

Review of the Properties of Lightweight Aggregate Concrete Produced from Recycled Plastic Waste and Periwinkle Shells

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Abstract. As the world population continues to increase, so does the demand for raw materials to produce basic needs of human race. One of the areas where this pressing demand for means of production is evident is in the production of concrete materials for building construction and infrastructure. The source of constitutive materials for concrete production, such as cement and aggregates are fast shrinking across the nations of the earth and there is an urgent need for substitutes that will guarantee the availability of this essential material to the built environment sector of the economy. One of the trending approach is the adoption of waste materials as replacement for some of the constitutive materials of concrete. This research reviews past works on the use of recycled plastic waste and periwinkle shells for the production of lightweight aggregate concrete. The results of this review showed that the adoption of reduced percentage of waste plastic in concrete leads to acceptable strengths for lightweight concrete, economy, efficient energy and good crack resistance. The use of periwinkle shell is beneficial for satisfactory strengths for normal aggregate concrete and for lightweight aggregate concrete, good resistance to heat and economy. This approach is sustainable as a means of recycling and will facilitate the actualization of the sustainable development goal “Responsible Production and Consumption”, (SDGs 12). There is a prospective that combining these two waste materials will lead to improvement towards achieving sustainable concrete.

Introduction

Generally, the world generates millions of tons of solid waste annually of which a significant percentage consist of non-biodegradable materials. The idea of the use of waste plastic has evolved due to the rate of its improper disposal and its availability as it is one of the most used materials for packaging consumable goods which are often disposed carelessly after use. The rate at which waste plastic is recycled is less than the rate at which they are produced. Annually, Nigeria alone generates over 32 million tons of solid waste out of which only about 20% to 30% is collected [1]. Plastic is a non-biodegradable material; hence it requires a lot of time to decompose. Recycling of these waste plastic for use as replacement of aggregates in concrete seems to be an innovative idea as it is a method of disposing the material properly and at the same time utilizing it. The recycling of waste plastic in concrete production reduces the cost of the constituent material substituted, such as cement, sand or aggregate. Periwinkle shell is also another waste material considered as it is usually found close to river shores and other places where they are discarded after the extraction of the edible part. Periwinkle shells become wastes after the edible portion have been removed and the shells are usually dumped in the soil. Periwinkle is a non-degradable waste material which constitutes a nuisance to the environment if it is not appropriately handled.