

THE “MODICA” STONE: STUDY OF SALT DAMAGE AND ASSESSMENT OF EFFICACY OF DIFFERENT CONSOLIDANTS

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The deterioration of a stone material is strictly related to its pore structure that affects the interaction between surface and environmental agents, especially water that transports large amounts of salts into the stone. Indeed, salt crystallization, is one of the most dangerous weathering agents in porous building materials [1,2]. In particular, the crystallization pressure of salt crystals, growing in confined pores, is found to be the main cause for damage [2,3]. The consolidation of degraded stone materials represents a crucial issue in the field of restoration of cultural heritage. This contribution presents the results of a laboratory experimentation carried out on a limestone largely used in the Sicilian Baroque architecture, namely the *Modica stone* [1] (Fig.1). Several specimens, collected from a historical quarry nearby the city of Modica were artificially degraded by salt crystallization tests [4] (Fig. 2a). Then, degraded samples were treated with three different consolidating products: i) a suspension of nanolime in isopropyl alcohol, ii) a suspension of nanosilica in water, iii) ethyl silicate dispersed in white spirit. A systematic approach, including thin section observations mercury intrusion porosimetry (MIP), colorimetric analysis, peeling tests [5,6] (Fig. 2b), point load test [7] and scanning electron microscopy (SEM) analysis, was used to evaluate the correlation between salt crystallization and both microstructural and chromatic variations of the examined limestone as well as the efficacy of treatments. The consolidating behavior of the tested products was also appraised by repeating salt crystallization tests after consolidation, in order to assess the resistance of treated stone against the crystallization pressure. Results showed that some treatments, although inducing an enhancement of stone cohesion, lead to an increase of the crystallization pressure, which could generate dangerous susceptibility to degradation.

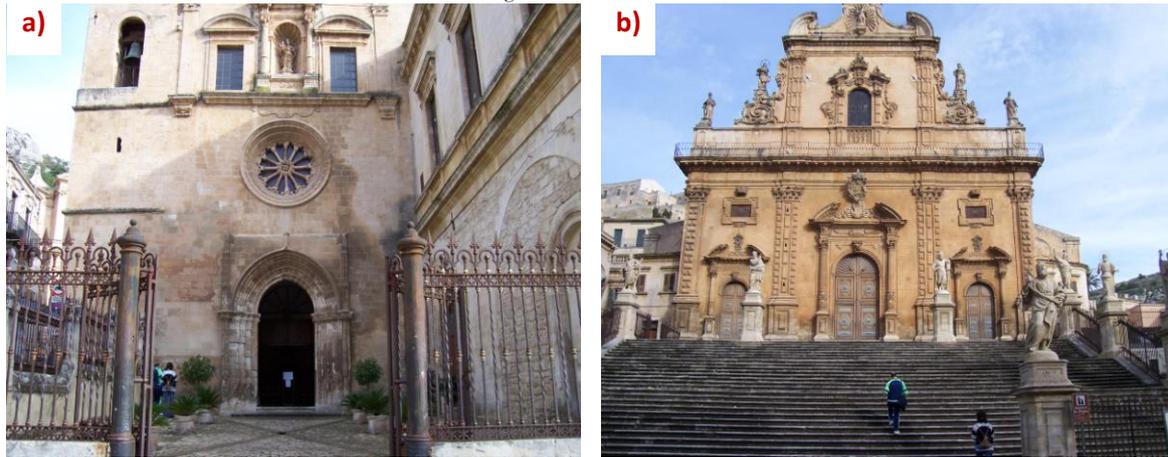


Fig. 1. a) Two examples of use of the Modica stone: Church of S. Maria dell'Annunziata and b) Cathedral of San Pietro in Modica.

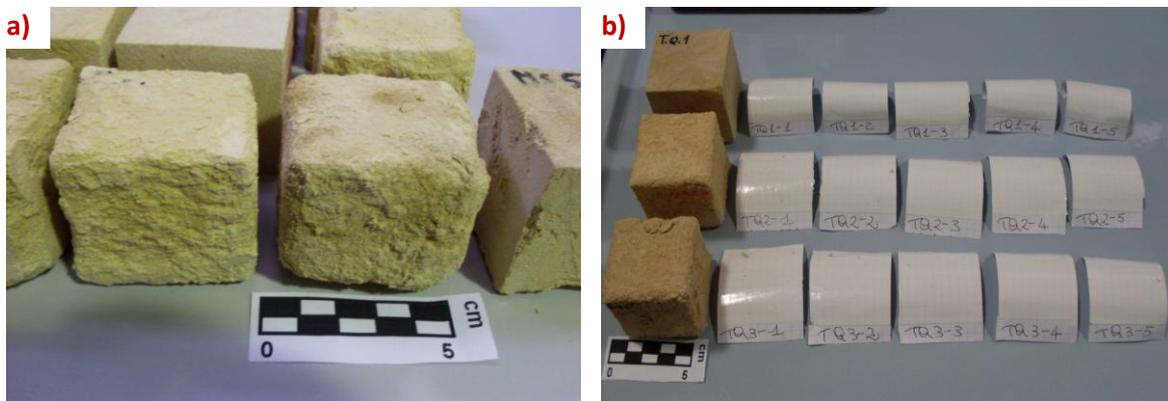


Fig. 2. a) Salt weathered limestone specimens and b) Peeling tests performed on specimens of the Modica stone

References

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