

Effect of Rice Husk Ash and Metakaolin on the Compressive Strengths of Ternary Cement Mortars

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Abstract : This paper studies the effect of Metakaolin (MK) and Rice husk ash (RHA) on the compressive strength of ternary cement mortar at replacement level up to 30%. The compressive strength test of the blended cement mortars were conducted using Tonic Technic compression and machine. Nineteen ternary cement mortars were prepared comprising of ordinary Portland cement (OPC), Rice husk ash (RHA) and Metakaolin (MK) at different proportion. Ternary mortar prisms in which Portland cement was replaced by up to 30% were tested at various age; 2, 7, 28 and 60 days. Result showed that the compressive strength of the cement mortars increased as the curing days were lengthened for both OPC and the blended cement samples. The ternary cement's compressive strengths showed significant improvement compared with the control especially beyond 28 days. This can be attributed to the slow pozzolanic reaction resulting from the formation of additional CSH from the interaction of the residual CH content and the silica available in the Metakaolin and Rice husk ash, thus providing significant strength gain at later age. Results indicated that the addition of metakaolin with rice husk ash kept constant was found to lead to an increment in the compressive strength. This can either be attributed to the high silica/alumina contribution to the matrix or the C/S ratio in the cement matrix. Whereas, increment in the rice husk ash content while metakaolin was held constant led to an increment in the compressive strength, which could be attributed to the reactivity of the rice husk ash followed by decrement owing to the presence of unburnt carbon in the RHA matrix. The best compressive strength results were obtained at 10% cement replacement (5% RHA, 5% MK); 15% cement replacement (10% MK and 5% RHA); 20% cement replacement (15% MK and 5% RHA); 25% cement replacement (20% MK and 5% RHA); 30% cement replacement (10%/20% MK and 20%/10% RHA). With the optimal combination of either 15% and 20% MK with 5% RHA giving the best compressive strength of 40.5MPa.

Keywords : metakaolin, rice husk ash, compressive strength, ternary mortar, curing days

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