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Optimum Design of Alkali Activated Slag Concretes for Low Chloride Ion Permeability and Water Absorption Capacity

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Abstract : In this research, effect of curing time (TC), curing temperature (CT), sodium concentration (SC) and silicate modules (SM) on the compressive strength, chloride ion permeability, and water absorption capacity of alkali activated slag (AAS) concretes were investigated. For maximization of compressive strength while for minimization of chloride ion permeability and water absorption capacity of AAS concretes, best possible combination of CT, CTime, SC and SM were determined. An experimental program was conducted by using the central composite design method. Alkali solution-slag ratio was kept constant at 0.53 in all mixture. The effects of the independent parameters were characterized and analyzed by using statistically significant quadratic regression models on the measured properties (dependent parameters). The proposed regression models are valid for AAS concretes with the SC from 0.1% to 7.5%, SM from 0.4 to 3.2, CT from 20 °C to 94 °C and TC from 1.2 hours to 25 hours. The results of test and analysis indicate that the most effective parameter for the compressive strength, chloride ion permeability and water absorption capacity is the sodium concentration.

Keywords : alkali activation, slag, rapid chloride permeability, water absorption capacity
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