

Influence of Fântânița Lake (Chalk Lake) Water on the Degradation of Basarabi–Murfatlar Churches

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Abstract

Discovered in 1957, the Ensemble Basarabi–Murfatlar is one of the most impressive archaeological sites from Europe. The monument is situated on a hill chalk cliff, and is built from amorphous calcium carbonate, very sensitive to moisture, frost, salts, as the most important and common causes of monuments degradation. The calcite dissolution is affected by the presence of foreign ions, Mg^{2+} (from $MgSO_4 \cdot 7H_2O$ and $MgSO_4 \cdot 6H_2O$) and Na^+ (from $Na_2SO_4 \cdot 10H_2O$ and Na_2SO_4), being the major cations in seawater and groundwater. Also, the anions SO_4^{2-} and Cl^- are favouring the calcite conversion to gypsum and is responsible for stone wall dissolution. Some petrographic and physico-chemical (X-ray fluorescence energy dispersive (EDXRF), thermal analysis, ICP-AES of wall samples are presented in this paper. The influence of Fântânița Lake water (Chalk Lake) composition situated very close to the church is discussed, pointing out the salts migration from the lake to the church wall.

Keywords

Basarabi–Murfatlar • Calcite • Degradation • Salts • Lake water

97.1 Introduction

The Basarabi–Murfatlar Ensemble has been discovered on 1957, and is one of the most impressive archaeological sites of Europe, consisting of four churches dated from 9th–11th century, recognized as the first religious monument from

medieval Dobrogea. Situated in the cliff of a chalk stone hill, this ensemble is built from amorphous calcium carbonate (calcite), very sensitive to humidity, frost, salts etc. Stone surfaces are continuously exposed to physical, chemical and biological degradation (Ion et al. 2013).

The high porosity allows penetration of water with corrosive ions, acids and salts inside the stone and cause it severe damages. The deterioration of stone is primarily due to the presence of different water-soluble salts. Salts crystallization is responsible for efflorescence (salt deposited on stone surfaces), sub-efflorescence (the salts beneath the surfaces) and crypto-efflorescence (the salts are deposited within the pore of the stone) (Gauri 1982). Sometimes, due to the increased salinity of the ground water, an increased stone degradation occurs, due to the reaction of calcite from limestone react with different oxides (El-Gohary 2011). Different anions (nitrates, sulphates, and chlorides) is facilitating the stone degradation. This situation has been identified for Basarabi–Murfatlar church.

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