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DEGRADATION OF CHALK STONES INDUCED BY FREEZE–THAW ACTION

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Abstract. In monuments preservation, the damages to natural building stones induced by the action of frost are considered to be of great importance. The frost resistance of building stones is checked by standardized freeze–thaw tests (20 freeze–thaw cycles) before using. The correlation between microstructural characteristics (microscopic and spectral characteristics) and material degradation (in terms of weight loss), given in environmental conditions, was investigated in this paper. The damages generated by the frost action induced ice crystallization and reduce the strength of the rock. This work presents the effects of freeze–thaw cycles on Chalk stone from Basarabi Churches Ensemble.

Keywords: freeze–thaw cycles, chalk stone, microscopy, RAMAN spectroscopy

INTRODUCTION

The freeze-thaw cycles are recognized as the major physical deterioration process in natural building stones [1-4]. Limestone is very common in architecture (monuments and cultural heritage buildings). The main cause of the weathering is the porosity of limestone and pore space distribution which soaks up water and show weathering patterns and forms: alveolar weathering, granular disintegration, efflorescence. The smaller the pore, the stronger the water is strained, and therefore freezing at increasingly lower temperatures results. Freezing-thawing actions can be considered as one of the processes that contribute in the deterioration of stones, characterized with air temperatures below freezing point temperature. By definition, freezing is when water becomes ice and happens at a temperature of 0°C. Water expands when it becomes ice, taking up more space. Thawing is when ice turns to water. This happens when the temperature rises above 0°C. Freeze-thaw weathering occurs when the temperature keeps fluctuating above and below 0°C. When the temperature drops below 0°C water in a crack in a rock will freeze. The ice thaws