



## Characterization protocol of Florentine historical mortars for absolute dating

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The raw materials used in the realization of a mortar provide information on the supply areas, original recipes and ancient technologies used to realize a building or an artefact. The raw materials utilized may vary over time, so they may be useful to give an indication of its relative dating.

In this field, from the pioneering studies of Labeyrie and Delibrias, (1964) and Stuiver and Smith, (1965), was evaluated the possibilities to radiocarbon dating of historical mortars; this research field still open, since may present many issues in its application. In principle, the carbon fraction datable is represented by calcite ( $\text{CaCO}_3$ ) resulting from the hardening of the quicklime (calcium hydroxide,  $\text{Ca}(\text{OH})_2$ ) that reacts with  $\text{CO}_2$  from the atmosphere. The lime binder and lump (unmixed portion of lime in an aerial mortar) represent the portions that must be isolated from other carbon sources to accurately date mortars. Previous research shows that suitable and proper sampling of mortar samples is of fundamental importance for a conclusive radiocarbon analysis.

In recent years, a complete characterization of the mortar before radiocarbon dating was strongly encouraged (Cantisani et al. 2021). The minero-petrographic characterization is the first step to identify the type of mortar and to develop an efficient analytical approach that allows to select the most suitable component of mortar for absolute dating.

This work is aimed at mortar characterizing of an important architectural Cultural Heritage in Florence (Italy), Palazzo Medici Riccardi, to understand the building technique, the choice of raw materials, the history of its construction and, possibly, the presence of mortar datable fraction. A correct sampling and characterization procedures allow to know the composition of the binder, the nature of the aggregate, the presence of lumps, the carbonate origins etc. Therefore, to reduce the cost and time of dating, it is necessary to utilize always a fully characterized sample, consisting of a calcite binder, to be subjected subsequently to analysis to accelerator mass spectrometry (AMS) for dating.

The research proposes on operative protocol applied on 12 mortar masonry samples of Palazzo

Medici Riccardi, composed by: i) a preliminary in-depth characterization of mortar specimens, by means of multi-analytical techniques such as OM, XRPD, TGA, SEM-EDS, OM-CL for a chemical, mineralogical and physical characterization fields; ii) non-destructive analyses of datable samples selected, using XRPD, OM-CL and ATR-FTIR (Calandra et al. 2022). The combined use of characterization techniques is the key to obtaining more evidence regarding the composition of the samples to be dated. The selection protocol has made it possible to choose several samples for dating, thanks to which the history of the construction of Palazzo Medici Riccardi will be further explored.