

## Properties of Triadic Concrete Containing Rice Husk Ash and Wood Waste Ash as Partial Cement Replacement

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**Abstract :** Concrete is one of the most popular materials used in construction industry. However, one of the setbacks is that concrete can degrade with time upon exposure to an aggressive environment that leads to decrease in strength. Thus, research works and innovative ways are needed to enhance the strength and durability of concrete. This work tries to look into the potential use of rice husk ash (RHA) and wood waste ash (WWA) as cement replacement material. These are waste materials that may not only enhance the properties of concrete but also can serve as a viable method of disposal of waste for sustainability. In addition, a substantial replacement of Ordinary Portland Cement (OPC) with these pozzolans will mean reduction in CO<sub>2</sub> emissions and high energy requirement associated with the production of OPC. This study is aimed at assessing the properties of triadic concrete produced using RHA and WWA as a partial replacement of cement. The effects of partial replacement of OPC with 10% RHA and 5% WWA on compressive and tensile strength of concrete among other properties were investigated. Concrete was produced with nominal mix of 1:2:4 and 0.55 water-cement ratio, prepared, cured and subjected to compressive and tensile strength test at 3, 7, 14, 28 and 90 days. The experimental data demonstrate that concrete containing RHA and WWA produced lighter weight in comparison with OPC sample. Results also show that combination of RHA and WWA help to prolong the initial and final setting time by about 10-30% compared to the control sample. Furthermore, compressive strength was increased by 15-30% with 10% RHA and 5% WWA replacement, respectively above the control, RHA and WWA samples. Tensile strength test at the ages of 3, 7, 14, 28 and 90 days reveals that a replacement of 15% RHA and 5% WWA produced samples with the highest tensile capacity compared to the control samples. Thus, it can be concluded that RHA and WWA can be used as partial cement replacement materials in concrete.

**Keywords :** concrete, rice husk ash, wood waste ash, ordinary Portland cement, compressive strength, tensile strength

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