

Role of Sodium Concentration, Waiting Time and Constituents' Temperature on the Rheological Behavior of Alkali Activated Slag Concrete

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Abstract : In this paper, rheological behavior of alkali activated slag concretes were investigated depending on the sodium concentration (SC), waiting time (WT) after production, and constituents' temperature (CT) parameters. For this purpose, an experimental program was conducted with four different SCs of 1.85, 3.0, 4.15, and 5.30%, three different WT of 0 (just after production), 15, and 30 minutes and three different CT of 18, 30, and 40 °C. Solid precursors are activated by water glass and sodium hydroxide solutions with silicate modulus ($M_s = \text{SiO}_2/\text{Na}_2\text{O}$) of 1. Slag content and (water + activator solution)/slag ratio were kept constant in all mixtures. Yield stress and plastic viscosity values were defined for each mixture by using the ICAR rheometer. Test results were demonstrated that all of the three studied parameters have tremendous effect on the yield stress and plastic viscosity values of the alkali activated slag concretes. Increasing the SC, WT, and CT drastically augmented the rheological parameters. At the 15 and 30 minutes WT after production, most of the alkali activated slag concretes were set instantaneously, and rheological measurements were not performed.

Keywords : alkali activation, slag, rheology, yield stress, plastic viscosity

Conference Title : ICCET 2016 : International Conference on Concrete Engineering and Technology

Conference Location : Paris, France

Conference Dates : November 21-22, 2016