

Influence of red mud addition on rheological behavior and hardened properties of mortars

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Abstract

This experimental research evaluates the individual and combined influence of red mud particles (RM) and water/binder weight ratio (W/B) on the fresh–hardened properties and durability of cured mortars up to 360 days. Samples containing up to 40 wt% RM and 0.47–0.58 W/B were prepared keeping the workability constant. Samples with similar workability showed distinct rheological behavior along time.

The yield stress was the best rheological parameter to represent such variations. The maximum values of exothermic peak reduced when the Portland cement was replaced by RM. Deeper negative changes in the apparent porosity, water absorption, compressive strength and carbonation extent were also observed changing the W/B ratio from 0.47 to 0.58 in the 20RM-containing mortars. In fact, the compressive strength of mortar 20RM + 0.47W/B reduced 13% in comparison to RM-free mortar at 360 days, while 20RM + 0.58W/B reduced 46%. Although the extra voids created in the matrix by using 0.58W/B implied in a positive effect to the alkali–silica reaction, adjusting a dosage of water similar to the one of RM-free mortar makes RM an attractive alternative without compromise the materials' properties studied in this work.

Keywords: Red mud, Mortars, Rheology, Slump flow, Durability