

Abstract

The Mortars of Built Cultural Heritage: The Palace of Knossos Case Study and Material Characterization [†]

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[†] Presented at the Materiais 2022, Marinha Grande, Portugal, 10–13 April 2022.

Keywords: historical mortars; characterization; Palace of Knossos



Citation: Carvalho, F.; Sousa, P.; Leal, N.; Simão, J.; Kavoulaki, E.; Lima, M.M.; da Silva, T.P.; Águas, H.; Padeletti, G.; Veiga, J.P. The Mortars of Built Cultural Heritage: The Palace of Knossos Case Study and Material Characterization. *Mater. Proc.* **2022**, *8*, 95. <https://doi.org/10.3390/materproc2022008095>

Published: 15 June 2022

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The study and characterization of mortars is generally related to the knowledge of the properties of the material, which guarantee or improve its performance and durability. When we consider the study of historical mortars, the main objective is to understand the characteristics of the material and how it has reached the present day, considering that, often, the time of its preparation and application is separated from the present by a long period of time, perhaps centuries, and is thus difficult to specify. This type of study may give indications on historical issues relevant to the understanding of a particular site or monument and, in addition, can assist in actions related to its preservation. Mortars can be used with different functions, ranging from structural function, protection, or finish, which requires distinct properties that are suitable for this functionality. It is necessary to consider that the desired characteristics, after drying the mortar, will depend on a set of factors, including the selection and quality of the raw material, the proportion between the main components, the way they are prepared and applied, and the environmental conditions they will be subjected to over time. Furthermore, the larger the monument is, the greater the chances of changes, reconstructions or interventions, including materials prepared in different periods with different raw materials and techniques. This is precisely the case of the Palace of Knossos, located near the Heraklion in Crete. It is estimated that the first palace was built in 2000 B.C.; however, it was destroyed and rebuilt more majestically in 1700 B.C. The definitive abandonment of the palace would have occurred around 1450 B.C., but the site where it was built maintained its importance for many centuries. Excavated at the beginning of the 20th century, the Palace of Knossos is one of the most important archaeological sites in Europe, both for its size and the complexity of its plant, with architectural solutions worthy of a well-developed civilization, as well as for the many reclaimed materials and *frescos* found. In addition to all of the material wealth found in its excavation, the palace has undergone peculiar historical conservation including the reconstruction of many of its structures, even as late as the early 20th century,

all considered of great importance for the history of the monument. For this study, samples of mortars were collected at different points of the Palace of Knossos, both from areas of archaeological remains as well as from reconstructed areas. For the characterization, we opted for a multi-analyses approach which involved optical microscopy observation, X-ray fluorescence, X-ray diffraction, FTIR, μ -Raman, simultaneous thermogravimetry and differential thermal analysis. The results obtained indicated that the samples were mostly lime mortars with different hydraulicity indexes produced from local raw materials. The results also indicated that the samples presented considerable differences depending on the area in which they were collected, showing the variety and complexity of the materials produced in different periods, even when used for the same function.

Author Contributions: Conceptualization, F.C. and J.P.V.; methodology, F.C., J.P.V. and G.P.; formal analysis, F.C., N.L., J.S., T.P.d.S. and J.P.V.; investigation, F.C. and J.P.V.; data curation, E.K.; writing—original draft preparation, F.C. and P.S.; writing—review and editing, F.C., J.P.V., N.L., J.S., T.P.d.S., E.K. and G.P.; visualization, M.M.L. and H.Á.; supervision, J.P.V.; project administration, G.P. and J.P.V.; funding acquisition, G.P. and J.P.V. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by FEDER funds through the COMPETE 2020 Programme and National Funds through FCT-Portuguese Foundation for Science and Technology under the project ref. UIDB/50025/2020-2023 and, SFRH/BD/145308/2019 (F. Carvalho). The funding from the European Union Horizon 2020 research and innovation programme H2020-DRS-2015 GA nr. 700395 (HERACLES project).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.