



## Analytical note

Inorganic pigment study of the San Pedro Gonzalez Telmo Sibyls using total reflection X-ray fluorescence <sup>☆</sup>Cristina Vázquez <sup>a,b,\*</sup>, Graciela Custo <sup>b</sup>, Néstor Barrio <sup>c</sup>, José Burucúa <sup>c</sup>, Susana Boeykens <sup>a</sup>, Fernando Marte <sup>c</sup><sup>a</sup> Universidad de Buenos Aires, Facultad de Ingeniería, Paseo Colón 850, C1063ACU, Buenos Aires, Argentina<sup>b</sup> Comisión Nacional de Energía Atómica, Gerencia Química, Av. Gral Paz 1499, B1650KNA, San Martín, Argentina<sup>c</sup> CEIRCAB-TAREA, Universidad Nacional de San Martín (UNSAM), Escuela de Humanidades, Campus Miguelete, 25 de Mayo y Francia, B1650KNA, San Martín, Argentina

## ARTICLE INFO

## Article history:

Received 25 October 2009

Accepted 15 June 2010

Available online 25 June 2010

## Keywords:

Total reflection X-ray fluorescence

Inorganic pigment

Sibyls

Archaeometry

## ABSTRACT

This article describes the study carried out on a series of oil paintings on canvas from the eighteenth century that were restored at *Centro de Producción e Investigación en Restauración y Conservación Artística y Bibliográfica - Tarea* (CEIRCAB-Tarea), Buenos Aires, Argentina: the San Pedro González Telmo Sibyls. Experimental study was undertaken to identify inorganic pigments and the technique used in their confection; and, in this way, try to add information about their local origin. Therefore special emphasis was put to infer technologies used in the manufacturing of these paintings. Elemental analysis was performed by total reflection X-ray fluorescence spectrometry (TXRF) and complemented by optical and polarized light microscopy. Microsampling was carefully done over areas of the paintings which were damaged and where a small additional loss will not be noticed. This investigation has shown that a variety of pigments were used, namely earth pigments (red and yellow ochres), white lead, vermilion, etc., and they were used either pure or in mixtures. This characterization helped conservators in their decisions regarding a better understanding of the deterioration processes. In addition, this research about the material composition allowed the art historians and restorers the possibility to obtain information about where, when or by whom The San Pedro González Telmo Sibyls may have been painted.

© 2010 Elsevier B.V. All rights reserved.

## 1. Introduction

During year 2005, a series of paintings belonging to San Pedro Telmo church, was studied and restored at CEIRCAB-Tarea; these paintings are among the most important colonial painting from Argentina. Beside the quality itself of the series, its importance resides in the fact that this is one of the few complete series of Sibyls. It is composed by twelve paintings: *Helespóntica, Cumea, Cumana, Pérsica, Líbica, Tiburtina, Frigia, Délfica, Rodia, Eritrea, Sanbethea and Samia*. These are based on engravings by Crispín de Passe [1], where the Sibyls appear prophesizing about different episode of Christ's life. Ten out of these paintings are from XVIII century; and the other two, *Délfica and Tiburtina*, are copies made during 1864 when they were requested probably to replace the two deteriorated originals. This request also included the restoration of the others paintings of the series [2].

Regarding the possible origin of this wonderful group, there are two positions. Some researchers believe in a workshop from Cuzco when some others attribute this series to a Spanish origin [3–5]. It is important to highlight that the paintings were extensively studied from the historical and aesthetic points of view but not from the material one. So, in this context a characterization study of the paintings was crucial in trying to elucidate the probable source. Although some late investigations may have finally attributed them a Spanish origin [6], fact that is supported from the organic pigments studies from this series (unpublished data).

The original palette is not vast in comparison with the amount of colors used in the areas where impaintings and old interventions are located—especially all over the garlands and garments.

It must be said that the San Pedro Telmo's series of Sibyls has a great potential value for technological and historical investigation. In fact, they were kept together for more or less two hundred years.

