Ormylia Art Diagnosis Centre

ARISTOTLE UNIVERSITY OF THESSALONIKI

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SURGICAL EXCAVATION

Non-Destructive Investigation of the Structure, Materials and Constructional Features of a Gilded Glass Sheet Fragment (Ancient Dion, Greece)

Small, irregular fragment of 5.2×3.5cm and 0.9cm thick. The top surface of the translucent green glass sheet was covered with a very thin gold leaf, which in turn was sealed with an almost colorless layer of glass of particularly small thickness (almost 2mm). The bottom surface of the fragment is rough, bearing the footprint of the one on which it was molded. The fragment retains part of one of the outer sides of the sheet that is straight and has a curved upper surface which has not been covered by the gold leaf or the final glass layer. According to the available data, it remains uncertain whether this fragment was part of a decorative tile belonging to a luxurious wall decoration in opus sectile or a residue of the process of cutting gilded tesserae for mosaics, as in both cases the construction technique was the same. It is certain, however, that it was intended for the decoration of a public building, most likely of the Early Byzantine period.

Figure 1 *Top and bottom surface of the fragment.*

Analytical methods

From the **UV-vis spectroscopy** measurements in diffuse reflection mode, the colour was determined numerically at various points on the surface of the object. The measurements are depicted as colour coordinates in the L*a*b* CIE 1976 standard colour space (see **fig. 2**).

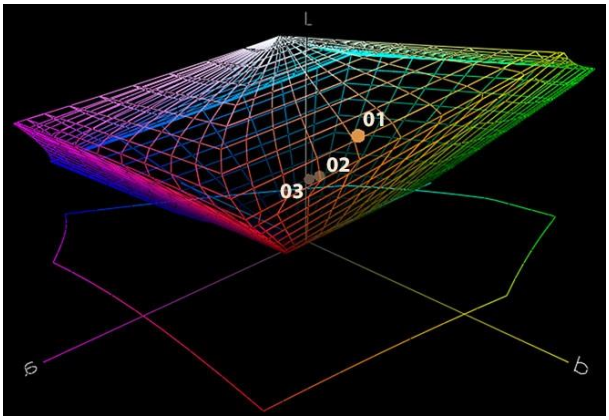
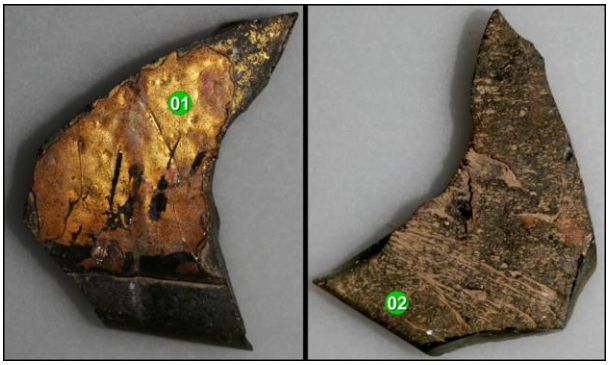


Figure 2

The major elements of the glass determined by **X-Ray Fluorescence** analysis were silicon (Si), calcium (Ca), potassium (K), manganese (Mn), iron (Fe), and lead (Pb). Metal leaf: gold (Au). The final, thin glass layer applied over the metal leaf is of the same composition as the main body of the glass sheet. The elemental analysis also confirmed that the metal leaf has a particularly high gold content (Au).



Εικόνα 3 *XRF measurement areas on the top and bottom surface of the fragment.*

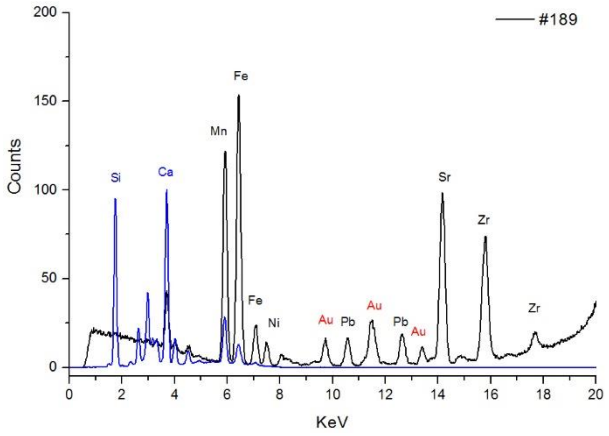


Figure 4 *XRF method – measurement area 01.*

Infrared spectroscopy (FTIR) offered additional data regarding the materials of the glass fragment. In the characteristic FTIR glass spectrum (see **fig. 5-6**), the peak at 3540 cm-1 corresponds to groups of -OH or H2O (water) trapped in the form of moisture or is crystalline. The peaks at 1337, 820 and 507 cm-1 may be due to the presence of potassium (K), silicon (Si) and lead (Pb) compounds in the structure.

Figure 5 *FTIR method – measurement area 01.*

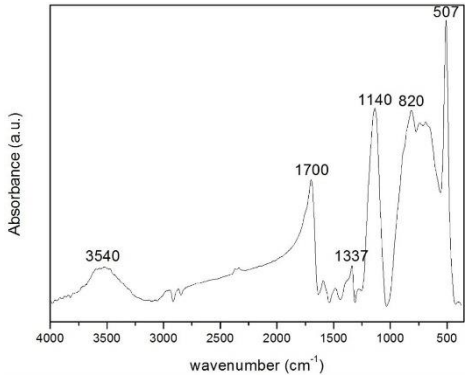


Figure 6 *Infrared spectroscopy (FTIR)*

Finally, the **acoustic microscopy (UT)** measurements recorded the roughness of the various surfaces of this multilayer object (**fig. 7**), as well as the air bubbles located in the interior of the glass, which, as found, appear more compact and well-formed near the surface (**fig. 8**). In addition, the thickness of each layer was accurately calculated.

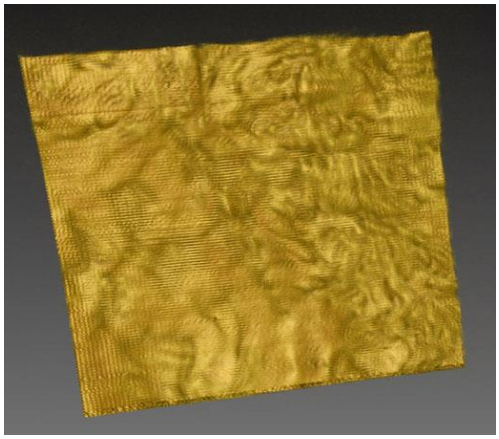


Figure 7 *Visualisation of the surface roughness.*

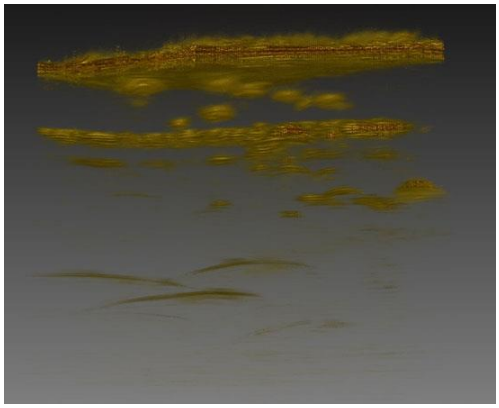


Figure 8. *Profile of the fragment. It depicts the top surface of the first glass layer, the trapped bubbles in it, the intermediate gold leaf, as well as bubbles and imperfections in the second, main layer of glass.*