Evaluation The Effectiveness of Some Consolidants for Preservation of Limestone in Hathor Temple at Memhis, Egypt

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Abstract

Memphis city is the first capital of ancient Egypt; it's considered to be an open-air museum for the ancient Egyptian archaeological buildings. Twenty kilometers south of Giza, the modern village of Mit- Rahina lies at the core of Memphis city. Hathor temple is one of the most important archaeological building in Mit- Rahina village, it was built of limestone by Ramesses II (the 19th Dynasty). The temple is being comprised of a partially exposed colonnaded hall on the north, and that hall has spectacular capitals in the traditional form of Hathor as a human visage with bovine ears. The temple was affected by several deterioration phenomena and patterns of damage which occurred as time went by, as a result of being exposed to many aggressive factors. The assessment of the current conservation state of the temple were performed, including studying the properties of limestone which is the main construction material of Hathor temple using X-ray diffraction, polarizing light microscopy (PLM) and the scanning electron microscopy (SEM). The experimental study was performed on samples of limestone using four consolidants to choose the best consolidant to the conservation of Hathor temple. To evaluate the consolidants, the physical and the mechanical properties of the treated samples were estimated, also aesthetical properties by visual examination, colorimetric measurements, as well as static water contact angle and the morphologic study using the scanning electron microscopy (SEM). The evaluation methodology of consolidants efficiency is performed by comparing properties of the treated samples together, then comparing them with properties of untreated samples. Stability and efficiency of the consolidants were evaluated by repeating the measurement of static water contact angle for the treated samples after exposure to the artificial aging cycles. The study indicated that the most important deterioration factor affecting the temple is a salty ground water. The results obtained from studying the archeological limestone by investigation and analytical methods which showed that it is consisting mainly of very fine grains of calcite, with minor amount of dolomite and rare quartz, opaque minerals, iron oxides and halite, with microfossils. It also suffers from different kinds of degradation phenomena. The experimental study results showed that the nanocomposite (Nanorestor + M.T.M.O.S) is the most suitable for consolidation and protection of the limestone samples, as it showed higher compatibility in physio-chemical, mechanical and aesthetical properties with the limestone material and the best for resistance to artificial aging procedures, compared by other consolidants in this study.

Key Worde

Limestone, consolidation, mechanical properties, physical properties, water contact angle.

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