

**DURABILITY OF BUILDING STONES AND
WEATHERING OF ANTIQUITIES IN CRETA/GREECE****DURABILITÉ DES ROCHES DE CONSTRUCTION ET
ALTERATION DES MONUMENTS ANCIENS EN CRÈTE/GRÈCE****B. CHRISTARAS***

Abstract

In the present investigation building stones from the archaeological sites of Knossos, Festos and Malia in Creta are studied with regard to their weathering condition and to some of their physical and mechanical properties. For this purpose studies were made of: a) the mineralogy with a semi-quantitative composition of the materials by microscopic and X ray diffraction methods, and in situ observations b) the weathering condition either under the microscope or with ultra-sonic velocity measurements c) weathering resistance by salt crystallisation methods d) dry density and water absorption and e) uniaxial compressive strength. All test results were interpreted statistically and the relationships were expressed mathematically; correlation diagrams are also given.

Résumé

En Crète, les monuments anciens de Knossos, Festos et Malia ont été étudiés pour identifier l'altération et les propriétés physiques et mécaniques des roches de construction. Dans ce but nous avons étudié: a) la minéralogie et la composition semi-quantitative des matériaux aux RX aussi bien qu'au microscope, b) l'état d'altération, calculé par les ultra-sons, c) la résistance à l'altération par attaque à Na₂SO₄ hydraté, d) la densité sèche et l'absorption d'eau et e) la résistance à la compression uniaxiale. Tous les résultats ont été étudiés par interprétation statistique les relations exprimées mathématiquement, des diagrammes de corrélation étant également établis.

Introduction

Historical building stones exposed to atmospheric factors are subject to the action of various agents causing their destruction. Water/Salt combination, activated by fluid circulation and evapo-transpiration, is one of the main factors which provoke weathering and decomposition of a stone, by the creation of shrinking expansion and freezing melting phenomena of pore water. The marine salts are a permanent cause of natural pollution, not only on the coast but even further inland, especially in islands. Components of smoke which react in the pores of the stones are also one of the atmospheric pollutants; non-metallic oxides, in particular sulphur oxides, dissolved in the water, reduce the water pH and form sulphuric acid, which reacts with the mineral components of the stones, resulting in the formation of salts, such as gypsum, in the case of limestones and sandstones.

In the archaeological sites of Knossos, Festos and Malia, studied in Creta island, the building stones were

mainly of marly limestones which are abundant in the surrounding area. As Creta is a Mediterranean island, with warm climatic conditions, and the studied ruins have an age of 3600 years old, a careful examination of the construction material may contribute to the recognition of the real factors which have caused damage, so that the most proper chemical and natural conservation and protection measures may be taken.

The archaeological sites

The studied area is located in the central part of Creta island in the southern part of Greece (Fig. 1). Excavations brought to light remains of ancient towns as the result of a famous ancient civilisation dated from neolithic times (Savignoni & de Sanctis, 1901; GNT0, 1986).

Knossos is situated 5 Km, to the South of Iraklio. It has been inhabited since the neolithic period and developed in the capital of the Minoan Kingdom,

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