European Mineralogical Conference
Vol. 1, EMC2012-688, 2012
European Mineralogical Conference 2012

Potentialities of LA-ICP-MS analysis in recognizing the source area of volcanic aggregate within historical mortars: the case of "Villa dei Quintili" (Rome, Italy)

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This contribution focuses on the study of historical mortars from a Roman archaeological site (II century A.D.) known as “Villa dei Quintili”, a monumental villa located in the south-eastern part of Rome (Italy). The villa consists of several edifices showing building techniques that can be referred to diverse construction phases. This study regarded forty-six mortar samples, collected from different edifices within the monumental complex.
A multianalytical approach has been used in order to completely characterize the samples, thus gaining information on the technological process as well as identifying the different construction phases of the villa. However, the main purpose of the work concerned the identification of the source area of raw materials used in the preparation of mortars.
The study was carried out following a geochemical approach through the use of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). Spot analyses have been carried out either on the binder (lumps) or the aggregate. The analysis of lime lumps is essential in the study of mortars since their composition usually resembles that of the original lime. Results of LA-ICP-MS analysis of the lumps have been compared with trace element composition of a lime sample taken from a limekiln discovered in the monumental complex, to establish if examined mortars have been prepared in situ.
In addition, LA-ICP-MS was also applied to determine the trace element composition of pozzolana and clinopyroxenes occurring in the aggregate fraction of the mortars. Data were then compared with those of literature, which refer to locally outcropping pozzolana samples and clinopyroxenes of volcanic rocks of the Roman magmatic province. This approach, even if limited to major elements, has been recently proposed by Barone et al. (2010), who demonstrated its validity as a powerful tool for provenance studies of ceramics. The primary result of this study is that investigation of the composition in terms of trace elements allows the unequivocal identification of the source for raw materials used as aggregate in the preparation of mortars.