Physical and chemical assessment of lime-metakaolin mortars: Influence of binder:aggregate ratio

A. Gameiro [a], A. Santos Silva [a,⇑], P. Faria [b], J. Grilo [a], T. Branco [b], R. Veiga [a], A. Velosa [c]

[a] National Laboratory for Civil Engineering, Av. do Brasil, 101, Lisbon, Portugal
[b] Department of Civil Engineering, NOVA University of Lisbon, 2829-516 Caparica, Portugal
[c] Department of Civil Engineering, Geobiotec, University of Aveiro, Aveiro, Portugal

Abstract

This work evaluates the influence of binder:aggregate ratio on the mineralogical and mechanical properties of air lime–metakaolin mortars.

Mineralogical analysis showed that binder:aggregate ratio affects the extent of carbonation and pozzolanic reactions with curing. The pozzolanic reaction occurs mostly at lower curing times (28 days), while, at higher curing ages, carbonation reaction is mostly dominant. The exceptions are mortars with 1:1 (air:lime) volumetric ratio with 30% and 50% MK in which the pozzolanic reaction is still dominant.

The reduction in the mechanical resistance of some compositions observed from 28 to 90 days is related to the calcium aluminate hydrate instability in the presence of free lime. This instability is expected to disappear after the total consumption of free lime, either by pozzolanic or carbonation reaction.