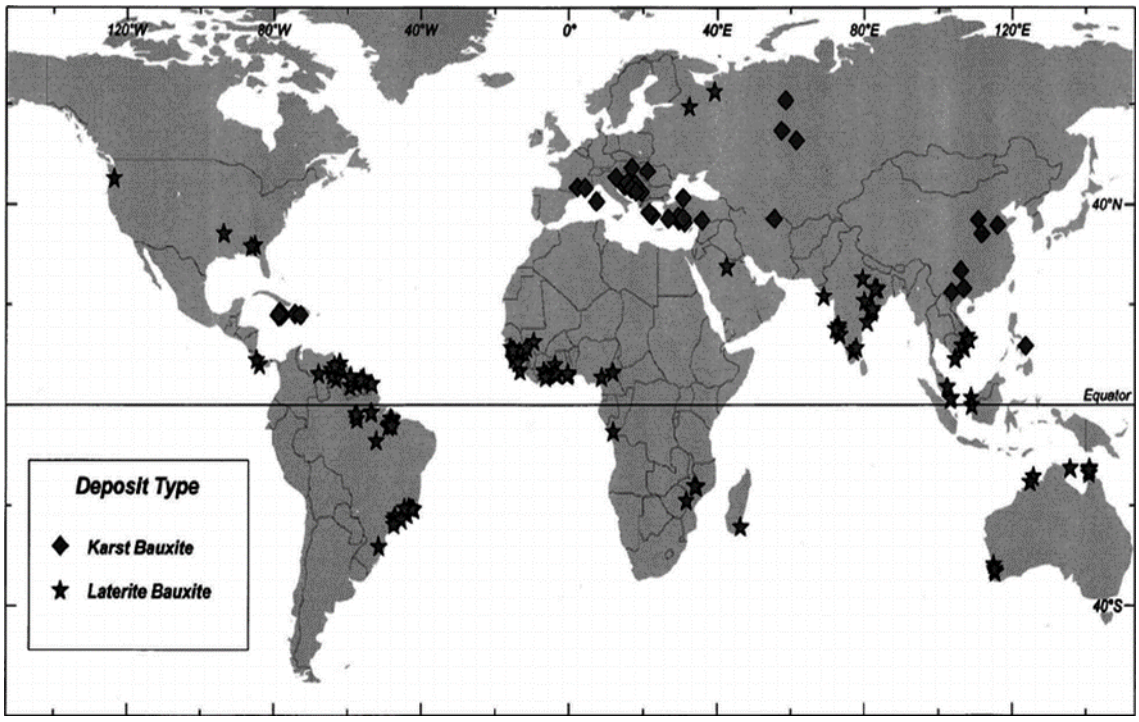

Figure 1.1: Bauxite distribution in the world

1.2 Problem Statement

Bauxite is a controversial issue in Malaysia especially in Pahang. As we know Pahang is the biggest bauxite area in Malaysia. For example, we can see the forests area being cut and levelled in order to explore and to mine the bauxite.

Pahang is a rapidly developing state in Malaysia country. So in a few years, the Kuantan area as the capital of State of Pahang will be developed rapidly and there will be many building and residential area that will be constructed especially at area that we all know contain bauxite deposit.

Other than that, we can see the earth was dug up. If raining, the water runoff will flow to the river and will cause the river water stained red. The water run off contain high amount of mercury and arsenic. This polluted water will harm human in a long term. This is because the water is the important source for the human.

This is important to investigate the chemical content in the bauxite before any construction of the building and residential area. The mineral contents in the bauxite can

affect the building esthetical value which is the colour of the building will become ugly due to the redness colour pollution that may affect the building colour.

Therefore, in order to solve the above problem, this study is carried out to investigate the mineralogy and geochemical of bauxite soil deposits. There are many type of test that we can conduct to determine the chemical content of soil at that area. For this research we conduct the x-ray diffraction method to do testing on the soil samples. The mineral composition is also to be determined.

1.3 Objectives of the Study

This research focus on the mineral content of bauxite. In order to achieve the aim for this research, the following objectives had been established:

i. To determine the mineralogy content of bauxite.
ii. To compare the mineral composition and chemical contents of bauxite in three sites in Kuantan

1.4 Scope of the Study

This research will undergo the laboratory test which is X-ray fluorescence test in order to determine and differentiate the mineralogy content that consist in the bauxite. This study is important to determine the mineral content of bauxite because, the bauxite is from various combination. Figure 1.2 show the location of the sample taken for testing from Bukit Goh, Indera Mahkota and Semambu. Three sample will be taken for testing from every site.

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