

Effect of Alkaline Activator, Water, Superplasticiser and Slag Contents on the Compressive Strength and Workability of Slag-Fly Ash Based Geopolymer Mortar Cured under Ambient Temperature

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Abstract : Geopolymer (cement-free) concrete is the most promising green alternative to ordinary Portland cement concrete and other cementitious materials. While a range of different geopolymer concretes have been produced, a common feature of these concretes is heat curing treatment which is essential in order to provide sufficient mechanical properties in the early age. However, there are several practical issues with the application of heat curing in large-scale structures. The purpose of this study is to develop cement-free concrete without heat curing treatment. Experimental investigations were carried out in two phases. In the first phase (Phase A), the optimum content of water, polycarboxylate based superplasticizer contents and potassium silicate activator in the mix was determined. In the second stage (Phase B), the effect of ground granulated blast furnace slag (GGBFS) incorporation on the compressive strength of fly ash (FA) and Slag based geopolymer mixtures was evaluated. Setting time and workability were also conducted alongside with compressive tests. The results showed that as the slag content was increased the setting time was reduced while the compressive strength was improved. The obtained compressive strength was in the range of 40-50 MPa for 50% slag replacement mixtures. Furthermore, the results indicated that increment of water and superplasticizer content resulted to retarding of the setting time and slight reduction of the compressive strength. The compressive strength of the examined mixes was considerably increased as potassium silicate content was increased.

Keywords : fly ash, geopolymer, potassium silicate, slag

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