

Hydration study of Belite-Alite Calcium Sulfoaluminate (BACSA)

cement blended with fly ash

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Abstract

An environmental strategy for reducing the negative effect, including lower CO₂ footprint, of the Ordinary Portland Cement (OPC) industry consists on its partial substitution by reactive industrial by-products, such as fly ash.

Another alternative to reduce the CO₂ footprint consists on the development of eco-cements composed by less calcite demanding phases, such as belite and ye'elimite. That is the case of Belite Calcium Sulfoaluminate (BCSA) cements. Since the reactivity of belite is not quick enough, these materials develop low mechanical strengths at intermediate hydration ages. A possible solution to this problem goes through the production of cements which jointly contain belite, alite and ye'elimite, known as Belite-Alite Calcium Sulfoaluminate (BACSA). The reaction of alite and ye'elimite with water will develop cements with high mechanical strengths at early ages, while belite will contribute to later values.

The main objective of this work is to understand the effect of the addition of fly ash (0, 15 and 30 wt%) in the hydration of a BACSA cement paste (water/cement=0.4) prepared with 12 wt% of anhydrite. The pastes were characterized, at different hydration ages, through laboratory X-ray powder diffraction (LXRPD) (using an internal standard) combined with the Rietveld methodology and thermal analyses. Details about the phase developments including pozzolanic reactivity will be reported and discussed.

Keywords: BACSA cement, hydration phases, Laboratory X-ray powder diffraction (LXRPD), Rietveld Quantitative Phase Analysis.