The size of the twelve paintings is about 117 × 92 cm. A very fine handmade flax canvas was laid over cedar stretchers using coarse nails. Both the stretchers and the supports appeared to us very different from those usually found in the colonial paintings. After the restoration treatment the twelve frames (initially covered by black paint), proved to be accomplished with the *jaspeado* technique, a delicate imitation of marble furrowed by fine red and black veins. This kind of decoration falls in the widespread seventeenth century

<sup>☆</sup> This paper was presented at the 13th Conference on Total reflection X-ray Fluorescence Analysis and Related Methods (TXRF 2009), held in Gothenburg, Sweden, 15–19 June 2009.

\* Corresponding author. Comisión Nacional de Energía Atómica, Gerencia Química, Av. Gral Paz 1499, B1650KNA, San Martín, Argentina.

E-mail addresses: [vazquez@cnea.gov.ar](mailto:vazquez@cnea.gov.ar) (C. Vázquez), [custo@cnea.gov.ar](mailto:custo@cnea.gov.ar) (G. Custo), [nbarrio@unsam.edu.ar](mailto:nbarrio@unsam.edu.ar) (N. Barrio), [gburucua@unsam.edu.ar](mailto:gburucua@unsam.edu.ar) (J. Burucúa), [fmarte@unsam.edu.ar](mailto:fmarte@unsam.edu.ar) (F. Marte).

Spanish tradition related with polychrome sculpture and altarpieces practice [7].

The paint technique is very simple: over an absorbent ground, composed essentially by a natural clay, we find no more than two or three color layers, where traditional pigments such as lead white, earth colors, bone black, calcium carbonate, vermilion and perhaps indigo, were mixed at different levels and proportions. The radiographic examination shows a subtle under-modeling treatment which was covered by delicate brushstrokes and some *impasto* layers in the light zones. The use of organic colors—particularly red lakes—is quite evident in the flesh areas and also in the *grutescos* at the bottom sections. Comparing the protected margins with the front surface, a severe discoloration caused by light exposure could be easily discovered [8].

From the twelve paintings samples were taken in order to have a full representation of the palette used by the artists; samples were also taken from the areas where re-paints were located in order to understand the history of the series.

Although analytical techniques have evolved to non-invasive ones, in the specific case of the “Sibyls” samples were required for other reasons (not related to the main subject of the article). The paintings came to the workshop for restoration and some little samples were taken from parts where the conservation treatments were applied. Samples were taken by restores regardless of the research we carried out. The main reason was to take them for studying the ground layer (because it was considered the possible reason of the deterioration

process), something you cannot do with portable XRF equipment. So, since we had samples available and, not least important, we have not access to a portable XRF equipment, we decided to use the instrument we reported in our article [9].

## 2. Experimental

### 2.1. Analytical techniques

Elemental analysis was performed by total reflection X-ray fluorescence spectrometry (TXRF) and complemented by scanning electron microscopy-energy dispersive spectroscopy (SEM-EDS) optical and polarized light microscopy. TXRF is well suited to the analysis of artist's pigments where it is mandatory to keep the sample size as low as possible. It is evident that TXRF can only be used for inorganic pigments. The majority of the old pigments is inorganic and was made mostly from natural minerals. Their identification by TXRF is based on the fact that most of them can be characterized by their obvious color and almost one to three constituents regarded as key elements. The proposed sampling requires only a few small grains of sample which are deposited on the reflector surface and illuminated by the totally reflected X-ray beam. This  $\mu\text{g}$ -amount of material is a valuable advantage doing practically a non-destructive determination [10,11].

