CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Urbanization is a common phenomenon for developing countries like Malaysia. In 2011, urban population of Malaysia is stated as 72.8% of its total population (Central Intelligence Agency, 2014). This population rate leads to the flourish of construction sector. Malaysia Key Economic Indicator showed that the construction sector had preliminary record of 3.5% in growth (Economic Development, 2011). The development of construction has increased the demand of aggregate as it’s a raw material for concrete.

Concrete is a common type of construction material which produce by mixing of water, aggregate and cement in different ratio. The growth of demand in concrete is predicted approximately 18 billion tons by 2050 (Khoshkenari et al., 2014). Since the general formula of concrete is 1:2:4 which represent cement, fine aggregate and coarse aggregate, concrete consists around 85% of aggregate. At this huge usage of aggregate, the increase of mining activity is inevitable. The current mining activities create unsuitability in environment and imbalance in ecologic. Diminution of mining activities is necessary to save the natural resources. Global concerns in the environment awareness also affect the construction concept in strategic planning to reduce environment impact (Henry & Kato, 2014).
In addition, the waste generated is gradually increased due to urbanization. There are few methods of disposal, such as incineration, landfilling and recycling (Albano et al., 2009). Nevertheless, the solid waste in Malaysia is managed or disposed through landfill and partly to recycle. There are 165 landfill areas operating and 35568 tons of waste is produced per day in Malaysia with the growth rate of 3.59 % per year (JPSPN, 2014). In this rate of waste generation, the insufficient of landfill can become a significant problem in coming years. Therefore, recycle of solid waste is a compulsory act to prevent the continuous on destroying environment and preserve the natural resources for the use of future generation (Environmental Protection Agency, 2014). Waste accumulation can be solved by alternative solution such as replacement of aggregate by solid waste.

In Malaysia, plastic waste is at the second highest rank which is 24 % out of total solid waste (The Star, 2012). Even in others countries, the waste of plastic is always within the rank of top five. Plastic waste includes containers, durable waste such as furniture, and non-durable waste such as diapers and medical devices (Solid Waste District, n.d.). Polyethylene Terephthalate (PET) is a type of polymer that mostly used to produce food and beverage containers. It comes with the SPI Resin Identification Code of 1. Recycling of PET is very common in worldwide. PET postconsumer resin is normally used for production of fiber, film and sheet (United States National Postconsumer Plastics Bottle Recycling Report, 2012).

The value of PET mostly falls back to the plastic production sector. The possibility of PET in replacing aggregate can develop a new market for PET postconsumer and also provide an alternative option for construction industry in material selecting. The suitability of the replacement of PET as coarse aggregate in concrete mixing is needed to be identified.
1.2 PROBLEM STATEMENT

The flourish of construction sector leads to the increase in demands of construction material such as cement and aggregate. The replacement of construction material by waste such as Polyethylene Terephthalate is a solution for the high demand of aggregate.

In concrete mixing, concrete is constituted by 60% to 80% of aggregate in volume and 70% to 85% of concrete in weight. However, aggregate is a non-renewable source. The continuous of quarrying activities is bringing the negative impact to the environment and shortage of aggregate. The replacement of aggregate is needed to reduce the impact of quarrying.

Polyethylene Terephthalate (PET) is a kind of plastic waste that is increasing directly proportional to human waste. Plastic is occupying 9.27% in average global waste composition (Waste Atlas report, 2013). This problem is causing the insufficiency of landfill area in the coming years.