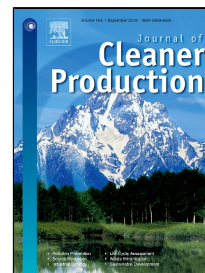


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# Value-added Utilization of Marine Clay as Cement Replacement for Sustainable Concrete Production

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## Abstract

Marine clay is abundant in the coastal regions around the world. It is produced in huge quantities during excavation works for infrastructure but has little value and is treated as construction waste, leading to environmental and sustainable concerns for countries like land-scarce Singapore. This study offers a value-added solution to convert marine clay, which has a low kaolinite phase of 20 wt.%, into supplementary cementitious material through thermal activation and that can partially replace ordinary Portland cement in concrete. A simple process was employed to calcine marine clay at 600, 700 and 800 °C. Owing to the kaolinite phase, calcined marine clay exhibits obvious pozzolanic reactivity due to dehydroxylation and loss of crystallinity during thermal treatment. Results from isothermal calorimetry and TGA have confirmed the pozzolanic reaction which consumes calcium hydroxide and releases additional heat. At 28 days, mortar with 30% cement replaced by calcined marine clay shows a good strength activation index. The activation temperature does not greatly affect the pozzolanic reactivity as indicated by the cement hydration and mortar strength results.

**Keywords:** Thermal Treatment; Pozzolan; Kaolinite; Calcination Temperature; Hydration.

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