Utilization of rice husk ash and waste glass in the production of ternary blended cement mortar composites

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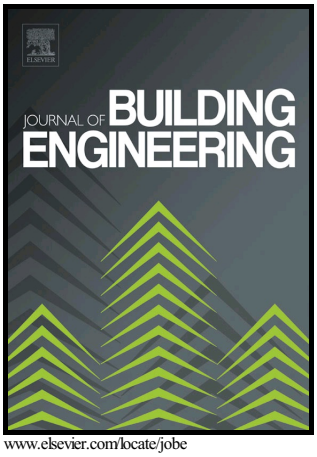

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Abstract:

The purpose of this study is the recycling or reuse of waste materials in the production of ternary blended cement mortars (TBCMs) by a partial substitution of ordinary Portland cement (OPC) with a ratio of 20% waste glass powder (WG) to obtain a blended cement (80% OPC: 20% WG). Three different ratios of rice husk ash namely 2.5%, 5%, and 10% are added to obtain three TBCMs as well as conventional cement mortar CM (zero % of rice husk ash). The specimens of all mortars are cured under tap water for different periods of time namely 3, 7, 28, 60, and 90 days. The influence of amorphous silica present in both waste glass and rice husk ash on the performance of TBCMs is studied. The results emphasized that both the waste glass and rice husk ash has a positive effect in the improvement of the compressive strength values of all mortar specimens with increasing hydration time. While the physical parameters such as total porosity and water absorption percentages decreased. The results also indicated that for any given hydration time, the compressive strength values of TBCMs are higher than those of CM. The noticeable improvement in the compressive strength is for TBCM2 specimens (5% rice husk ash). On the other hand, the influence of gamma-irradiation doses on physico-mechanical properties of unsaturated polyester (UP)/impregnated blended cement mortar composite specimens (TBCMs) is studied. The obtained data showed an enhancement in the mechanical properties of the irradiated specimens as compared to unirradiated ones. Furthermore, the thermal stability of TBCMs is studied by using thermo gravimetric analysis (TGA). The results are also confirmed by XRD analysis.

Keywords;

waste glass, rice husk ash, blended cement mortar, polymer composite, gamma rays.

1. Introduction

In the present time, with increasing awareness of the importance of sustainable development in the world, many attempts are made to achieve it. Sustainable development has an effective role in rationalizing energy consumption, environmental protection and natural conservation. The sustainability of concrete as a construction material has gained many attentions due to the high cost of building materials and energy used in the cement industry. Besides, Portland cement production causes a release of significant amounts of CO_2 and greenhouse gas (GHG) [1]. The production of one tone of Portland cement produces approximately about one tone of CO_2 and other GHGs. So, in order to save resource and energy