

Strength Properties of Cement Mortar with Dark Glass Waste Powder as a Partial Sand Replacement

Authors : Ng Wei Yan, Lim Jee Hock, Lee Foo Wei, Mo Kim Hung, Yip Chun Chieh

Abstract : The burgeoning accumulation of glass waste in Malaysia, particularly from the food and beverage industry, has become a prominent environmental concern, with disposal sites reaching saturation. This study introduces a distinct approach to addressing the twin challenges of landfill scarcity and natural resource conservation by repurposing discarded glass bottle waste into a viable construction material. The research presents a comprehensive evaluation of the strength characteristics of cement mortar when dark glass waste powder is used as a partial sand replacement. The experimental investigation probes the density, flow spread diameter, and key strength parameters—including compressive, splitting tensile, and flexural strengths—of the modified cement mortar. Remarkably, results indicate that a full replacement of sand with glass waste powder significantly improves the material's strength attributes. A specific mixture with a cement/sand/water ratio of 1:5:1.24 was found to be optimal, yielding an impressive compressive strength of 7 MPa at the 28-day mark, accompanied by a favourable 200 mm spread diameter in flow table tests. The findings of this study underscore the dual benefits of utilizing glass waste powder in cement mortar: mitigating Malaysia's glass waste dilemma and enhancing the performance of construction materials such as bricks and concrete products. Consequently, the research validates the premise that increasing the incorporation of glass waste as a sand substitute promotes not only environmental sustainability but also material innovation in the construction industry.

Keywords : glass waste, strength properties, cement mortar, environmental friendly

Conference Title : ICCEE 2024 : International Conference on Civil Engineering and Environment

Conference Location : Tokyo, Japan

Conference Dates : July 22-23, 2024