

# **INORGANIC NANOMATERIALS WITH PRACTICAL APPLICATIONS IN CULTURAL HERITAGE CONSERVATION**

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## **Abstract**

The main purpose of the work is represented by the development of nanostructured materials used in different formulations to preserve the objects belonging to the cultural heritage. In the study, apatitic materials were developed, integrated in formulations for the treatment of heritage objects, both from inorganic support (natural or artificial stone) and from organic support (wood). Apatitic materials with heavy metals were synthesized, characterized by modern techniques (XRD, XRF, FTIR, TGA, SEM-EDX), and three types of nanocomposites were formulated: apatitic/polymeric for silicon supports, multilayered for calcium supports and polymer films for organic supports. Prior to the application of materials, archaeometric studies were carried out to understand the behavior and degradation of heritage artefacts over time, including physical, chemical and mechanical changes caused by natural factors or biodegradation. For the application of the materials, inorganic model artifacts (brick, cement, adobe, plaster) were developed and common organic supports (pine, fir, oak, ash) were procured, which were artificially aged to simulate conditions of excessive humidity

All materials were antimicrobially evaluated by qualitative and quantitative tests. The nanocomposite materials were applied to the developed inorganic and organic model artifacts. On the inorganic model artifacts, photodegradation and hydrophobicity tests were performed to analyze their consolidating character, weighing of the model artifacts, before and after treatment, to see if the nanocomposites damage their surface, and color tests to see if the treatment affects the aesthetic parameters. On the model artifacts of an organic nature, mechanical strength tests were performed to evaluate the consolidating properties, water adsorption tests to see if the material manages to close all the pores, cracks and fissures in the wood mass, and gloss and color tests to notice if there are changes at the aesthetic level

**Key words:** phosphate nanomaterials, hydroxyapatite, reinforcing nanocomposites, cultural heritage, inorganic polymer