



## Study by non-destructive technique of gilding coat of arms of the Real Alcázar of Seville, Spain

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The Real Alcazar of Seville is a building inscribed in the World Heritage List, being the most ancient Real Palace in Europe still in use. It was built over roman buildings, from the XI century to our days, exceptional buildings and gardens of the highest architectonical, cultural and historic value.

High value wall paintings of different periods are located in different places all over the palace. In one of its chamber – the King's bedroom - golden medallions that represent the coat of arms of Leon and Castilla Kingdom appear decorating its walls.

The objective of this work was the study of the materials employed in the manufacture of these coats by portable and non-destructive techniques: X-ray diffraction (XRD) and X-ray fluorescence (XRF) and Raman spectroscopy. The support used for gilding was also studied using conventional techniques such as: powder X-ray diffraction (powder XRD), thermal analysis (DTA-TG) and FT-IR spectroscopy.

The results obtained by portable XRD, XRF and Raman spectroscopy showed that the polychrome was carried out with gold in all samples studied. Other elements such as silver and cooper were also found in minor proportion. XRF allowed the quantification of the different metal (average composition: Au 79.5 %, Ag 8.1 %, Cu 5 %).

There were various ways of adhering the golden leaf to the surface, but for large areas a bole mix of fine earth was typical. For other ornamentations, technique based on an aqueous medium and brushed onto the part to be gilded was used an. For panel and wall paintings, however, oil mordant was commonly used. In our study the gold was adhered to the surface using oil mordant.

The powder XRD of the support showed the presence of gypsum and small proportion of anhydrite. However, calcium carbonate was not detected due to low proportion and low diffraction intensity of the mineral. The DTA-TG study confirms the presence of calcite (less than 5%). This technique also revealed the presence of organic compounds (oil mordant). The FT-IR spectroscopy confirmed the presence of carbonate in these supports.

The determination of the composition of the golden of the coat of arms by portable XRF and Raman spectroscopy was very useful and allowed the determination of the quantitative composition of the gold layer employed. The DTA-TG technique showed an endothermic effect about 675 °C and a mass lost, between 600 – 750 °C, attributed to the decomposition of carbonate. The FT-IR confirmed the presence of carbonate. This mineral was not well characterized by XRD.

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