

Study of a traditional pair of women's shoes from Chios island dated to 1905

7th Balkan Symposium on Archaeometry Athens 22-25 September 2020 University of West Attica



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Introduction

The poster focuses on the study and of a pair of shoes (known as *slippers*) from Pyrgi of Chios, which is part of the collection of the *Lykeion ton Hellenidon*, a non-profitable organization that takes care and preserves traditional and historical costumes and accessories from Greece. The *slippers* are flat and have a textile upper with leather sole with pointed front. A deep red velvet fabric with metal thread embroidery forming a flower in raised technique with *file* threads surrounded by patterns with *tirtir* threads is used as textile upper. The same fabric covers the insole area but the embroidery is flat comprising of *file* threads and sequins (Karatzani 2008). Tassels made of red threads were used for their decoration, one at the pointed edge and three at the edge of the textile upper (some are now missing). The leather sole is partly sewed and partly glued to the shoe upper. The uniqueness of these shoes is due to both the number of surviving examples and the fact that there is not enough written information about how they were made. The history of shoes is of great interest because they can provide information about the economic and social status of their owner. Moreover, the *slippers* seem to have a lot in common with eastern shoes, due to the geographic location of the island and to the possible trade routes of the period produced (Görünür, 2014). For these reason it was decided to contact a thorough investigation before any conservation interventions. The aim of this investigation was to identify and record the consisting materials and the manufacturing techniques used for their production, so OM, SEM/EDX, X-Radiography and X-Ray Computed Tomography as well as FTIR/ATR were used to study the shoes.

