

# REUSE OF GLASS AND CLAY BRICK WASTES AS SUBSTITUTE FOR NATURAL AGGREGATE IN GREEN CONCRETE

OLUWAROTIMI OLOFINNADE<sup>1</sup>, ANTHONY EDE<sup>1</sup>, JULIUS NDAMBUKI<sup>2</sup>, and AYANFE OPEYEMI<sup>1</sup>

<sup>1</sup>*Dept of Civil Engineering, Covenant University, Ota, Nigeria*

<sup>2</sup>*Dept of Civil Engineering, Tshwane University of Technology, Pretoria, South Africa*

Utilization of recycled waste materials in making concrete is identified as a sustainable means of managing wastes, thereby reducing the energy consumption, preserving the environment and conserving of natural resources from depletion. Researchers referred to this type of concrete as “green” concrete. This study examines the possible reusing of crushed waste glass as partial and complete substitute for natural aggregates in production of moderate strength green concrete with the addition of ground clay brick as admixture. The clay bricks were obtained as generated wastes from the ceramic and brick producing factory, while the glass wastes were sourced from dump sites and waste collection points within Ota, Nigeria. The waste glass varied from 25% – 100% in steps of 25%, and the ground clay brick was added in 10%, 15% and 20% by mass of Portland cement into the concrete mixes. Tests, which include workability and characteristics strength were carried out on the concrete specimens. Microstructural examination was performed on selected concrete specimens. Results indicate reduction in workability with increased waste glass and clay brick powder content. Moreover, the characteristic compressive strength of the concrete specimens increased with curing age, however, concrete mixes containing 10% clay brick powder and 25% waste glass aggregate showed significant improvement in strength at curing age of 28 days than the control concrete.

*Keywords:* Compressive strength, Sustainability, Recycling, Eco-concrete, Microstructure, Waste management.

## 1 INTRODUCTION

The concept of sustainability in the construction industry can be attributed to sustainable development. The report of World commission in Environment and Development on sustainable development mentioned that the idea of sustainable development implies the present generation meeting their needs without compromising the needs of the future generation (WCED 1987). Furthermore, sustainability in the construction industry is now being considered a major concern due to the identifiable environmental impact associated with the amount of natural resource depleted for production of building materials such as cement and concrete for buildings and engineering structures (Bilodeau and Malhotra 2000). The industry is reported to be contributing more CO<sub>2</sub> emission into the atmosphere compare to other industries (Kline and Barcelo 2012). Calkins (2009) mentioned that the construction industry depends more on nonrenewable materials as resources for construction, which in turn aid the destruction of the environment. Of recent,