



Criteria for the production of artificial stone for the needs of restoration works in the medieval monuments of Rhodes

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The Medieval city of Rhodes has been listed in the UNESCO chart since 1988. It contains city walls, fortresses, castles and buildings. The history of the monuments dates back to the 7th century and goes through the medieval period during which a lot of construction work took place.

The main building materials were used were biogenic limestone from local quarries (the age of which was determined in upper Pliocene- lower Pleistocene) and mortars based on lime.

Different deterioration problems (from static problems and demolition to salt crystallization phenomena and alveolization) are present. In order to proceed to the restoration of the monuments the need of stone is obvious. The re-use of blocks does not cover the demand for stone. The supply of stone from local quarries has been stopped as in many places the deposits have run out while in others the re-opening is not feasible for the time being.

For a period the problem was solved by importing compatible stone from Cyprus. However, this solution was costly.

The design and application of artificial stone was an alternative taking into account the need of the artificial stone to being compatible to the old ones.

The first step is the understanding of the mechanical, physical and microstructure properties of the building material.

For the authentic limestone, cubes of 5x5x5cm were shaped in order to test the mechanical properties. Porosity and porosity properties were measured by water absorption, by optical microscope (assisted by image analysis) and by B.E.T. SEM and EDS analysis were also performed in order to study the microstructure.

Taking into account the above results and also the colour and the morphology , a series of mixtures were produced in the laboratory based on “traditional” binders available at the market.

For each raw material used for the mixture production, properties as the water soluble salt content, the pozzolanicity index and the specific gravity were tested. The produced mixtures were cured and tested after 28 days. Their strength, porosity and microstructure were recorded.

The results showed that the manufacture of artificial stone is possible. Further tests concerning the environmental behaviour of the artificial stones in contact to the authentic ones are also in progress.