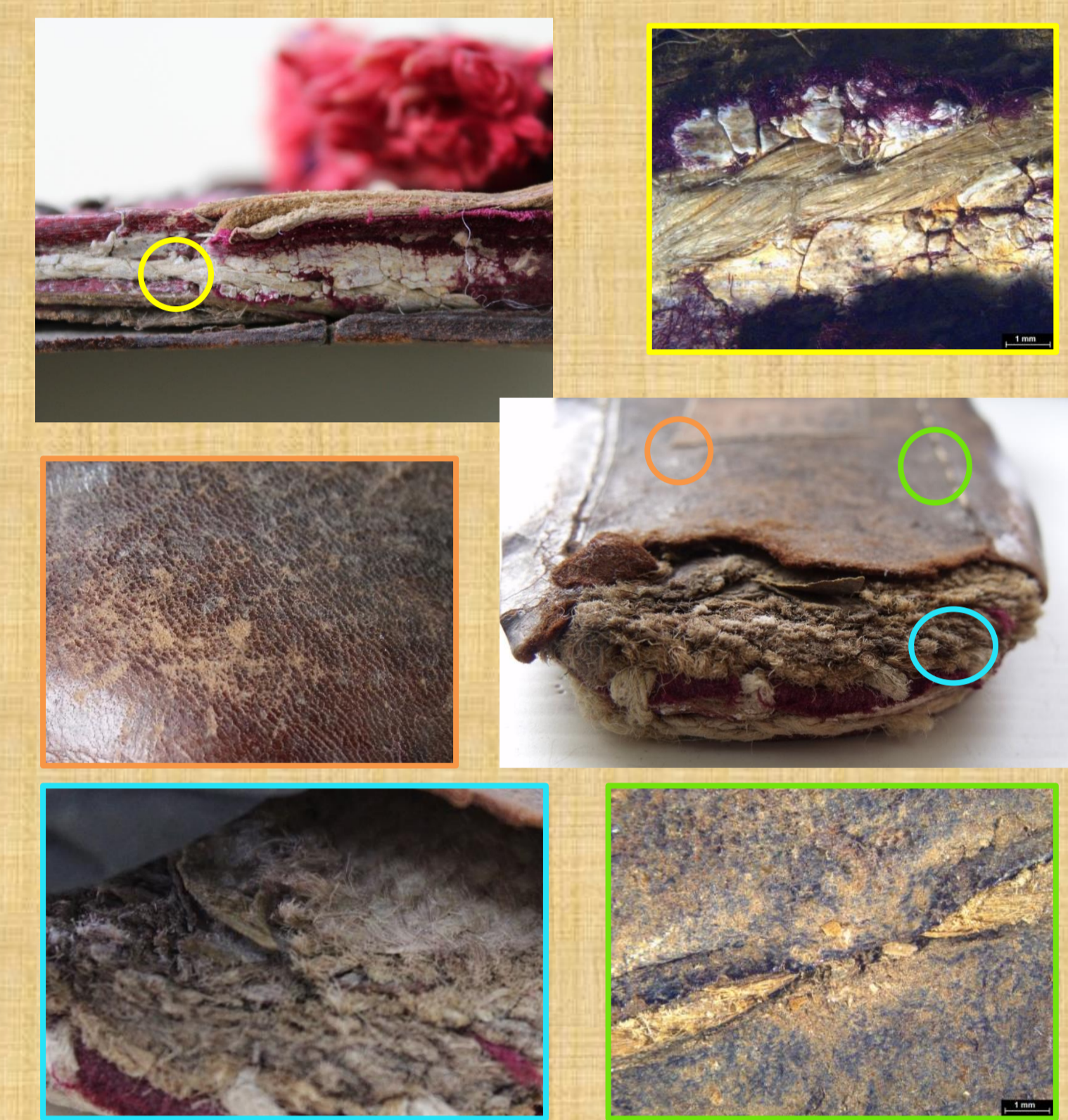


The *slippers* and the leather outsole with the stitching. The paper with accession number is glued to the leather outsole.



Optical Microscopy

Initially, the study of the object under the microscope gave information about twisting of fibers and types of metal threads, the velvet fabric and the condition of leather, metals and fibers. Subsequently, samples of the metal threads, the velvet fabric and the tassels were observed with a Leica DMLP Polarizing Microscope in order to identify the various fibers used on the objects. The velvet (base fabric and pile) was made of cotton. Cotton was also used as core for the metal threads and as sewing thread for the tassels and the *tirtir* threads. The cotton fibers are friable and dirty, while the metal threads are corroded and in some cases are untangled. In the case of the tassels, even though there is a colour and size difference among them, they are all made of silk threads. Finally, the sequins were made by punching and have hexagonal opening in the center.



OM images of the component materials of the slippers. Details of the outsole layers, the leather outsole, the sewing thread and the textile lining of the outsole.

