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Usage of Belterra Clay as raw material in the production of carbon dioxide reduced cement types

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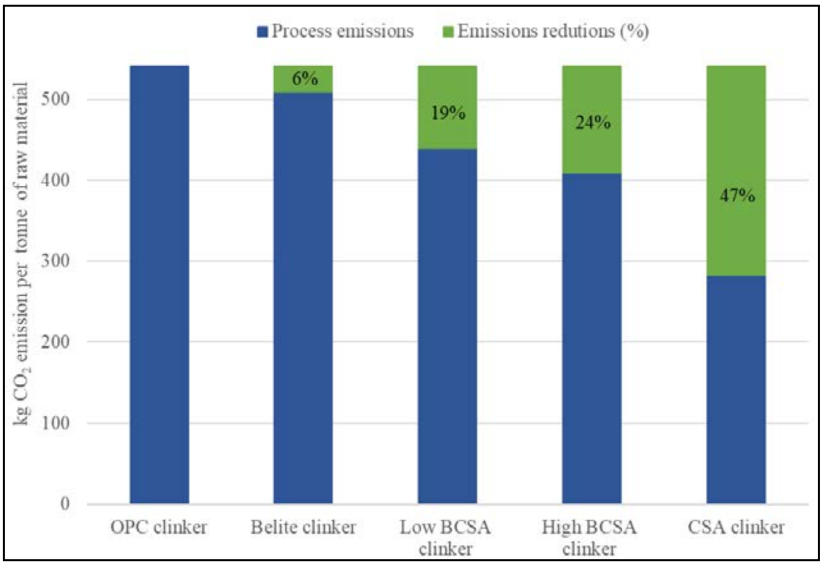
One of the main challenges in the cement industry has been the reduction of CO_2 emissions, as this sector is responsible for roughly 8% of the global CO_2 output [1]. The main CO_2-mitigation strategies by the cement sector include the optimization of industrial processes, use of alternative (and less carbon intensive) fuels, addition of calcined clays in the clinker and the progressive use of alternative binders to the world-used Ordinary Portland Cement (OPC) [2]. The research on alternative binders has special attention, as only the clinkerization process (limestone calcination) is responsible for up to 70% of the CO2 generation in the OPCs production.



Calcium Sulphoaluminate-based cements (CSA) are current an interesting alternative binder to OPC, as they can be produced with lower $CaCO_3$ amounts, reduced temperatures (~300 °C lower than OPC's) and are, therefore, easier to grind [3,4]. The expensiveness bauxite, Al-source of these cements, has though limited CSA production.

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Belterra Clay (BTC, left image) is a widespread yellowish clay covering most of the bauxite deposits of the Brazilian Amazon [5–7]. BTC's large uniform distribution, high Al contents, mineral assemblage and silty-clay fineness rises it as an appealing raw material for the upcoming cement industry. In this work, we use statistical design of experiments to blend BTC, limestone and gypsum and obtain optimized CSA-based clinker compositions using the possible minimal limestone, lowest temperature and shortest sintering time. The produced clinkers have their mineralogy and hydration behavior studied in detail using XRPD, SEM/EDS, thermal analysis, and other techniques.

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