CERIS : Civil Engineering Research and Innovation for Sustainability

High-performance wall rendering cementitious mortars with recycled aggregates

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Period
2015-2020

Funding
FCT scholarship (PD/BD/113639/2015)

Summary

The main objective is to study the technical and environmental viability of the incorporation of industrial wastes on eco-sustainable mortars. The consumption of natural resources and energy has increased in proportion to the growth of the world population and to the general improvement in economic levels. An exponentially increasing consumption of scarce results ensued, together with an increase in environment damages. The introduction of wastes as substitutes of natural resources is a viable alternative solution to new raw materials. This introduction will also extend the wastes life cycle, decreasing at the same time the landfill wastes deposition. The wastes on this research replace cement and/or sand, and are incorporated as binders, aggregates, fillers or additions. Seven wastes from the industry were chosen to be incorporated on mortars, considering environmental factors as well as their potential technical advantages: Sanitary ware (SW); Glass fibre reinforced polymer (GFRP); Biomass ashes (BA); Catalytic cracking catalyst (CCC); Textile fibres (TF); Acrylic fibres (AF); and Glass fibres (GF). SW came from the ceramic industry and is incorporated on the mortars as an aggregate (replacing sand) and as a filler.

GFRP is a powder from the polymer industry generated on the process of floor cutting pieces. This waste is introduced as a filler (replacing sand). The BA and CCC wastes are studied as potential binders. BA comes from the burning process of forest wastes to generate electrical power in power stations. CCC is a waste from oil refining process (oil industry). Textile and acrylic fibres come from textile industry. Glass fibres are generated by the burning of the GFRP pieces. The fibres are introduced as additives, with the aim of improving some characteristics, such as cracking behavior. In this research the main characteristics of each waste are analyzed and their influence on the properties of the mortars is studied.

The knowledge about the performance of each residue on renders determines their advantages and disadvantages in its use. Combinations of residues will also be combined in a mortar with the aim of improving its general characteristics, taking advantage of the best features of each one. In the end, the mortars will have a high volume of residues. Hence the research will be a technical and environmental viability study, contributing to increase the wastes' life cycle and to decrease landfill deposition, allied to a reduction in natural resources extraction while also ensuring an optimized performance.

Keywords

Mortars, renders, re-use, recycle, waste, eco-mortars.

Real application of three render mortars with industrial wastes incorporation.