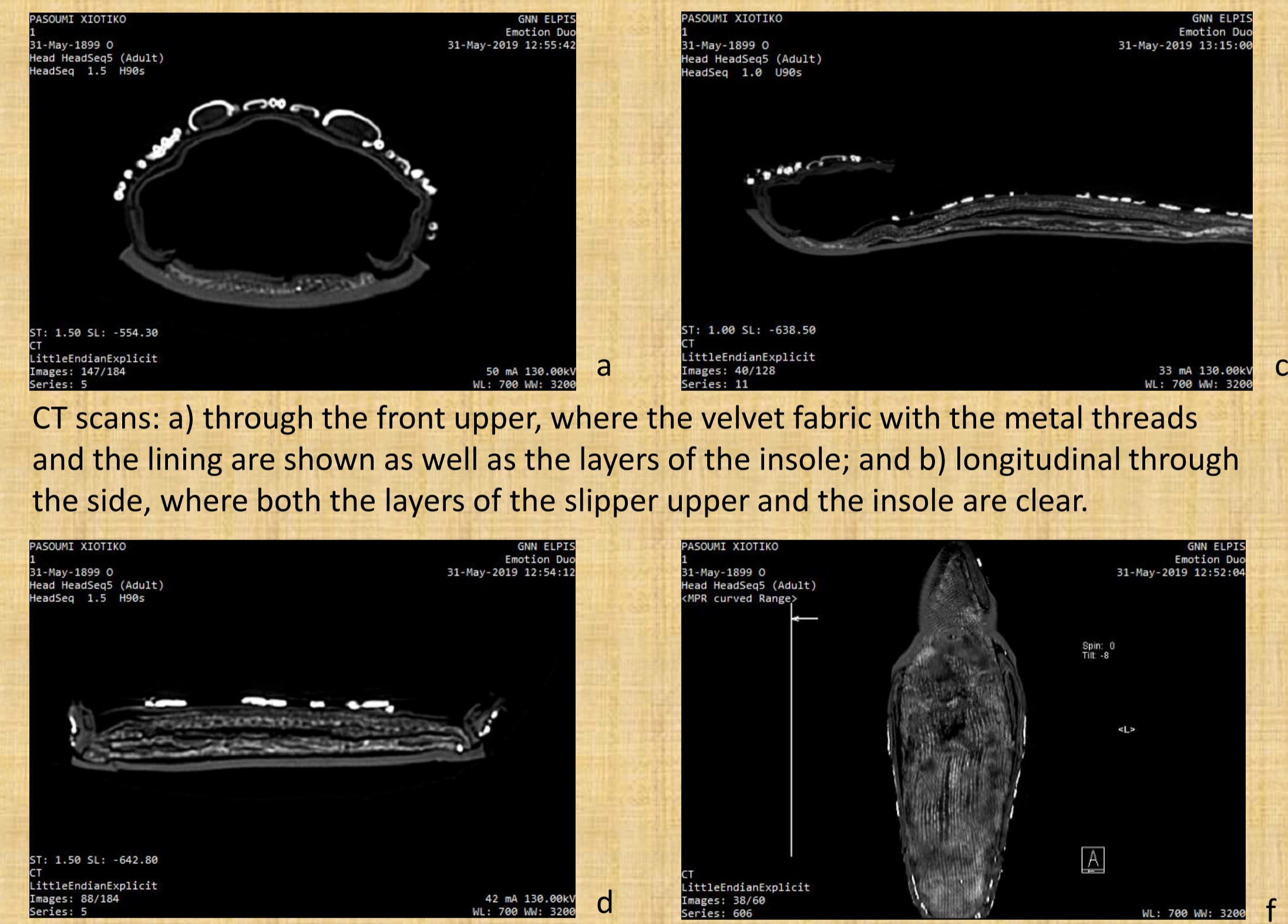
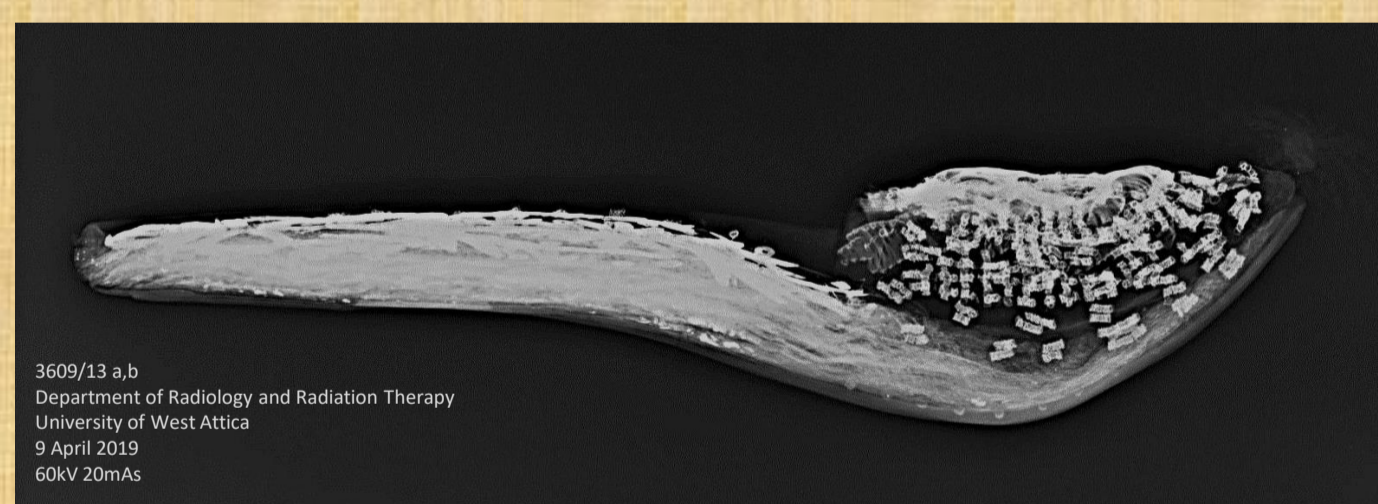
X-ray Radiography and X-Ray Computed Tomography

