Physicochemical characterization of late post-Byzantine wall paintings Monastery of the Ascension, Elassona, Mount Olympus, Greece

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INTRODUCTION

The Monastery of Ascension is located in Sykea, a village of Elassona town near Mount Olympus, with a significant charitable and cultural contribution in the area. Its catholicon was constructed and painted in the mid-17th century, while the iconographer remains unknown. This work concerns the study of 17 samples of the catholicon wall paintings – including plaster and painting layers- and its purpose is the characterization and the identification of the painting technique that was used at that period of time.

Wall painting under study, Catholicon, Unknown artist, Mid-17th century

METHODS

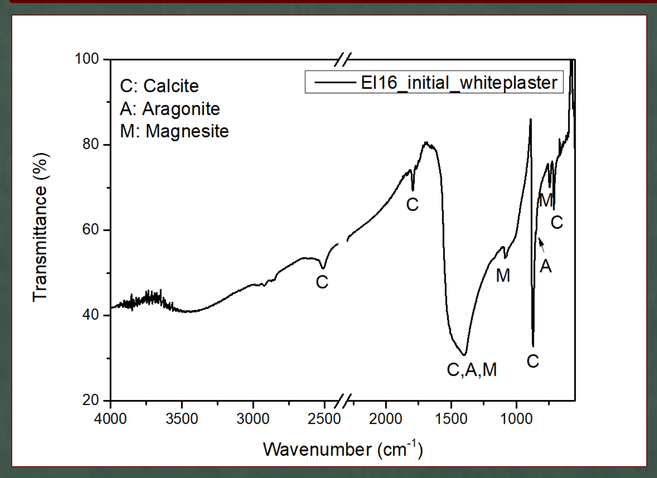
Optical Microscopy: Zeiss STEMI DV4.
μ-FTIR Spectroscopy: i-Series Perkin Elmer microscope and Spectrum 1000 Perkin Elmer spectrometer, MIR region, transmittance mode, 32 scans, 4 cm^{-1} resolution.
SEM-EDS Microscopy: JEOL JMS-840A with Oxford ISIS 300 detector, 20 kV accelerating voltage.
Thermogravimetry: Setaram SETSYS 16/18 system. Dynamic conditions, temperature range 25-1000 °C with a heating rate of 20 °C/min, N_2. Samples of 5-8 mg in alumina crucibles.
XRD: Rigaku Ultima, Bragg – Brentano, CuK_a, 40 KV, 30 mA, range (2θ): 5-90°, step size: 0.05°, count step: 1.0 s/step.

RESULTS

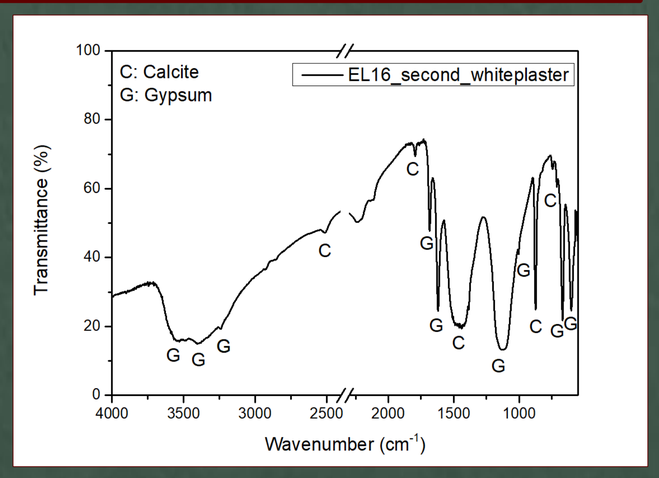
Optical Microscopy

OM image of Sample El16. The presence of a second pictorial phase -including a plaster layer- is noted

μ-FTIR

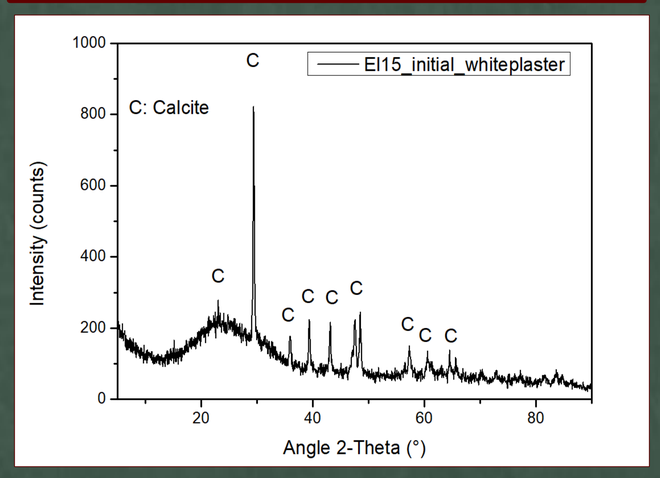


μ-FTIR spectrum of the El16 white plaster, attributed to the initial pictorial phase. Calcite, Aragonite, Magnesite, Silicates



