

Article

# Exploring Manufacturing Process and Degradation Products of Gilt and Painted Leather

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**Abstract:** In this work, we studied the manufacturing processes and the conservation state of gilt and painted leather fragments from Palazzo Chigi in Ariccia (Italy) by using different analytical techniques. Leather fragments present a silver leaf superimposed onto leather support. A gold varnish and different painted layers decorate it all. A top-down analytical approach was used to investigate this complex multilayer structure, which adopted techniques with different sampling depths. Organic and inorganic constitutive materials together with related degradation products were studied by time of flight secondary ion mass spectrometry (ToF-SIMS), attenuated total reflectance-Fourier transform infrared spectroscopy (ATR-FTIR), and macro X-ray fluorescence (MA-XRF). The findings have revealed the presence of different elements and species as calcium and iron in the leather support, which was attributed to the un-hairing process in the leather tanning. Regarding what concerns the silver leaf, where the varnish cracked, silver chlorides, oxides, and sulfides were detected as degradation products of the silver leaf. Proteinaceous compounds were also identified where the silver leaf is unprotected by the varnish. These ion signals reveal a potential use of animal glue on both sides of the silver leaf to promote durable adhesion. In the gold varnish, the surface analysis revealed organic compounds such as resins and oils. In particular, the copresence of linoleic, arachidonic, and lignoceric acid ion signals in the yellow area suggests the use of aloe as a colorant. Lead ions in the same area were detected and attributed to the use of lead as siccative. Blue areas were obtained by using indigo and lead white in addition to an oil binder. This is confirmed by the detection of indigotin, fatty acid, and lead soap ion signals. A copper-based pigment was used to depict the green areas and copper oxalates were identified as its degradation products. Lastly, no significant information about the red colorant was obtained. Colophony is present as a component of the final varnish.

**Keywords:** leather; MA-XRF; ATR-FTIR; ToF-SIMS; manufacturing process; degradation products

## 1. Introduction

Gilt and painted leather was one of the most luxurious types of wall decoration largely used in high-status public buildings, palaces, stately homes, and high-class mansions. Examples of gilt and painted leather can be found in decorative wall hangings, paintings, and other furnishings. It was used in ecclesiastic settings as altar frontals and ecclesiastical vestments [1].