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New cement based mortar formulations as potential energetic efficiency building materials

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***Abstract*— Nowadays, thermal insulation in buildings appears as a key factor to achieve the objectives set by the different energy saving regulations. Through the use of the proper construction materials, building thermal enveloping can be enhanced. Concisely, in the lab simulation of energetic efficiency mortars, selected formulations including different types and amounts of additives were proposed to prepare energetic efficiency building materials with interesting results observed.**

Keywords*— *Phase Change Materials, Cement, Energy Efficiency.

I. Introduction

The energy saving in the construction and rehabilitation of buildings involve the CO_2 emissions decreasing to the atmosphere in order to compliance with the international agreements reached, including the Kyoto Protocol. On this scenery, the thermal insulation in buildings appears as a key factor to achieve the objectives set by the different energy saving regulations. The air conditioning equipment is the main responsible for the energy consumption in many public buildings and homes. Through the use of the proper construction materials, in outdoor and indoor elements, the building thermal enveloping can be greatly enhanced. This action would let to reduce the time of use of the air conditioning and, in the best of the cases, preventing the installation of this equipment.

Therefore, there is an increasing interest to study new advanced energetic efficiency building materials [1-3]. These materials, cement, mortar and concrete, incorporate specific additives on their formulation allowing the preparation of a product with improved thermal properties. Thus, the quality and comfort inside buildings is optimized: minimizing energy consumption and maximizing energy efficiency thereof.

II. Results and Discussion

A cement based mortar with improved energetic efficiency was prepared. The mortar´s formulation (Type CSIII) consisted in white cement, filler, sand and additives. A specific thermal insulating additive from the perlite or vermiculite lightweight aggregates, phase change materials and aerogels was added to each formulation. The physico-mechanical properties and thermal performance of different mortars, including different types and amounts of additives were studied. A first evaluation consisted into select those formulations that fulfill the technical European standards for commercial rendering products.

Afterwards, it was proceeded with the evaluation of the thermal conductivity parameter of the selected mortars in order to know about the proper temperature controlling effect of the studied insulating mortar. As expected, by increasing the amount of insulating materials present in the mortar formulation the effective heat value decreased. This could be extrapolated to temperature delay time prolonged and the cooling extent became greater. Moreover, interesting results were observed in mortar´s formulations using two different thermal insulating additives.

III. Conclusions

In the lab simulation of energetic efficiency mortars the use of different thermal insulating additives was studied. For each different additive, the optimization of the physico-mechanical and thermal characteristics required the use of a specific amount in the mortar´s formulation. The physical and mechanical performances of the mortars have also met the standard requirements. Selected formulations were proposed to prepare energetic efficiency building materials.

References

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These new materials improve the quality and comfort inside buildings minimizing energy consumption and maximizing energy efficiency thereof.