Modified lime mortars for restoration works

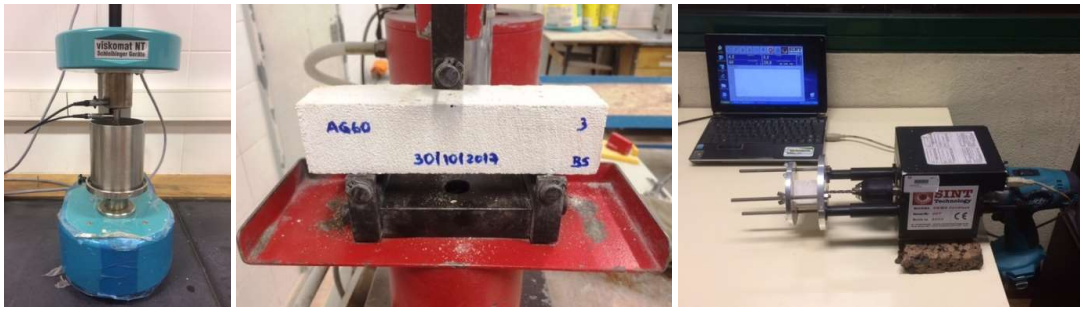
Summary

The selection of adequate mortars is critical for the success of a restoration intervention. Two of the main requirements for this type of mortars are compatibility with the pre-existent materials of old masonries and durability. Lime mortars have generally been considered the most compatible option. However, the reduced strength at early ages and the high porosity and permeability to water of these mortars can make them particularly susceptible to degradation. In the past, rudimentary admixtures, such as vegetable oil and animal blood or fat, were use to minimize these drawbacks. In the same way, modern chemical admixtures have the potential to improve the performance of the lime mortars currently made, including their durability, without hindering their compatibility. These substances, although frequently used in cement-based materials, have been scarcely used in lime mortars, where their effect is, therefore, not very well-known. In this context, the main objective of this work was to study the influence of modern chemical admixtures on the fresh and hardened state properties of air lime mortars, on their susceptibility to degradation and on their compatibility with old masonries, in order to assess the potential usefulness of these modified lime mortars for restoration. To this end, the behaviour of lime mortars without admixtures (reference mortars) and that of lime mortars with admixtures (modified lime mortars) was compared.

As admixtures, several commercial water-reducers, viscosity-modifiers, air-entrainers and water-repellents were used. An extensive research programme was then defined to characterize these mortars, divided into three stages: (i) an initial incisive study of the effect of a broad set of admixtures (type and dosage) on the fresh and hardened (14 to 180 days of age) state properties of lime mortars to select those more suitable for restoration; (ii) further characterization of the selected mortars, to evaluate their susceptibility to degradation to freeze/thaw cycles, as a way to contribute to the assessment of their potential durability. 'Fully' carbonated mortar specimens were used in this stage; (iii) an assessment of the potential compatibility of the selected mortars with old masonries and of their potential suitability for a given function within a masonry structure, based on the results obtained beforehand and the requirements available in the literature. This work allowed providing new insights into the admixtures effect on the rheological, mechanical, physical, mineralogical and microstructural properties of lime mortars and, thereby, identifying those more suitable for lime mortars for restoration. Conclusions were also reached on the influence of water content, mixing conditions and accelerated carbonation on the resulting properties of lime mortars.

Keywords

Lime mortars, admixtures, mechanical and physical characterization, durability, compatibility, restoration.



Characterization of lime mortars modified with admixtures.

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Period
2016 -2021

Funding
FCT scholarship (SFRH/BD/107879/2015)