A Technical Examination of a 17th-Century Spanish Portrait by an unknown artist

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Introduction

Portrait of a Nobleman, located at the National Gallery of Canada, currently stands unattributed. Recently, Claudio Coello has been suggested as a possible artist. Limited analysis has been done on this artist's oeuvre and many Spanish artists of the time remain unexplored. The painting was examined using a multi-analytical approach and compared with literature, technical examinations and treatises on Spanish paintings from this period. The focus of the analysis was to obtain more technical information on the support, application of layers, painting technique, and pigments as well as to identify the presence of wood ash particles in the ground.

Figure 1. *Portrait of a Nobleman* , Oil on canvas , 17th century, unknown artist, National Gallery of Canada

Experimental

Non-destructive techniques employed:

- Multimodal imaging
  - Normal light
  - Raking light
  - Ultraviolet fluorescence
  - Infrared reflectography
  - X-radiography
- X-ray fluorescence spectroscopy (XRF)
- Microscopic examination

Minimally invasive techniques:

- Fourier transform infrared spectroscopy (FTIR)
- Polarized light microscopy
- Fluorescence microscopy
- Scanning electron microscopy- Energy dispersive X-ray spectroscopy (SEM-EDS)

Results & Discussion

Visual observations

- A drying phenomena referred to as 'microcissing' was observed in areas of the portrait's face and hands. While this drying-cracking phenomena has been described in 17th - and 18th -century British portraiture, it has not been recorded in 17th –century Spanish paintings.

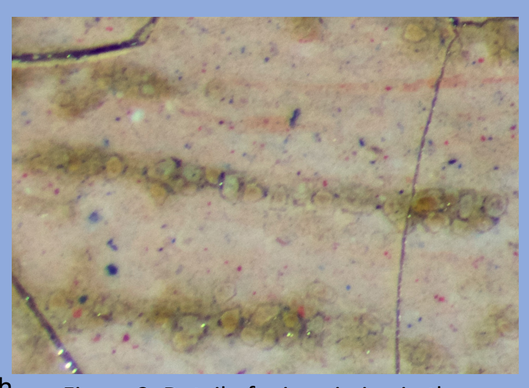

Figure 2. Detail of microcissing in the sitter's face. 250x magnification

Cross section analysis

Analysis of the cross-sections under reflected light, UVF with WU and NV excitation filters helped determine the layer structure, application of paint and the artist's technique. Figure 4B shows four layers while figure 4D shows six layers. Both samples show two preparatory layers: a thick ground layer and a red priming layer. A red priming layer was commonly used by artists from Madrid.

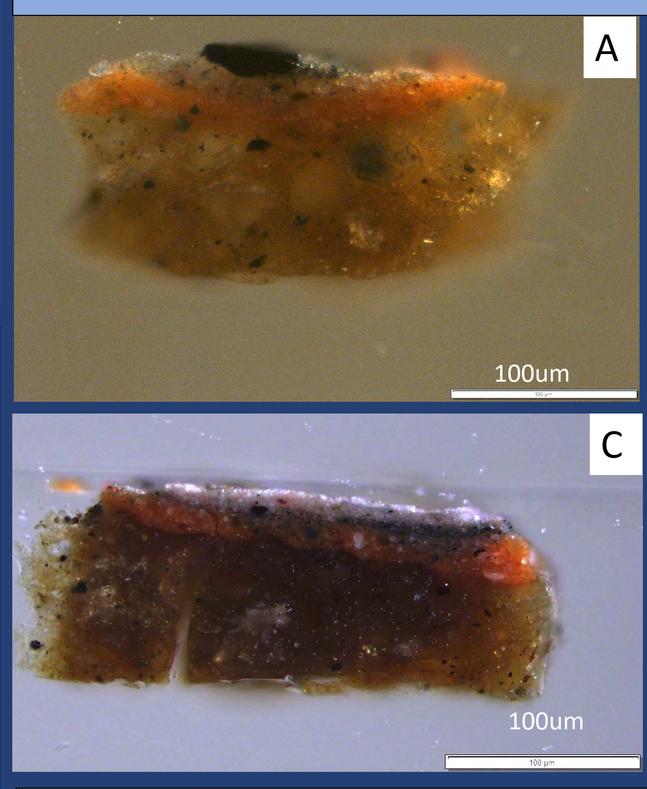

Figure 4. (A) Cross-section from the grey frame under reflected light. (B) Cross section under WU filter. (C) Cross-section from grey frame. (D) Cross-section under NV filter. Six separate layers were visible. At the bottom of the ground, a thin green fluorescing line is visible, suggesting a proteinaceous material. Images taken at 200x and 400x magnification

Pigment identification

- Results from XRF, PLM and FTIR showed that the artist used a limited palette. Calcium, lead and iron were found throughout the composition likely from chalk, lead white and earth pigments in underlayers or the priming layer. PLM and FTIR suggested the use of calcium carbonate and ultramarine in the areas of the sky and leaves.

