

Characterization of the Guignard Painter's Palette by XRF and FTIR

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1. Introduction

Alberto da Veiga Guignard is a famous Brazilian painter, who lived between 1896-1962, who has a varied art having painted portraits, landscapes and still life [1]. Often in Brazil, dubious works by Guignard appear in auction markets, which are difficult to conclude about their authenticity. In these cases, the results of the physicalchemical characterizations of the artist's palette, pigments, binders and varnishes can be a tool that can help in this authentication process. However, it is desirable that examinations of the suspect canvas be compared with standard results obtained from authentic materials used by the painter.

In this work, the pigments and binders used by the painter Guignard in his palette were characterized by X-Ray Fluorescence (XRF) and Fourier Transform Infrared Spectroscopy (FTIR) techniques. These techniques are widely used in pigment characterization in artworks [2–6]. The results of this work will be useful in the future, as a database, to be compared with those obtained from suspicious screens.

2. Methodology

The palette of pigments and binders, shown in Figure 1, was analyzed. The analyzes were carried out at the Museu Casa Guignard in Ouro Preto Minas Gerais.



Figure 1: Painter Guignard's pigment palette.

For the analyses, the portable system model TRACER SD IV from Bruker was used, which has an Rh anode and can operate with maximum voltage and current of respectively 40 kV and 200 μ A. The spectra were collected for 30 s, with the system operating with a current of 10 μ A and a voltage of 40 kV.

The FTIR analyzes were carried out in Bruker's Alpha model system, with the spectra collected in the mid-infrared region (600-4000 cm^{-1}), with a spectral resolution of 4 cm^{-1} and 2 minutes of scanning.

3. Results and Discussion

The results obtained so far have allowed us to characterize other pigments, which have Fe as a key element in red and brown tones. Green pigments based on Cr, which can be correlated to viridian ($\text{Cr}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$) and/or chromium oxide (Cr_2O_3). Cd in red shades and Co in blue shades were also detected. In all pigments the presence of Zn, Ti and Ba was detected, and these elements are key elements of the white zinc pigment (ZnO), Titanium Oxide (TiO) and Barite (BaSO_4), which may have been mixed in the pigments to achieve lighter tones. The FTIR analysis allowed to detect that the pigments' binder is an oil, as bands 2932, 2850 and 1750 cm^{-1} were detected.

4. Conclusions

The results obtained so far indicate that the Guignard painter's palette has classical materials used in painting. The ones presented in this work will be a source of consultation and a database mainly for the forensic examination of suspicious paintings by the painter Guignard.

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References

- [1] C.M.D. Moresi, A.R.A. Neves, B.R. Veloso, P. Baptista, A. de A. Araújo, C.C. e Lima, I.A. de C. Teixeira, A.A. Andrade, C.N. da Silva, Pesquisa Guignard, *Ciência Conserv. História Da Arte Técnica*. 1 (2014) 86–99.
- [2] R.P. Freitas, V.S. Felix, M.O. Pereira, R.S. Santos, A.L. Oliveira, E.A.S. Gonçalves, D.S. Ferreira, A.R. Pimenta, L.O. Pereira, M.J. Anjos, Micro-XRF analysis of a Brazilian polychrome sculpture, *Microchem. J.* 149 (2019) 104020. <https://doi.org/10.1016/j.microc.2019.104020>.
- [3] M.O. Pereira, V.S. Felix, A.L. Oliveira, D.S. Ferreira, A.R. Pimenta, C.S. Carvalho, F.L. Silva, C.A. Perez, D. Galante, R.P. Freitas, Investigating counterfeiting of an artwork by XRF, SEM-EDS, FTIR and synchrotron radiation induced MA-XRF at LNLS-BRAZIL, *Spectrochim. Acta - Part A Mol. Biomol. Spectrosc.* 246 (2021) 118925. <https://doi.org/10.1016/j.saa.2020.118925>.
- [4] R.P. Freitas, *Aplicações de Técnicas Nucleares e Espectroscopia Molecular em Arqueometria*, Universidade Federal do Rio de Janeiro, 2014.
- [5] S.H. Rodriguez, C.R. Appoloni, P.H.O.V. Campos, B. Gonçalves, E.A.M. Kajiya, R. Molari, M.A. Rizzutto, C. Winter, Non-Destructive and portable analyses helping the study and conservation of a Saraceni copper plate painting in the São Paulo museum of art, *Microchem. J.* 155 (2020) 104787.

<https://doi.org/10.1016/j.microc.2020.104787>.

- [6] C.R. Appoloni, M.S. Blonski, P.S. Parreira, L.A.C. Souza, Study of the pigments elementary chemical composition of a painting in process of attribution to Gainsborough employing a portable X-rays fluorescence system, *Nucl. Instruments Methods Phys. Res. Sect. A Accel. Spectrometers, Detect. Assoc. Equip.* 580 (2007) 710–713. <https://doi.org/10.1016/j.nima.2007.05.141>.