

## Summary

The present research suggests, on one hand, optimizing a multi-technical method for the characterization of organic compounds and traditional lime mortars to use in monumental buildings of antiquity. To illustrate the effectiveness of this methodology it has been applied to a study case, the stucco from mural painting of Maya culture (Ancient Mesoamerica), which has been chosen by the need to continue studying the composition of preparation layers of these stuccos. There are two reasons for this choice: the first one is that knowledge of materials and of execution techniques of these surfaces is providing new data to understand the technological complexity of this culture; and the second one is based on the fact that just this type of research will allow us to know with certainty how these preparation layers were made and, this way, ensure the correct interventions of conservation and restoration. From these considerations, the study conducted establishes a methodological approach that comes from the specialized literature search of geographical and cultural context, the physical (geology and climatology) and biological environment (flora and vegetation) from Yucatan Peninsula (Mexico), getting theoretical knowledge necessary to deal with a detailed description and characterization of the raw materials from the geological environment that were used in the manufacture of the preparation layers from Maya mural painting. The method continues with the use of instrumental analysis techniques such as optical microscopy (OM), polarizing optical microscopy (POM), infrared Fourier transform spectroscopy (FT-IR), x-ray diffraction (XRD), scanning electron microscopy-x-ray microanalysis (SEM-EDX), x-ray microdiffraction ( $\mu$ -XRD), transmission electron microscopy (TEM) and the optimization of instrumental techniques for analyzing organic compounds, such as gas chromatography/mass spectrometry (GC/MS).

On the other hand, the current researches tend to reinforce the idea of incorporating organic components to the cementitious matrix of historical mortars. There is a debate about whether these additives modify the fresh mortar properties and if they also improve the hardened mortar properties. In this study is suggested the development of a method of making lime mortars with an application in the field of restoration, to provide adequate quality control over their constituents. To do this, it has been used an experimental research of air lime mortar paste to which cementitious matrix, two natural organic additives of vegetable origin in different proportions have been incorporated, so changes in its behavior related to the main rheological, hydraulics and physical-mechanical properties of the mortar can be assessed, as ecological and sustainable alternative to non-biodegradable and irreversible synthetic resins, and to ensure greater compatibility with the original materials.

That is why this research is added to initiatives, occurred since the early nineteenth century, of several archaeological projects in the Northern Maya lowlands (Yucatan Peninsula, Mexico), fall of them focused on recovering ancient technical traditions which allowed to develop a mix of lime able to withstand for centuries the serious problems of environmental and microbiological conservation that represents the forest environment that surrounds them. Only the fact of fully decode the recipe, or put in another way, the various ingredients that made possible the manufacture of mixtures of this strength and quality, will enable us to duplicate these mixtures to use them as reintegrative material in construction restoration processes, ensuring the excellent results achieved thousands of years ago by former specialists. Therefore, this study shows, once again, the need of scientists (chemists, biologists, geologists), historians, art historians, archaeologists and restorers join forces for the benefit of the knowledge and the preservation of the rich archaeological cultural heritage from ancient cultures.