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## Clinkering and hydration study of non-active and active Belite-Alite-Ye'elimite (BAY) cements.

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### Abstract:

Ordinary Portland Cement (OPC) has become the most widely used binder material in construction. However, the high quantity of CO<sub>2</sub> released during its manufacture is its main environmental problem. Design new formulations of cements formed by low calcite-demanding phases, such as belite and ye'elimite, is a challenge for researchers. Ye'elimite (or Klein salt) rich cements are considered to be environmentally friendly materials since in their manufacturing process they emit up to 15-35% less CO<sub>2</sub> to the atmosphere than (OPC). Promising eco-friendly binders are those that contain belite, ye'elimite and ferrite, known as BYF cements; however, belite phase (its main phase) has a slow hydrating behaviour therefore its mechanical strengths are lower than those of OPC at early ages. To solve this problem, BYF can be activated by obtaining clinkers with belite, alite (tricalcium silicate) and ye'elimite, known as BAY clinkers. The alite and ye'elimite reaction with water should develop high mechanical strengths at early ages, besides, belite contributes to later curing times. A second activation is based on the stabilization of alpha forms of belite by dopants.

The objective of this work is to optimize the clinkering of two types of BAY (standard and active BAY) using CaF<sub>2</sub> as mineraliser and borax as dopant agent to stabilize alpha forms of belite phase Anhydrite was added as source of sulphates to obtain corresponding cements. The hydration behaviour of these cements has been studied through rheological and x-ray diffraction measurements, the latter combined with Rietveld quantitative phase analysis. In addition, mechanical and dimensional properties of BAY mortars will also be presented and discussed.

**Keywords:** clinkering, hydration properties, BAY cements, mineralogical behaviour, Rietveld quantitative phase analysis.