

## **Behaviour of blended cements elaborated with metakaolin from valorised paper sludge**

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The authors of the present paper have reported the possibility of obtaining a pozzolanic material (metakaolin) from valorised paper sludge. The paper sludge, generated in the paper recycling process, can constitute an alternative source of pozzolanic materials when those are subjected to controlled thermal process.

This research work presents and discusses the pozzolanic potential of thermally-treated paper sludge from a scientific point of view (calcining conditions, transformation process, pozzolanic activity and reaction kinetics), as well as its technical behaviour on new cementing matrixes (physico-mechanical and chemical behaviour).

These results are confirmed through techniques such as SEM/EDX, showing the presence of calcite aggregates with very porous surface, the formation of metakaolin with pseudohexagonal morphology and the talc presence with fibrous aspect. The tests show that, when calcining at different temperatures (700-800°C) and different times in furnace (2 and 5 hours), calcined paper sludge show pozzolanic activity, except for those calcined at 800°C for 2 hours. The maximum pozzolanic activity corresponds to the paper sludge calcined at 700°C for 2 hours. Cements with 10% calcined paper sludge comply with the mechanical, physical and chemical specifications established in the existing standard UNE EN 197-1. When comparing with a reference cement (CEM I-42,5 R), calcined paper sludge blended cements reveal the following performance: initial setting time occurs 30 minutes sooner, the incorporation of the new addition does not experiment volume instability in the blended cement, sulphate content (expressed in % of SO<sub>3</sub>) is approximately 10% less than in reference cement, the loss on ignition is 60% greater than that exhibited by reference cement mainly due to the presence of calcite in the addition, and the compressive strength slightly increases from 7 curing days on.