

White European Lacquer: a case-study

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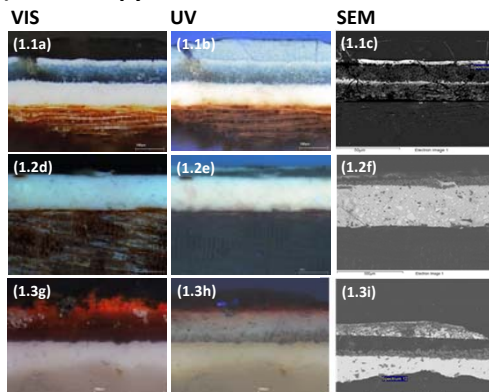
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INTRODUCTION

A multi-disciplinary and multi-analytical study of a white lacquered cabinet from a private collection has shed new light on its materials and techniques. Stylistically this lacquered cabinet can be situated in the late 17th or early 18th century tradition of white European lacquers. Inspired by trendsetting white lacquer works of Gérard Dagly and Martin Schnell, this Western cabinet with decorative hinges, corner mounts, and motives such as the dancing boy, chrysanthemums and flying wildlife clearly aims to imitate the exotic atmosphere of Far Eastern lacquerware.

1) Microscopy and SEM



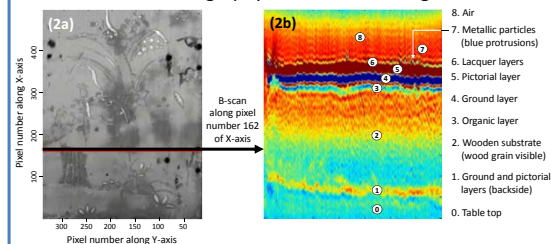
VIS/UV and SEM images of embedded cross sections of samples taken under the lower right hinge (sample no. 1.1), the backside of the cabinet and the left side.

Using Scanning Electron Microscopy (SEM) with EDX (Energy-dispersive X-ray spectroscopy), point measurements provided elemental information of the layers of interest. On the wood, a lead white layer with a small amount of smalt is applied, followed by a smalt rich layer for the blue decoration. Over the complete surface, an organic layer is present. Finally, a vermillion paint layer serves as an underground for the metallic particles.



2) Terahertz Time-domain Imaging (Thz-TDI)

Column B-scan: stratigraphy of the scanned region



C-scans: imaging surface and sub-surface layer planes

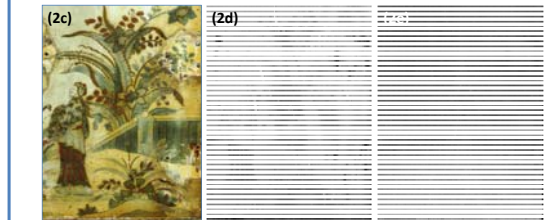


Fig. 2c: scanned region, Fig. 2d: surface imaging visual light Fig. 2e: imaging of wooden substrate

3) XRF Element mapping

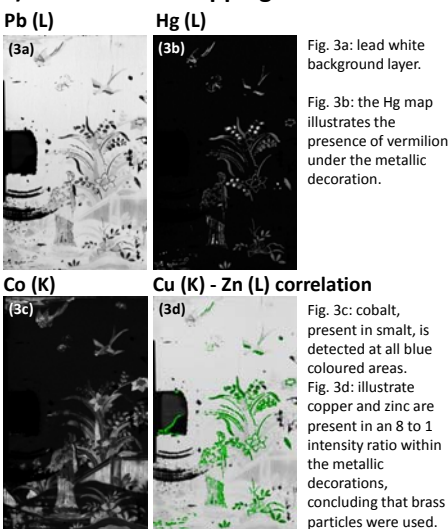


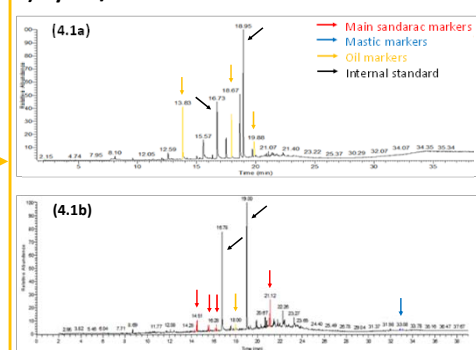
Fig. 3a: lead white background layer.

Fig. 3b: the Hg map illustrates the presence of vermilion under the metallic decoration.

Fig. 3c: cobalt, present in smalt, is detected at all blue coloured areas. Fig. 3d: illustrate copper and zinc are present in an 8 to 1 intensity ratio within the metallic decorations, concluding that brass particles were used.



4) Py-GC/MS



Analysis of organic components in the lacquer layers is performed by thermally assisted hydrolysis and methylation-gas chromatography-mass spectrometry (THM-GC/MS). The lead white background layer contains a drying oil (Fig. 4.1a). The transparent and glossy finish consists of sandarac with (probably) mastic. Only small quantities of fatty acids were detected, indicating a spirit-resin based varnish. The fatty acids could have migrated from the underlying oil-based ground layer or suggest the use of a non-drying polishing agent (Fig. 4.1b).

RESULTS

The results of the cross-sections' VIS, UV, SEM-EDX and MA-XRF scanning show no anachronisms or anomalies in the observed materials and techniques. The smalt blue decoration on lead white background was visualised with all techniques. VIS-microscopy and SEM-EDX both show this background layer was mixed with a small quantity of smalt. Smalt could have been used as an optical brightener, creating a blueish hue which increases the perceived optical brightness. Vermilion was used for all red colours and to build up a low relief for the brass metal powder. The Terahertz-TDI imaging equipment allowed us to explore the instrument's possibilities and limitations for the ELiNC-project's technical research. The Thz-images of both B and C-scans are consistent with the observed layer sequences of the cross sections and revealed no irregularities. THM-GC/MS analysis of the white background indicates the use of a drying oil as a binder. The analysis of the transparent varnish, sampled underneath the fire gilded hinge on the upper right, points to the use of sandarac and mastic. Only a small quantity of fatty acids is present. The fatty acids could have migrated from the underlying oil-based ground, or could suggest the use of a polishing suspension for the varnish's top coat, consisting of a non-drying oil with fine abrasive particles. Many 17th and 18th century recipes mention the use of sandarac and mastic as main ingredients but are often joined with other products such as camphor and spike oil. The latter two being both volatile, become undetectable over time.

A spirit varnish with a high content of sandarac, and mastic as plasticiser, becomes a transparent and glossy lacquer finish after polishing. These physical aspects, combined with a bright white background, resulted in a brilliant white porcelain look. Contours of prominent blue and red scenery were highlighted by a raised brass-particle line hence, scattering light. The combination of both materials and techniques resulted in a contemporary trendy cabinet and would make it a fashionable centre piece to any late 17th century room.

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