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Synthesis of active Belite-Alite-Ye'elimite clinker (BAY)

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Ordinary Portland cement (OPC) is an environmentally contentious material, as for every ton of OPC produced, on average, 0.97 tons of CO₂ are released. Ye'elimite-rich cements are considered as eco-cements because their manufacturing process releases less CO₂ into the atmosphere than OPC; this is due to the low calcite demand. Belite-Alite-Ye'elimite (BAY) cements are promising eco-friendly building materials as OPC substitutes at a large scale. The reaction of alite and ye'elimite with water should develop cements with high mechanical strengths at early ages, while belite will contribute to later curing times. However, they develop lower mechanical strengths at early-medium ages than OPC. It is known that the presence of different polymorphs of ye'elimite and belite affects the hydration due to the different reactivity of those phases. Thus, a solution to this problem may be well the activation of BAY clinkers by preparing them with α'_H -belite and pseudo-cubic-ye'elimite, jointly with alite.

The aim of this work is the preparation and characterization of active-BAY clinkers which contain high percentages of coexisting α'_H -belite and pseudo-cubic-ye'elimite, jointly with alite to develop, in a future step, comparable mechanical strengths to OPC. The parameters evolved in the preparation of the clinker have been optimized, including the selection of raw materials (mineralizers and activators) and clinkering conditions. Finally, the clinker was characterized through laboratory X-ray powder diffraction, in combination with the Rietveld methodology, and scanning electron microscopy.

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