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MINERALOGICAL COMPARISON STUDY OF OLD MORTARS FROM SOUTHERN PORTUGAL CATHEDRALS (ÉVORA AND ELVAS)

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Abstract

The study of old mortars, based on integrated methodologies that combine mineralogical, microstructural, chemical, physical and mechanical characterization has an important role on the preservation of architectural cultural heritage, allowing a deep knowledge about the materials used, construction techniques, possible repairs and behavior [1-3].

In this context and in the scope of a project between the National Laboratory of Civil Engineering (LNEC), the University of Évora and the Portuguese Institute of Architectural Heritage (IPPAR) related to the characterization and conservation of traditional and historical mortars from Alentejo's religious buildings, (CATHEDRAL Project - POCI/HEC/57915/2004), different mortars from two important classified monuments, the Santa Maria Church in Évora (Evora's Cathedral), constructed between 13th and 16th centuries, and the Nossa Senhora da Assunção Church in Elvas (Old Elvas Cathedral), constructed in the 16th century, were collected and studied.

In this work, we present the results of the mineralogical characterization of the mortars that was accomplished by combining different techniques, namely optical microscopy, scanning electron microscopy coupled with Energy dispersive X-ray spectrometry (SEM-EDS) and X-ray diffraction (XRD). The combined use of these techniques with the geological information allowed a detailed insight on the nature of the aggregates and binders, the identification of neo-formation and alteration products and, in the case of Évora Cathedral, even the determination of the provenance of the aggregates used. Relating this information with historical data of the building it is possible to extract several conclusions about the construction materials and techniques used.

References

- [1] M.R. Veiga, J. Aguiar, A.S. Silva, F. Carvalho, Methodologies for characterisation and repair of mortars of ancient buildings in *Proceedings of the 3rd International Seminar on Historical Constructions*, Guimarães, 353-362, 2001.
- [2] A. Santos Silva, J.M. Ricardo, M. Salta, P. Adriano, J. Mirão, A.E. Candeias, S. Macias, Characterization of Roman mortars from the historical town of Mértola in *Heritage, Weathering and Conservation*, Fort, Alvarez de Buergo, Gomes-Heras, Vazquez-Calvo, Eds, Taylor & Francis, Madrid, 85-90, 2006.
- [3] A.E. Candeias, P. Nogueira, J. Mirão, A. Santos Silva, R. Veiga, M. Gil Casal, I. Ribeiro, A.I. Seruya, Characterization of ancient mortars: present methodology and future perspectives, *Ext. Abst. of CERC3 Workshop on Chemistry in the Conservation of Cultural Heritage*, EU-ARTECH, 4pp, 2006. (http://www.eu-arteche.org/files/Ext_ab/candeias.pdf)