

2nd International Workshop on calcium sulfoaluminate cements - 2023

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BELITE CALCIUM SULFOALUMINATE CEMENT EARLY HYDRATION: CITRIC ACID SENSITIVITY

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Three buckets, corresponding to three selected samples, of the same type of belite calcium sulfoaluminate (BCSA) cements have been studied. These cements show very similar elemental and mineralogical compositions, and textural properties. Mortars, for mechanical strength characterisation at 3 and 24 hours, were prepared by two different methodologies: i) with w/c of 0.40 without citric acid and ii) with w/c=0.40 and adding 0.375 wt% by weight of cement (bwc) of citric acid used as a retarder.

On the one hand, the mechanical strengths, at 24 hours, obtained by the three mortars prepared by both methodologies are almost coincident, 61(5) MPa without citric acid and 61(4) MPa for the mortars prepared with citric acid. On the other hand, the early mechanical strengths at 3 hours for the mortars prepared without citric acid are also almost coincident among the three cements, i.e. ~49(3) MPa. However, when the citric acid is added, the mechanical strengths at 3 hours are quite different among the three buckets, i.e. 34(1), 42(1) and 48(1) MPa, respectively. The main aim of this study is to understand the reasons causing the different early mechanical strengths.

First of all, a full characterization of the three cements has been performed: textural properties, elemental composition by X-Ray Fluorescence (XRF) and mineralogical composition, including the amorphous content, by Laboratory X-Ray Powder Diffraction (LXRPD) combined with the Rietveld method. Moreover, the soluble sulphate contents within the first minutes of hydration are being determined.

An isothermal calorimetry study at 20°C for pastes without and with different amounts of citric acid will be presented as well as *in situ* X-Ray powder diffraction data analysis. The results will be discussed to give a picture of the early hydration behaviour of these BCSA cements.