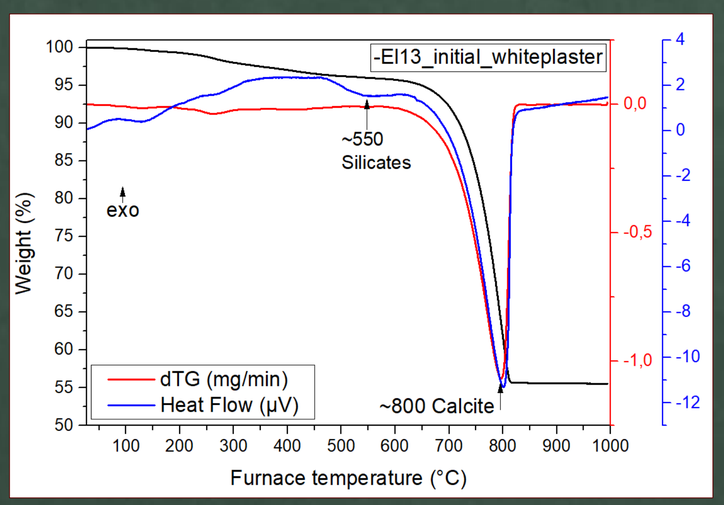
μ-FTIR spectrum of the El16 second white plaster, attributed to overpainting or to a second pictorial phase. Gypsum, Calcite , Silicates

XRD

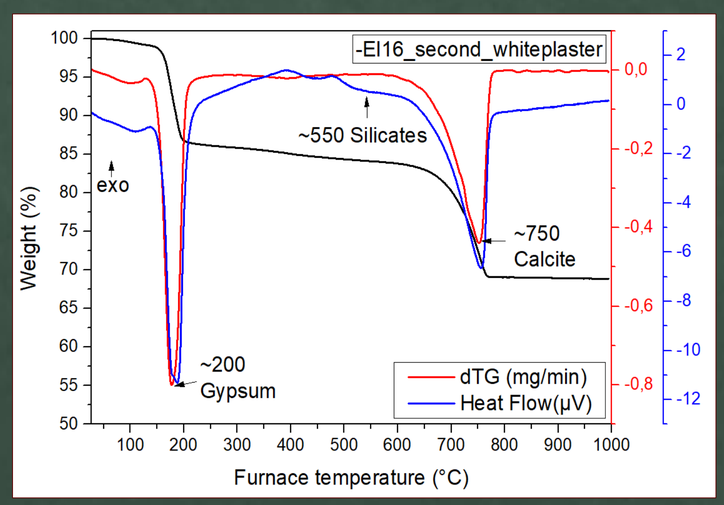


XRD pattern of the El15 white plaster, attributed to the initial pictorial phase. Calcite

TG

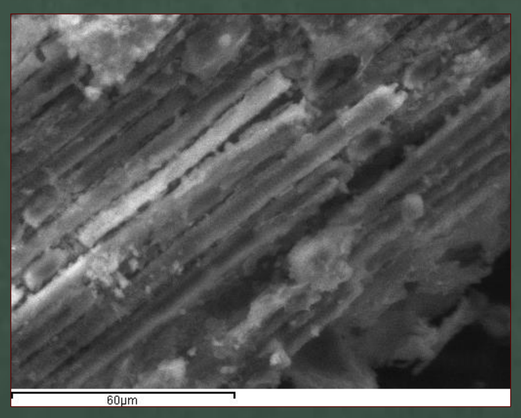


TGA thermograph of the El13 white plaster, attributed to the initial pictorial phase. Calcite and silicates

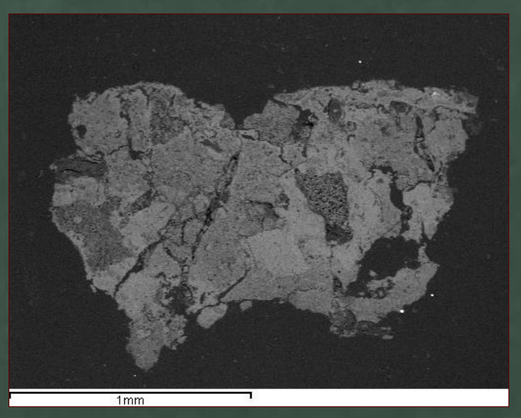


TGA thermograph of the El16 second white plaster, attributed to overpainting or to a second pictorial phase. Gypsum, Calcite and silicates

SEM-EDS



SEM image of the El12 of a wooden fiber, characteristic of the white plaster layer.



SEM image of the El16 white plaster, attributed to the initial pictorial phase The presence of aggregates is noted.

CONCLUSIONS

The combined spectroscopic and microstratigraphic results indicate the use of fresco technique; calcite with silicates and wooden fibers were used for the initial white plaster layer, with a small participation of aragonite, while -in some cases- magnesite was also identified. Moreover, no organic binder was detected, the painting layers have irregular thickness - below 100 μm-, and no Ca-interface layer was detected. Overpainting was spotted in one of the samples under study, in sample El16, in the form of a second pictorial phase containing a plaster layer also of calcite, gypsum and silicates. In addition, the collected FTIR spectra of the painting layers showed the presence of Primal, which is attributed to previous works of restoration, while the sporadic presence of calcium oxalates and nitrate radicals are attributed to degradation phenomena. To sum up, the artist's palette is quite simple, as the painting layers consist of red, yellow and brown colors, while ferrous pigments (ochres), malachite and carbon black were the identified pigments, with indications of the use of lazurite.

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