X-ray radiography was used to determine the manufacturing methods used for the production of the *slippers*, as well as the state of preservation of the component parts which are not visible with visual observation. Both the upper and the side of the objects were studied aiming to visualize the component material distribution. After digitally adjusting the radiographs the metal thread embroidery was clearly observed with the stitching used to secure them and the paper support of the embroidery on the velvet. The structure of the thick fabric under the velvet of the insole was also very clear. However, it was not possible to obtain more information about the layers comprising the insole.

X-Ray Computed Tomography was decided to be used in order to examine the insole materials and construction (Morigi *et al* 2010). With the successive small sections of the object both horizontally and vertically, internal deformations of the construction materials were determined, explaining the shape of the *slipper's*. Furthermore, it was possible to identify the successive layers of the sole (leather and supporting materials), their morphology and thickness and after a closer inspection the layers joined with seams were also observed.



Radiograph view of the slippers from above and from side. It was not possible to determine the various layers used for the manufacture of the insole.



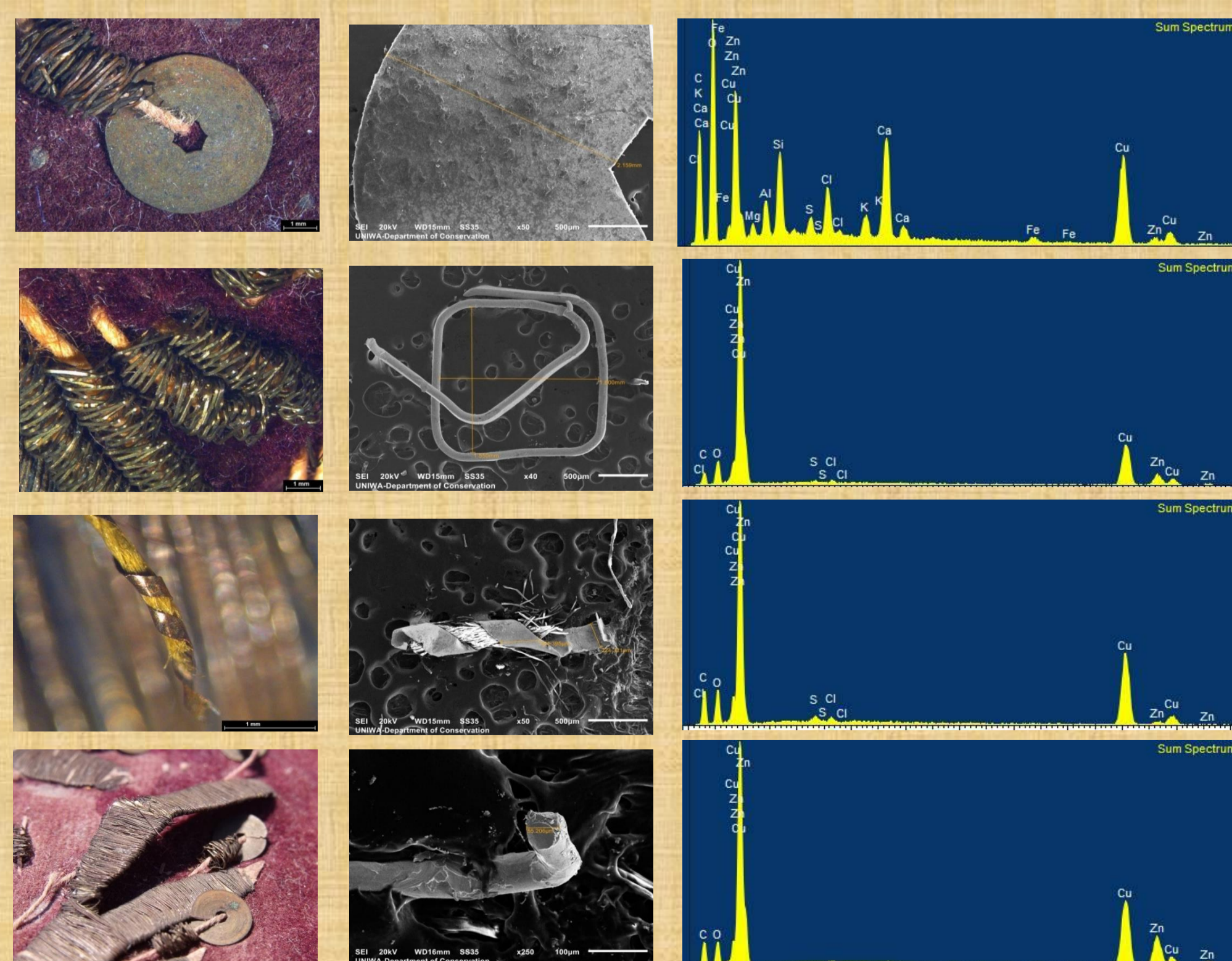
CT scans: a) through the front upper, where the velvet fabric with the metal threads and the lining are shown as well as the layers of the insole; and b) longitudinal through the side, where both the layers of the slipper upper and the insole are clear. CT scans: c) through the sole, where the lining is shown; and d) longitudinal scan through the thick textile lining of the sole.

