

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background of Research

Aluminium or aluminum is a chemical element that contains silvery-white, nonmagnetic, soft and ductile material. Aluminium is the third most abundant metal in the earth's crust after oxygen and silicon. Aluminium metal found based on combined over 270 different mineral. The main ore of aluminum is bauxite that are consists mostly of the minerals gibbsite ( $\text{Al}(\text{OH})_3$ ), boehmite ( $\gamma\text{-AlO}(\text{OH})$ ) and diaspore ( $\alpha\text{-AlO}(\text{OH})$ ), mixed with the two iron oxides goethite and haematite, the clay mineral kaolinite and small amounts of anatase ( $\text{TiO}_2$ ) and ilmenite ( $\text{FeTiO}_3$  or  $\text{FeO} \cdot \text{TiO}_2$ ). The most useful compounds of aluminum, at least every weight, are oxides and sulphates. It is a metal that have high valuable properties. Aluminium has about 1/3 the density and the stiffness of steel. It is easily machined, cast, drawn and extruded. It is also good in electrical conductor and thermal because having electrical conductivity 60% that of copper. Aluminium is also common material for fabrication of superconducting (Shakhashiri, 2012).

A naturally occurring ore containing aluminum, oxygen, and hydrogen. Bauxite is the principal ore in the production of alumina. The bulk of world bauxite production (approximately 85%) is used as the feed stock in the production of alumina. The normal classification of bauxite deposits are divides into three types that are depending on the mineralogy, geochemistry and host lithology. Bauxite is the principal ore of alumina ( $\text{Al}_2\text{O}_3$ ). That is used to produced aluminum (Al). The main compound that made up bauxite is titanium oxide, silica, hydrated aluminosilicates, hydrated iron oxides,

hydrated aluminum oxides, iron oxides. Bauxite also contains a few minerals such as goethite, boehmite, hematite and ilmenite.

The bauxite residual deposits are generally developed under humid tropical to subtropical climate conditions with an average temperature higher than 22°C and annual rainfall exceeding 1.2m (Ahmadnejad et al., 2017). The current estimated global bauxite resource is more than 70 billion tonnes. More of that are concentrations of bauxite in South and Central America especially at Guinea and also at Australia, Vietnam, India and China. The approximately 25 billion tonnes are well-proven resources bauxite form Guinea. Although the aluminium demand are rapidly in increasing, the bauxite ore are sufficient to meet the worldwide demand for aluminium for many country during several centuries.

Bauxite mostly happens close to the soil surface that is only 1 to 2 meter of overburden. The typical deposits range is in thickness from 3 to 15 meter. Some place, the ore bauxite is found at the surface the gradually gets deeper and needed underground mining to economically extract the mineral. Example like in China, totally there is much area that has bauxite at depths from 200 to 300 meter. Figure 1.1 show bauxite areas of the world.

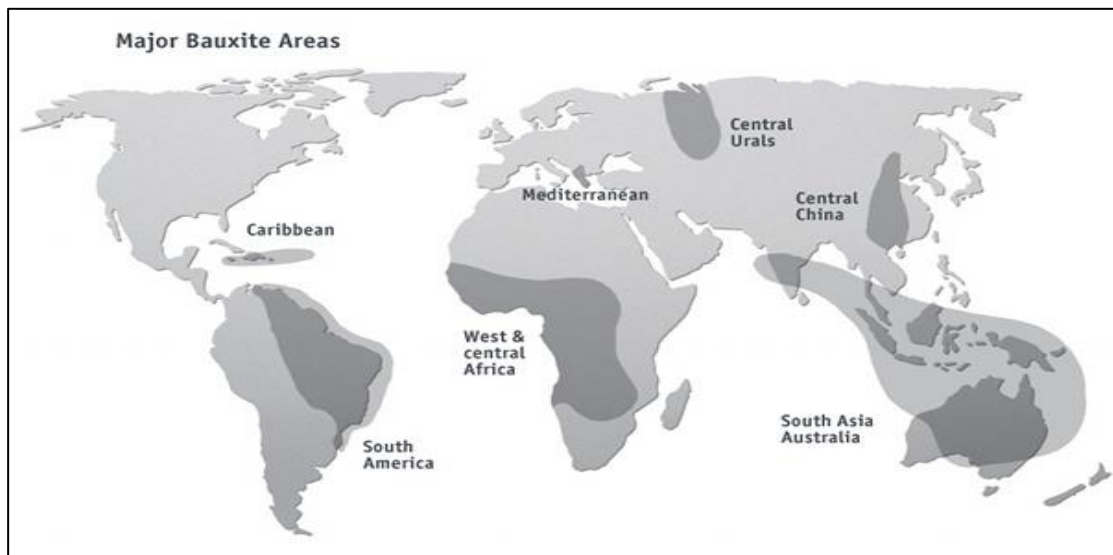


Figure 1.1: World Bauxite Provinces

Source: Burgess (2010)

Bauxite mines are springing up in Malaysia and shipping ever-increasing amounts of the raw material used for aluminium to China, helping fill a gap since Indonesia banned ore exports in January in a bid to encourage value added processing at home. China will need around 130 million tonnes of bauxite next year to feed its fast-growing aluminium industry and must import about 36.8 million of that, according to consultancy CRU (Raghu et al., 2014).

Bauxite mines have sprung up in Malaysia since late last year, notably in Pahang's state capital of Kuantan, a district along the east coast facing the South China Sea. The mines have been shipping increasing amounts of bauxite for aluminium production to China, filling in a gap as Indonesia banned ore exports in January last year to encourage value added processing at home. Malaysia supplied 1.27 million tonnes of bauxite to China in the first nine months of last year, 12 times more than the 105,000 tonnes shipped in the same period for 2013 (Reuter, 2015). Kuantan a district in eastern Peninsular Malaysia facing the South China Sea is a hot spot for new bauxite mines. It was producing about 4,000 tonnes a day and planned to raise output to 10,000 tonnes in the first quarter of next year once monsoon rains subsided. A hundred percent of bauxite shipped off to China (Raghu et al., 2014). Figure 1.2 are indicate about some bauxite mining are at some place in Kuantan, Pahang.



Figure 1.2: Bauxite mining area in some place in Kuantan

Source: <http://www.sinarharian.com.my/nasional/>