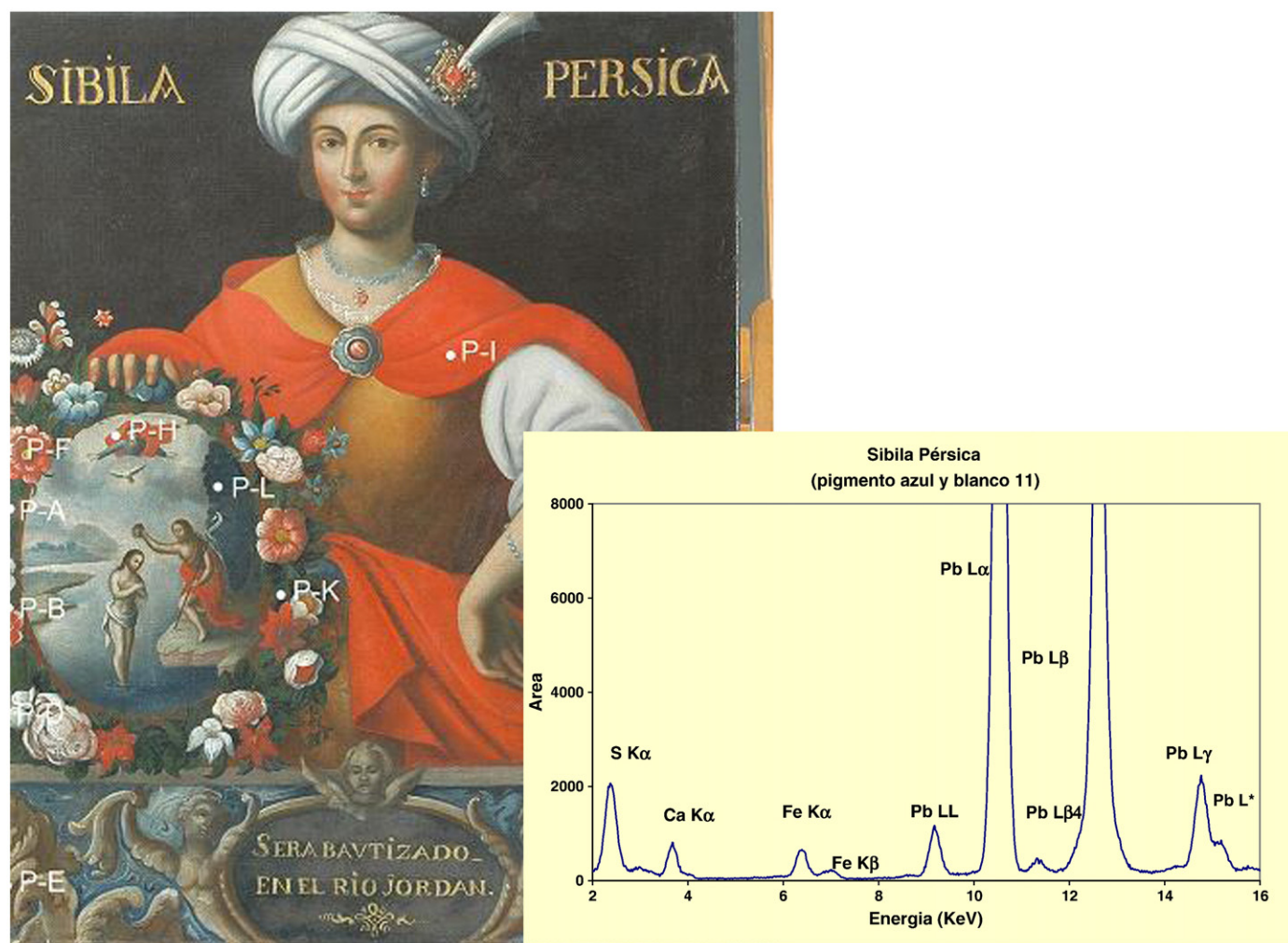


Fig. 1. Selected sample location of Persica sibyl with the corresponding TXRF spectrum showing Pb L lines attributed to basic lead carbonate. Note that the spectra shown in this figure and in all subsequent figures are directly reproduced from the Spanish software.

Download English Version:

<https://daneshyari.com/en/article/1240915>

Download Persian Version:

<https://daneshyari.com/article/1240915>

[Daneshyari.com](https://daneshyari.com)