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Roman mortars from Ammaia archaeological site – an interdisciplinary study

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Traditional and historic mortars are composite materials consisting of a binder (usually lime or hydraulic lime), aggregates (quartz sand, calcite or dolomite) and some additives (e.g. brick dust, volcanic ash) in order to increase adherence, workability, strength and durability. The characterization of mortars allows the identification of their phase and chemical compositions and the characteristic features related to the physical properties. Moreover, sometimes it is possible to identify the alteration products and, in some cases, establish the provenance of materials used in the manufacture of mortars.

The mortars are building materials that may reveal the technological capability of a society and their relation with space and environment. Mortars depend directly on the available raw materials and have a composite nature with many variables which depend strongly on the technological knowledge. Therefore, issues like the control of the aggregates nature and quality, the use of the correct aggregate/binder ratio, the mineralogical composition of the binder raw material and the control of the hydraulic properties by the employment of additives like artificial or natural pozzolans are characteristics that reveal information about the societies that built them.

The similarity between traditional mortars and sedimentary clastic rocks are evident. In both, it is possible to figure out cement that sustains together the clasts (in sedimentary rocks) or the aggregates (in mortars). Nevertheless important differences are obvious. For instance, additives are frequently present in mortars in order to get better mechanical properties and the very alkaline environments during the merging of the lime and the aggregates cause frequently the partial dissolution of quartz aggregates. Methods like XRD, TGA, optical microscopy, SEM-EDS and chemical analyses techniques are currently employed.

The methodology employed has been developed over the last 8 years and extensively tested in several case studies (see e.g. Silva et al. 2010 and references therein) and it was applied to mortar from Roman Ammaia (Marvão, Portugal). According to archaeological evidence the Roman town of Ammaia was settled in the course of the 1st century BC and developed soon as an important regional urban centre. The town was gradually abandoned around the 9th century and is now almost completely free of modern occupation. During some 15 years of archaeological fieldwork in Ammaia interesting results have been obtained about some of its infrastructures and many well preserved archaeological materials, most of which found “in situ”, have been collected (Vermeulen et al. 2005).

The physical, chemical and mineralogical study of the Ammaia archeological site mortars is contributing for the understanding of the urban evolution of the Ammaia Roman city (including the occurrence of ancient reconstructions) and for the knowledge of the construction technologies. The research focus on the identification of aggregates, binders and additives, binder to aggregate ratio and the evaluation of their state of conservation. Furthermore, the information gained is essential for their conservation and for the development of compatible mortars to be used in future conservation and restoration actions.

Silva, AS et al (2010) Characterization of Historical Mortars from Alentejo’s Religious Buildings, International Journal of Architectural Heritage, 4 (2) April 2010 , pp. 138-154

Vermeulen F. et al. (2005) Geoarchaeological observations on the Roman town of Ammaia, Internet Archaeol., 19, pp. 1-28