CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Construction industry is one of the major industries in Malaysia and had contributed much to the economic growth of the country (Olanrewaju & Abdul-Aziz, 2015). However, this industry produces a lot of wastes and causes negative impact to the environment. According to Yap & Foong (2013), it stated that about 15 - 30% of the daily production goes to waste in ceramic industry and the ceramic waste has high resistance toward chemical, physical and biological degradation forces. Hence, the ceramic waste generally managed by dumping in the landfill site or by incineration. One of the ways to address these problems is to recycle those waste materials and reuse them for other construction purposes. Meanwhile, depletion of the natural aggregates arises due to rapid urbanization in the developing country.

In order to preserve waste management problem and depletion of natural resources, the alternative way to overcome the issue is by utilizing potential ceramic waste material such as Porcelain Granite Tile Waste (PGTW) as coarse aggregate. Therefore, research on the performance of concrete with PGTW must be determined with the purpose of identify whether the ceramic waste is suitable to be used as a substitution for the coarse aggregate material in concrete.
1.2 BACKGROUND OF STUDY

Replacing coarse aggregate with other materials over of conventional one is one of the ways to reuse and recycle the waste materials. Moreover, concrete with recycled waste materials is able to perform as well as the conventional one. Some of the recycled waste materials used in concrete are cockle shell, oil palm kernel shell, recycled concrete aggregate and ceramic. These materials are common agricultural and construction wastes. Besides that, construction wastes are non-biodegradable. Hence, the common ways to dispose them are to bury these materials in landfills, where in the long term pose threats to the natural environment.

Based on the research done by Kalpavalli (2015), the result exhibited that the compressive strength of the recycled aggregate concrete is closed to conventional concrete. Alengaram (2013) stated that the splitting tensile strength of oil palm kernel shell concrete is similar to conventional concrete. Besides that, Sekar et al. (2011) mentioned that ceramic aggregate concrete can exhibited similar strength in compression, flexure and split tensile as conventional concrete.

From past studies (Alengaram et al., 2013; Kalpavalli, 2015; Muthusamy et al., 2012; Sekar et al., 2011), concrete made of recycled waste materials generally have shown satisfying results, including increased compressive strength, increased flexural strength at certain percentage of replacement on coarse aggregates. These properties are deemed beneficial to the overall performance of concrete. Hence, it is favourable to use recycled waste materials as a substitution for the coarse aggregate in concrete while still being able to perform as satisfactory as the conventional ones.

However, the structural performance of concrete with ceramic aggregate remains unknown. Ceramic waste arguably does make an ideal substitution material to be used as aggregate in reinforced structural member. Nevertheless, not much research has been conducted on replacing coarse aggregate of concrete with ceramic waste in term of structural performance.
1.3 PROBLEM STATEMENT

The high demand of concrete production will lead to high extraction of aggregates from natural resources (Serres et al., 2015). Coarse aggregate is a non-renewable resource in the production of concrete. Sustainable issue arises as this non-renewable natural resource will be depleted eventually due to the huge demand in the construction sector. In addition, the cost of materials for producing concrete had been rising yearly. This is mainly caused by increasing demand of the materials while at the same time increased difficulties to obtain the materials. This has been worsened by the activity of illegal harvesting of these materials.

Construction activity had produced a lot of construction and demolition waste especially ceramic materials and it usually disposed in the landfill (Juan et al., 2011). According to Pacheco-Torgal & Jalali (2010), reutilization of ceramic waste in construction industry is a potential to develop a sustainable concrete. It contributes an alternative method to waste disposal by recycle the waste material instead of incineration or landfilling. In addition, it also directly helps in decreasing the use of natural aggregate in production of concrete.

But little is known about the mechanical performance of ceramic waste concrete with regard to its suitability as a substitute of coarse aggregate, and how well would ceramic waste concrete performs with compare to conventional concrete in terms of structural performance. Thus, research on the performance of concrete with ceramic waste must first be conducted in order to identify the suitability of ceramic waste as coarse aggregate in concrete.

1.4 RESEARCH OBJECTIVES

i. To determine the compressive strength of PGTW concrete
ii. To study the flexural behaviour of reinforced concrete beam with PGTW
iii. To compare performance of conventional concrete with various percentages of replaced aggregate in concrete.