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**Evaluation of Some Complicated Nanocomposite Materials  
for the Cleaning and Self -Protection of Stucco Monuments :  
A Study Applied on a Selected Model**

A Research for an MA Degree

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## summary

Decorations with stucco units in Islamic buildings are characterized by great artistic and historical value, and these decorations are found in buildings in the open environment, and therefore these decorations in the surrounding environment suffer from natural weathering processes; As it is exposed to sunlight and the accompanying light and heat during the day, it affects in the long run these decorations through the expansion of its components, followed by the night and the accompanying decrease in temperatures and shrinkage of the components of the stucco decorations. Due to the heterogeneity of the components and the differences in their expansion lead to the disintegration and fall of these components, in addition to the chemical transformation of the components due to the loss of water associated with gypsum and its transformation into the anhydrite phase and the conversion of calcium carbonate to calcium sulphate due to polluting gases and moisture. Seasonal changes also greatly affect these decorations and on them. The study dealt with the definition of raw plaster and its uses in Islamic architecture, the components of stucco decorations, factors, and manifestations of damage to these decorations, as the study dealt with the use of some traditional protective materials, and some modern nanomaterials in protecting stucco decorations.

When examining and analyzing the stucco decorations in the Qadiriya Mosque, it was found out using a microscope Stereoscopic light, polarizing microscopy, and scanning electron microscopy gave a description of the surface shape, the trace texture of the surface of stucco decorations, and the manifestations of damage and calcification accumulated on the surface. And cracks, cracks, internal installation defects, molding, etc., and analysis using the X- ray fluorescence device (XRF), the X- ray diffraction device (XRD), and the infrared spectrometer analysis device (FTIR). Involved in the composition of the plaster material, and therefore the difference in its properties and the nature of each component by itself, and we can do that by the nature and degree of damage, and through that a proposed plan for treatment is developed based on experimentation and choosing the best treatment methods for plaster decorations according to the current condition on them. who knows

An experimental study was carried out for some cleaning methods for plaster samples, and it was according to the traditional methods used, which start with mechanical cleaning and its accompanying advantages and disadvantages, followed by chemical cleaning using some solvents, and then chemical compresses were made and Mora's compress was compared with other compresses developed for it due to the high cost of Mora's compress, and it was proven The developed poultices (O- A), (O- F) have higher efficiency than Mora poultice, which gave better cleaning results on the surface of samples and lower cost while reducing the time for application.

This era is the age of technology and the use of modern materials in accordance with the possibilities and the preservation of those decorations. Accordingly, the nanomaterials used in the experimental study were prepared to protect stucco decorations by chemical deposition method. To protect the decorations and apply these different materials, to know their effectiveness, and to choose the most suitable for application on the external stucco decorations in the Qadiriya Mosque in Cairo. Samples of experimental stucco decorations,

and it was preceded by the use of polymers and was of a high degree of efficiency, but with the passage of time it had a damaging effect on them. These nanomaterials were combined with the effective tetraethyl ortho silicate polymer in the treatment to improve its properties to protect the stucco decorations, and through the experimental study it appeared The success of nanomaterials particles with the tetraethyl orthosilicate polymer used in the study with secondary barium oxide particles, secondary zinc oxide particles, and secondary alumina particles in strengthening and protecting the stucco decorations of the experimental samples, and increased the resistance of the experimental samples to damage factors in the surrounding environment, so the three secondary materials were At a concentration of (0.5%) and (1%) with high characteristics and gave good results when combined with tetraethyl ortho silicate polymer, and improving its properties, the barium nanoparticles had high and distinctive properties in strengthening samples and their future protection, and the alumina oxide particles with the polymer also gave results Good, and high water repellent strength, the zinc oxide nanoparticles with the polymer had a power to repel water and protect the surfaces of the samples and the nanomaterials gave the samples an increase in their resistance to the surrounding environment and improved the physical and mechanical properties, after exposing those samples to conditions of accelerated aging in the heat and humidity cycles, and the stability of the efficiency These materials are relative to the traditional polymeric materials individually, and the characteristics of the barium oxide particles were efficient in strengthening and strengthening, while the nano particles of zinc oxide gave good protection to the experimental samples. In the practical aspect of the study, the study was applied to stucco decorations in the dome of Zain al- Din Yusuf ibn Yahya in a mosque The Qadiriyya on one of the windows and stucco bands surrounding the dome in the external environment.