

## Material Characterisation of Stucco Decoration Fragments from the Early Byzantine Cathedral of Dion, Northern Greece

The objective of this analysis was to study the composition of the plaster used in the stucco decoration of Dion's Early Byzantine cathedral, by using **Non Destructive Testing Methods**. The main question that needed to be addressed was whether the material was lime or gypsum based.

### The monument



Figure 1

The Early Byzantine cathedral is among the most important monuments of the ancient city of Dion (fig. 1) and occupies a central position in the town plan. In its lifetime, the monument underwent two major building phases, which correspond to two successive churches, conventionally called Basilica A and Basilica B. Basilica A was a three-aisled timber roofed basilica that dates to the early 5<sup>th</sup> century AD. Of the interior decoration of Basilica A floor mosaics with geometric motifs are preserved in the nave and the narthex, while the Bema floor was laid with marble opus sectile.

Moreover, the church was decorated with wall paintings supplemented by stucco reliefs, which presumably were placed on the upper part of the interior walls. From the scant fragments preserved, we can only conclude that they rendered architectural and vegetal decorative elements (fig. 2).



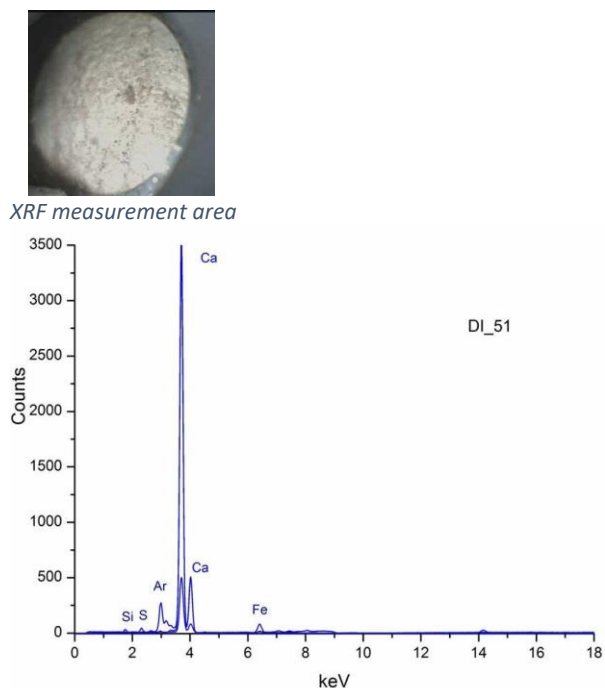
Figure 2

Stucco decoration was made of lime or gypsum plaster that was moulded or modelled into relief decoration for walls and ceilings. This type of decor was particularly favoured in Roman times and remained popular during the early Byzantine period, too.

### XRF elemental analysis

The XRF analysis revealed calcium (Ca) as the only major component, showing – in comparison to the identification of calcium carbonate (CaCO<sub>3</sub>) by microRaman spectroscopy – that the stucco

applied here was lime based (**fig. 3**). The secondary elements Si, Fe, Ni, Sr are commonly found in lime plasters.



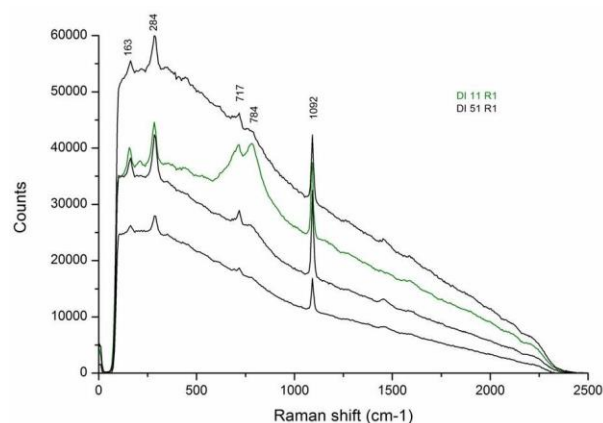
Major elements Ca  
Minor elements Si, S, Fe, Sr, Ni

**Figure 3**

### Molecular structure investigation using microRaman spectroscopy

MicroRaman revealed the calcitic composition of the plaster reliefs (**fig. 4**). In comparison, the given diagram also shows the spectrum of a

similar fragment of stucco decoration from the Forum area (DI\_11). In this object, non-carbonised lime was also identified.



**Figure 4**

### Conclusions

The overall evaluation of the analytical results derived from **XRF, microRaman and FTIR measurements** revealed the calcitic composition of the plaster decorations. The small amount of sulphur detected by XRF indicates that sulphation (gypsification) of calcium carbonate has occurred locally.

These results confirm, at least in the case of Dion, the predominant use of lime plaster in stuccowork, which simulated but even substituted marble architectural decorations.