SEM/EDX and FTIR-ATR

The elemental analysis of the metal threads, the determination of their condition, as well as the measurement of dimensions (width, thickness and diameter) was made with SEM-EDX. They were all made of brass (copper and zinc alloy). The yellowish look of brass resembles gold, so possibly it was used to imitate it.

Finally, all the data obtained was further confirmed with FTIR-ATR. Spectrums of all the component materials were obtained and identified, either by using a known database or by investigating the vibrations of the molecules that appear as peaks and identifying them bibliographically, taking also into consideration the results from all the others techniques used.

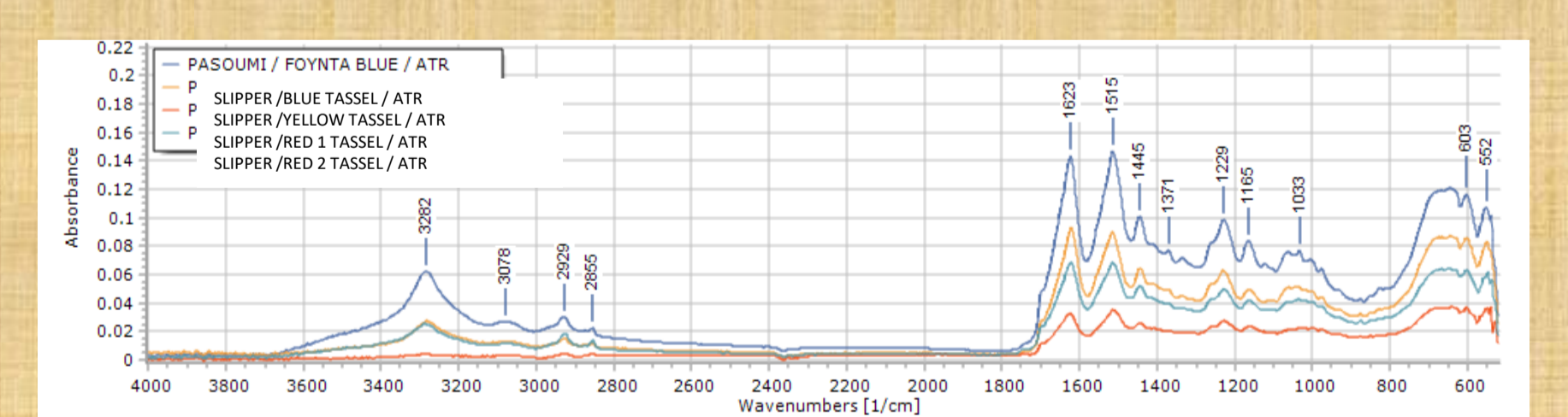
The task of the conservator is to preserve both the integrity and the information each object bears. The analysis performed helped to identify the construction materials, the technological characteristics and the condition of the objects in order to choose the most appropriate treatment methodology. They also aid to date the shoes, connect them with specific crafts and social groups that used them and to track connections with oriental shoe production, based on the proximity of Chios island with Turkey. These are important issues, especially since the literature about shoe production is limited.



