CAL-TEX – Durability of lime-based renders with textile waste under wetting/UV cycles simulating the impact of climate change

Summary

Lime-based mortars have been used as a sustainable alternative to cement mortar in the restoration of heritage buildings. Nevertheless, their performance and durability depend on the microstructure of the mixture, subject to changes over time due to variable climate conditions.

Anthropogenic greenhouse gas (GHG) emissions have reached unprecedented levels. These elevated GHG levels not only escalate humidity but also contribute to the intensification of warming. This triggers a feedback loop, resulting in rising temperatures and increased water vapour absorption by the atmosphere.

The current state of climate change is giving rise to more frequent extreme weather events. Consequently, this project aims to assess the influence of reported extreme weather events in recent years on the physico-mechanical behaviour of hydraulic lime-based renders incorporating textile waste (Fig. 1 and Fig. 2). This evaluation will be carried out in parallel with reference lime-based composites. To realize this objective, three accelerated ageing tests have been designed. The aim is to replicate specific compound extreme weather events. Consequently, lime-based mortar specimens were subjected to three accelerated ageing tests, each comprising 15 cycles:

Test 1: High temperatures (similar to a Mediterranean summer) followed by a period of torrential rain.

Test 2: A flood event followed by a significant increase in temperature.

Test 3: A rapid and pronounced decrease in temperature followed by a fast and pronounced increase in temperature.

One of the findings is the impact of water on the performance of accelerated ageing tests. A long period of water submersion appeared to have a more favourable effect on hydraulic lime-based mortars (Test 2) compared to continuous periods of short submersion (Test 1). Nevertheless, additional research is necessary, as there has been no mechanical test assessing the impact of extreme weather conditions on the adhesion grade between lime mortars and the brick substrate.

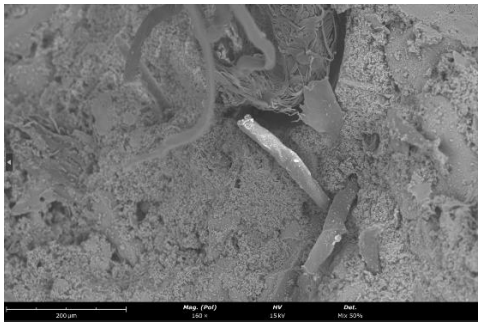

Figure 2. Scanning electron microscope (SEM) image of lime-based mortar with textile fibres

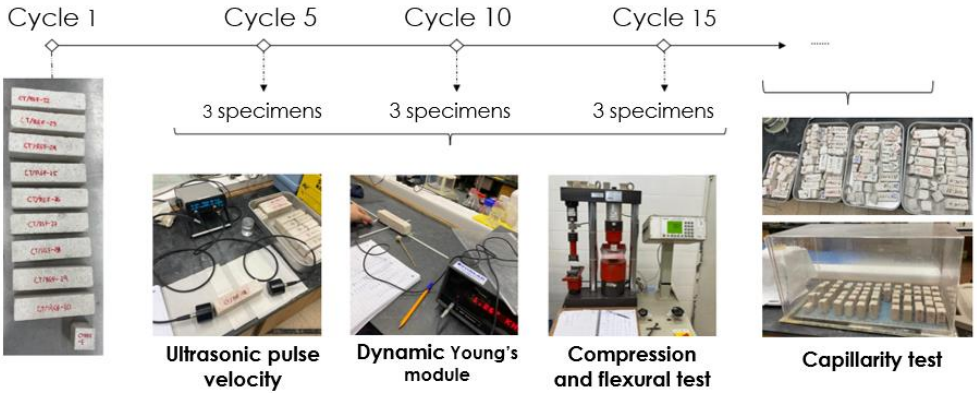

Figure 1. Diagram for mechanical tests performed on the three ageing tests.

Project Reference

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