Table 1. XRF elemental analysis summary

Colour	Major element (minor)	Possible pigments
Red	Fe, Hg, Pb (traces of K)	Vermillion, iron oxide, lead white
Pink	Fe, Pb (traces of Hg, K)	Iron oxides, vermillion, lead white
Blue #1 (sky)	Pb, Fe, Ca (Co, Si Al)	Smalt, Calcium carbonate, possible under layers of iron oxides and lead white.
Blue #2 (mountain)	Pb, Ca (Cu, Fe)	Azurite, lead white
Brown	Fe, Mn (traces of P)	Umber
White	Pb	Lead white
Gray	Pb, Fe (traces of Mn)	Lead white, earth pigments
Black	Ca, Fe, P, Pb	Ivory or bone black

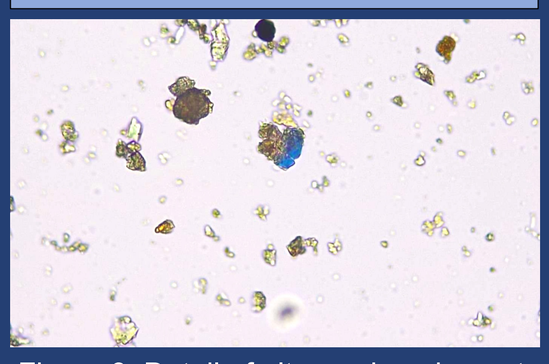

Figure 3. Detail of ultramarine pigment. 400x magnification

SEM-EDS results

Major elements detected Al, Mg, Si, Ca, Fe, Pb and O. Findings suggest the inclusion of quartz, dolomite, and calcite in the ground. Figure 5B shows a detailed closeup of a particle with a skeletal structure and embayments resembling calcite pseudomorphs seen in previously studied ash grounds. Elemental analysis suggested a similar composition to those found in ash grounds.

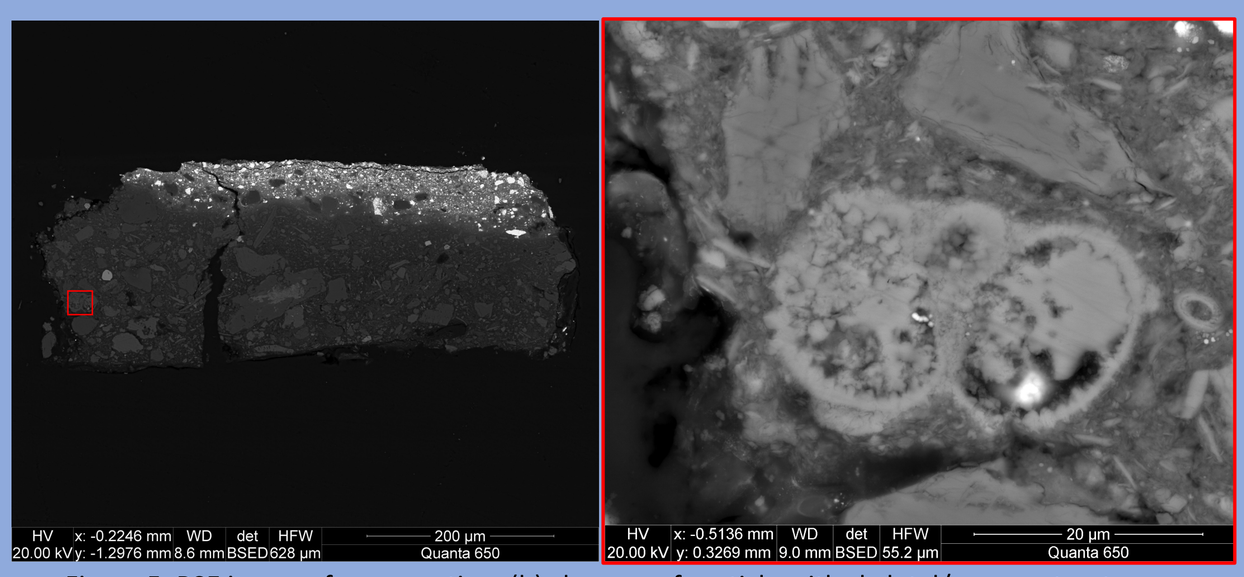

Figure 5. BSE image of cross section, (b) close up of particle with skeletal/porous structure

Conclusion

- Results showed that the painting followed a paint structure and pigment palette common for the period. However, natural ultramarine had a limited use in Spain and was often reserved for important areas of the composition.
- Cross-section analysis revealed a thick ground layer and red priming layer, which was commonly seen in paintings from Madrid. SEM-EDS gave elemental and morphological evidence suggesting the use of wood ash in the ground; however, the cross-sections did not contain abundant amounts of calcite pseudomorphs as seen in previously studied cross-sections of the period.
- The painting is comparable to other Spanish paintings of the period. Further analysis of Coello's paintings is needed in order to expand this research.

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Selected references: Bruquetas Galán, Rocío. Técnicas y materiales de la pintura española en los siglos de oro. 2002; Carò, Federico, Silvia A. Centeno, and Dorothy Mahon. "Painting with Recycled Materials: On the Morphology of Calcite Pseudomorphs as Evidence of the Use of Wood Ash Residues in Baroque Paintings." Heritage science 6, no. 1 (2018): 1–11; Gayo MD, Jover de Celis M. "Preparación de los lienzos en la corte de Madrid: de Felipe IV a Felipe V." Boletin del Museo del Prado 38, no. 58 (2022): 113-132.