

Clay roofing tiles under salt mist atmosphere

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Abstract

A research is being carried out to study the degradation of clay roofing tiles subjected to sea environment. Some case studies are analyzed and their state of conservation is evaluated. The program comprises artificial weathering tests of exposition to salt mist of different kinds of clay tiles currently used, as well as natural weathering tests in controlled conditions. The weathering effect is monitored in both situations, through visual analysis and physical tests followed by comparison of the results.

The kind and severity of degradation obtained by the weathering tests are compared with the problems observed in the case studies with a view to provide information about the degradation mechanisms and the factors involved.

In this paper some of the results obtained so far are presented. Some case studies of natural damage of roofing tiles on the central coast of Portugal are analyzed, considering environmental and exposition conditions. Artificial accelerated tests are described and their visual inspection results are presented and compared with those of the natural damage cases. Finally, natural exposition tests installation is described.

Keywords: Clay roofing tiles, Durability, Salt mist atmosphere, Weathering tests.

1. Introduction

Clay tiles are largely used in traditional construction in Portugal. In coastal zones some cases of accelerated decay have been affecting the roofing tiles durability, apparently due to the exposition to salt mist atmosphere. The crystallization of soluble salts is considered one of the main causes for the degradation of porous construction materials (Rodrigues and Gonçalves 2006).



Fig. 1 Natural damage

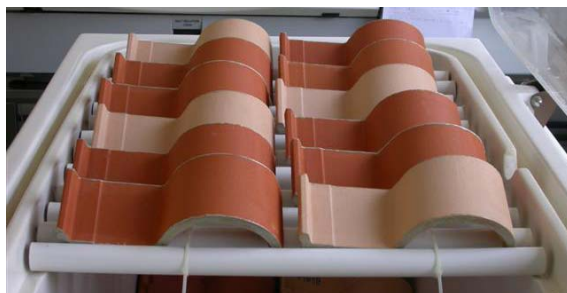


Fig. 2 Specimens in the climatic chamber

A research is being carried out to study the degradation of clay roofing tiles subjected to sea environment (Cruz *et al* 2007). This work presents some cases of roofing tiles natural degradation, artificial accelerated weathering tests and its visual analysis results, and natural weathering tests installation.

2. Cases of natural damage

Four cases of natural degradation in coastal zones are presented. According with the terminology used in stone and rendering architectonic surfaces (Henriques *et al* 2004), the types of degradation observed were: Efflorescence, pitting, granular disaggregation, peeling, bowing, plaques and exfoliation. Figure 1 shows one of the degraded tiles.

3. Artificial accelerated weathering tests

To simulate in laboratory the weathering defects due to salty mist, in order to study the parameters involved,

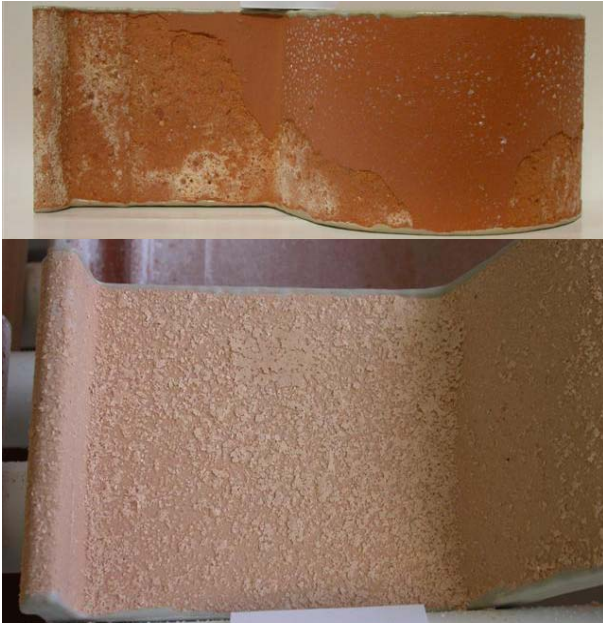


Fig. 3 Accelerated tests damage



Fig. 4 Natural weathering tests

specimens from 8 different types of tiles have been subjected, in a climatic chamber (figure 2), to sets of 10, 20 and 30 cycles of wetting with a salty mist and subsequent drying. These tests caused different types and levels of alteration and degradation in different kinds of clay tiles (examples in figure 3). Hydrophobic specimens don't show immediate defects but they can suffer huge degradation (bowing and plaques) if the solution can pass through the protected surface. Non-hydrophobic tiles, both red and white, show low to medium degradation level characterized mainly by pitting, some disaggregation and peeling.

4. Natural weathering tests

Some tiles are exposed to natural weathering in the Portuguese west coast, under predominant North winds, on the centre of Portugal (figure 4). They are from the same batch than some of the tiles that were subjected to artificial accelerated weathering tests. After 12 months the tiles do not show any degradation.

5. Conclusions

Some ceramic roof tiles in coastal zones can achieve high levels of degradation in relatively short time.

Accelerated artificial salt mist tests in climatic chamber can cause different levels and types of degradation in different types of tiles. The types of degradation are similar to the ones obtained in coastal zones, but in a lower level. This is an

important step towards the laboratory simulation of real problems that will permit to study the different parameters involved. It is necessary to proceed with the laboratory tests, increasing the number of cycles, to obtain higher degradation levels, comparable to those observed in the cases studied. A change in some of the parameters, such as the temperature, in order to approach them to real conditions is also a possibility. After the accelerated test is considered as simulating the natural weathering in a shorter period of time, the study of the influence of tiles production parameters will be engaged.

The natural exposition tests will be carried out with periodic monitorization in order to compare the degradation obtained in the same types of tiles under natural and artificial conditions. These tests will contribute to validate and to calibrate the accelerated weathering tests.

6. References

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