

Study of the pozzolanic activity of hydrochar as a substitute for cementitious materials.

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The use of biochar in cement-based applications is an emerging area of research, and different approaches [1] have shown the successful performance of biochar from rice husk [2], coconut husk [3], bamboo [4], sugar cane bagasse [5], peanuts [6], straw [7], wastes [8], etc. as partial substitute of cement.

Hydrothermal carbonisation (HTC) is a sustainable thermochemical process that competes favourably in terms of energy consumption with biochar production. Without the need for pre-drying since it uses water as a reagent, the HTC easily transform highly moist biomass wastes by applying low temperatures and the corresponding autogenous steam pressure for periods of less than 8 hours [9]. The main product of the hydrothermal process is a stable carbon-enriched solid called hydrochar [10]. Unlike biochar, the hydrochar has so far not been addressed as a construction material.

The main objective of this study was to evaluate the potential of a large variety of hydrochars as a supplementary pozzolanic material in order to understand and predict the behaviour of modified cementitious materials [11]. The hydrochars were produced by subjecting a diversity of biomass wastes (sugarcane bagasse, stabilised organic waste from a mechanical-biological treatment (MBT) for mixed-municipal waste, etc.) at 180-230 °C for 2 h.

Here we highlight the direct determination of calcium consumption by Chapelle's test [12] to assess the reactivity of pozzolanic materials and to evaluate the presence of hydrated phases in the solid residue of the test with Scanning Electron Microscopy (SEM).

References

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