

NANOFIRE – Fire behaviour of conventional and innovative thermal mortars

Summary

This project aimed to study the fire behaviour of conventional EPS-based thermal mortars and innovative ones, integrating aerogel into their composition. The study compared the fire reaction properties, determining the thermophysical and thermodynamic properties and proposing a risk matrix based on these results. For this, the experimental campaign included fire reaction tests to determine the heat of combustion and the ignitability of these products.

Fire resistance tests, in which mortars were subjected to a standard fire curve (ISO 834) and their thermophysical properties at elevated temperatures were determined/ calibrated based on the temperature distributions. Residual properties characterization tests - mortars heated to high temperatures (e.g. 200, 300, 400°C) and, after cooling down to room temperature, the mechanical properties were inferred through standard tests. Compared to the preliminary results obtained at room temperature, The comparison is established between the different mortar compositions and

the degradation of their properties and components when heated. The lime mortar was used as a reference, being widely used in the market and whose behaviour to fire is the most favourable, class A1. The EPS mortar was representative of a standard thermal mortar, whose properties are also known. The potential interest of the research was focused on the mortar containing a nanomaterial as aggregate, the aerogel.

The project output was: i) calibration of thermophysical properties of thermal mortars (EPS and Aerogel) as a function of temperature; ii) evaluation of fire reaction properties of the studied mortars; iii) determination of residual mechanical properties of studied mortars post-heated; iv) proposal of a fire risk matrix of the studied materials based on the results.

Two conference papers, one Master's dissertation, and one international collaboration with Prof. F. Markert from DTU (Denmark) were carried out. Two articles in journals are in preparation.



Figure 1. EPS Mortar testing set-up (on the left) and detailed view post-exposure to standard fire curve (on the right).

Project Reference

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Leading Institution

CERIS – Civil Engineering Research and Innovation for Sustainability (Portugal)

Partners

DTU (Denmark) – internship

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Funding

CERIS – Civil Engineering Research and Innovation for Sustainability

Period

2021

Total

15 000.00€

CERIS

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Project Website

percoqt.tecnico.ulisboa.pt/Docs/nanofire.pdf