

# Technological and compositional study of the gold leaf from Portuguese Baroque altarpieces from the northwest region

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Throughout the second half of the 17th century and the first half of the 18th century, Portugal witnessed an increase in altarpiece production and in the use of gold in church decoration. The gold alloy composition should have properties that allowed it to be transformed in very thin leafs by the gold-beaters. The leafs were then applied by the gilders, over the carved and prepared wood.

This research aimed to identify distinctive features in the gold applied in the main altarpieces of the churches of Jesus (Aveiro), São Bento da Vitória (Porto), Porto Cathedral, São Francisco (Porto), Santa Clara (Porto) and São Paulo (Braga).

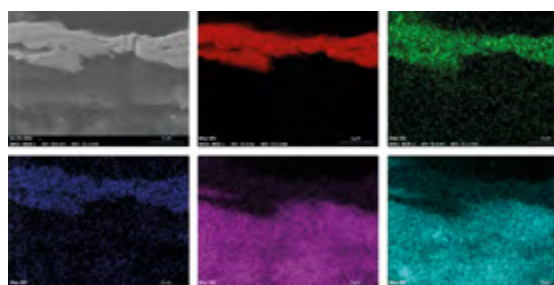
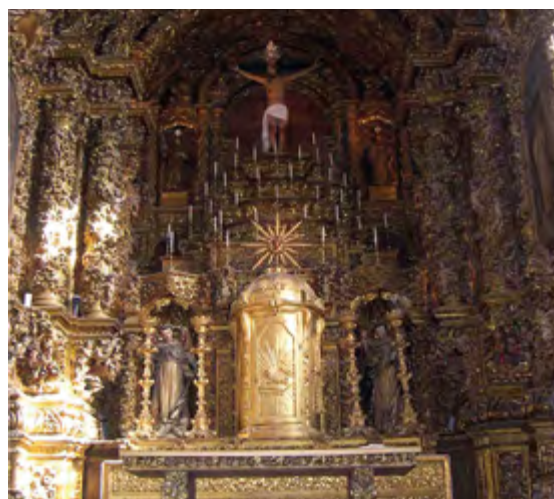
The use of a multi analytical approach and the knowledge of the advantages and disadvantages of each method, made it possible to accurately study the gold leaf and the gilding technique.

Through a combination of optical microscopy (OM) and scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS), it was possible to identify the presence of a water gilding with three distinct layers – gold, bole and ground – with no traces of regilding. The use of SEM-EDS allowed to define the elemental profile of the layers and to identify an alloy with approximately 22 carat. The trace elements were identified through inductively coupled plasma mass spectrometry (ICP-MS). The use of synchrotron radiation micro X-ray fluorescence (SR- $\mu$ XRF), applied to Aveiro and Porto Cathedral samples, confirmed the presence of previous detected elements and allowed to define the layers elemental profile.

Considering that the analytical results point to a geological provenance from South American deposits and the historical sources confirm that Brazil was Europe

main gold supplier and a Portuguese colony at the time of the gilding of the altarpieces, it can be assumed that the gold used has a Brazilian origin.

The definition of a profile for the gold through a well-structured and defined protocol, can be an asset in the setting of new historical, stylistic and technological approaches, revealing similarities ignored until now. In a final analysis, this profile will be an important advantage for the conservation and restoration of these art works. The knowledge of the gold characteristics and the applied techniques will allow to define a more accurate intervention methodology, based on the information of material and technological features of the altarpieces.



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**FIGURE 1**  
Church of Jesus (Aveiro, Portugal) main altarpiece.

**FIGURE 2**  
SEM-EDS image (8000x) of the cross-section of a sample from the church of Jesus main altarpiece and elemental mapping: Au, Ag, Cu, Al e Si.