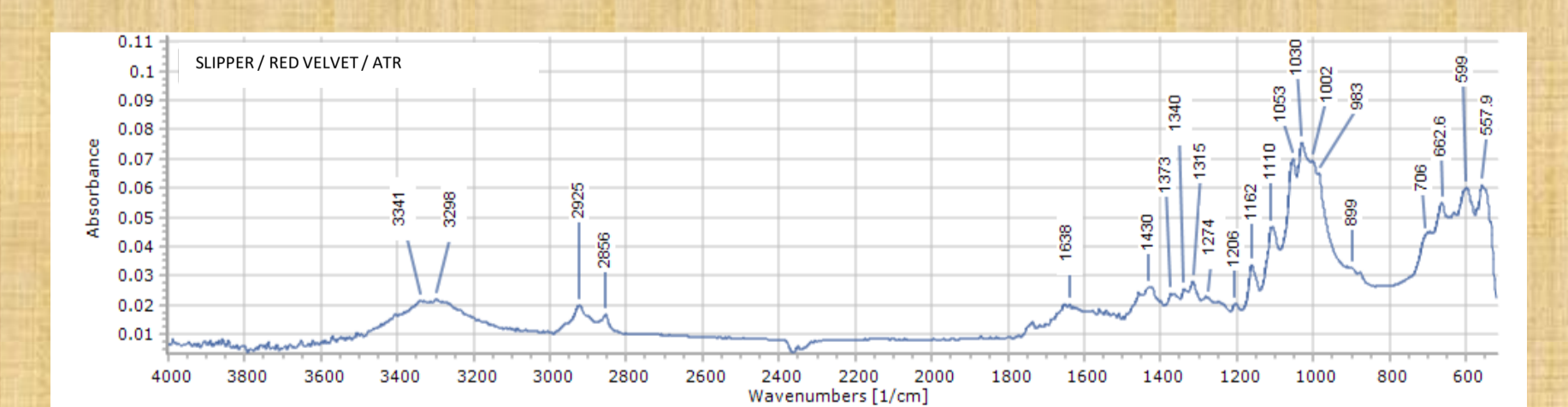
SEM/EDS data: photomicrographs with measurements and spectrums of the various metal threads and the sequin, showing the elemental composition of the metals Cu and Zn alloy (brass).

Acknowledgements

The authors want to thank: "The Lykeio ton Hellenidon" for providing the wonderful objects and the permission for sampling them. Dr St. Boyatzis for the FTIR/ATR analysis, Dr V. Argyropoulos for providing access to TC analysis, Mr Th. Panou for the X-ray radiography, Ms M. Dousi for the TC analysis and Mr Th. Karabotsos for the help with SEM/EDS analysis



Spectrums of the various coloured threads from the tassels showing the characteristic vibrations for silk threads



Spectrum of the velvet fabric showing the characteristic vibrations for cotton fibers.

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