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**Hydration of ternary blended cements comprising co-calcined
bauxite residue and kaolinitic clay**

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ABSTRACT

The Bayer-process for alumina extraction results in an alkaline iron oxide-rich residue, so-called bauxite residue (BR). Presently 160 Mt/y of BR is generated and several Gt is stored in landfills. If suitably processed, bauxite residue would be an interesting candidate supplementary cementitious material (SCM) and reduce risks and costs related to current landfilling or storage practices. In nature, bauxite ore is often found associated with or in the proximity of kaolinitic clays. Earlier findings showed that co-calcination of bauxite residue and kaolinitic clay results in a pozzolanically reactive material with promising potential as a novel SCM for high-level clinker replacement (30-50 wt.%). In the present study, the hydration and performance of ternary blended cements comprising co-calcined BR are studied in order to optimize the cement formulation. Co-calcined BR was blended with Portland cement, limestone filler and calcium sulfate. The hydration kinetics and evolution of hydrate assemblages of the blended cement pastes is characterized by means of isothermal calorimetry, X-ray diffraction, and thermogravimetric analysis in complement to compressive strength testing on mortar bars, to better understand the reactivity and performance contribution of the co-calcined BR in ternary blends. Finally, the feasibility and potential impact of ternary blended cements comprising co-calcined BR is discussed.

KEYWORDS: *red mud, co-calcination, ternary blended cement, reactivity, industrial symbiosis.*