

Authentication method the red pigment from painting layer of the icon "St. Nicholas" church Nicorita, Iași

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Abstract

Establishing the authenticity and accurate dating of a work of art is one of the current scientific priorities. The paper presents identification and authentication red pigment of cinnabar (HgS), using optical microscopy (OM) and X-ray fluorescence (XRF). Accurate knowledge of natural pigments allows the restorer to use materials as the originals belonging objects. The components accompanying the basics of the pigments provide information which contributes to establishing the origin of natural or synthetic pigment.

1.Introduction

Church Nicoriță, was founded in 1626 by the hetman Nicoară Baltag, and his wife, Theodosia, sister of Miron Barnovschi. Patron Saint John the New Church is celebrated on June 2. On the place of this church, in the past there was another wooden same church, which was built after 1402.

The present church has undergone several changes, the most important ones in 1858 when the abbey was built under the guidance of Archimandrite Athanasius, 1926, when it was rebuilt part of the parish house and interior painting was done and 1968.

The church is built of stone and brick. The plan is trefoil. The spire from middle the church is in style of churches moldavian, before the period of decadence. In 1814 it was restored by Archimandrite Nikodim who added the porch; on this porch was raised belfry.



Fig. 1. Church Nicoriță, Iași

Inside the nave and narthex form a single ship with vaulted ceiling, having the tower sitting on transverse and longitudinal arc in form octagonal. The plan the altar is a callote in quarter-sphere. Biserica a fost pictată la începutul secolului XX. After the 1940 earthquake existing cracks were more pronounced. The repairs made were whitewashed walls coating painting.

The iconostasis belongs to the nineteenth century and is beautifully carved. The icons of the iconostasis dates from the XVIII, XIX. Nicoriță church was renovated in the last century (1968 and 1977-1978).

2. Experimental part

2.1 Equipment

In situ determinations were performed with a spectrophotometer XRF analysis was performed with a fluorescence X-ray spectrometer, portable type INNOV - X microscopy microscope Olympus SZX 160. To establish spectra and analysis semi-quantitative was used software for heavy matrices Analytical mode, during arousal being selected 30 sec.

Laboratory measurements were performed with an Olympus microscope SZX 160 direct and polarized light.

2.2. Results and discussions



Fig. 2. Royal icon "St. Nicholas"

XRF analysis of the pigments can answer the questions of when and where pigments were made. If this information is not consistent with what is known about the materials assigned the artist, the forgeries may be disclosed. Information from the authentication are also used to help restore the icon allows the restorer to use materials similar to the original.

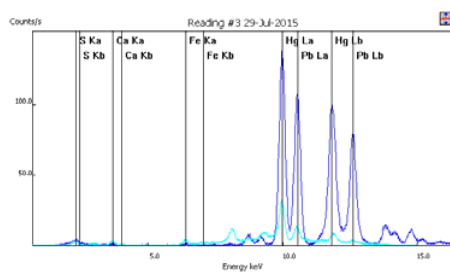


Fig. 3. XRF Spectrum red pigment cinnabar

The elements identified are: Hg²⁺, Pb²⁺, S (cinnabar, white lead, lead minium). XRF analysis provides us with information on the chemical elements present in both the pictorial layer and the painting support (layer preparation). Characterization the red cinnabar pigment was performed by optical microscopy.

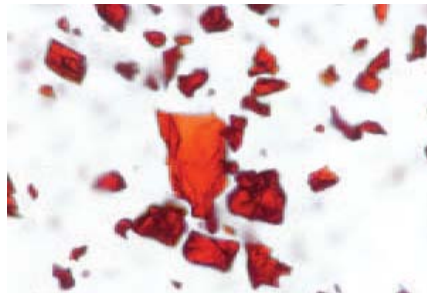


Fig. 4. OM image of red cinnabar pigment particles, the icon of St. Nicholas

Differentiation optical the cinnabar pigment natural of its variants is doable because synthetic natural crystal colorless bands can not be distinguished. The presence and identification of impurities in the pigment composition gives us more reliable data on their origin from natural minerals. It is known that the pigment is found in synthetic form in many works of art.

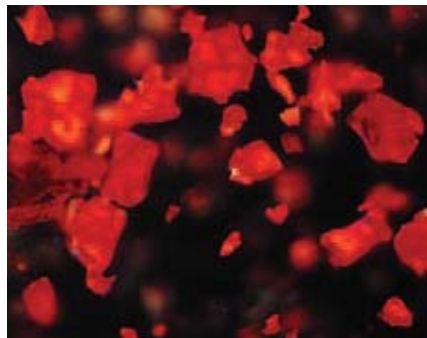
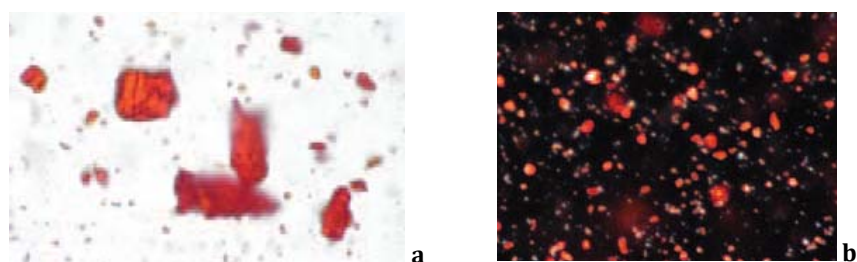


Fig. 5. Image OM in polarized light, the granules red cinnabar pigment, icon of St. Nicholas

In polarized light (Fig. 5) particles have the color red to orange stronger. The crystal absorbs different wavelengths of light in different ways. Depending on the direction of incidence of the rays or their plane of polarization, resulting in the emergence of different colors depending on the angle from which the was observation (in Fig. 5. Particle cinnabar color ranges from pale orange to dark orange to deep red). Cinnabar is often coarse grained, with angular particles. In order to determine the nature of pigment we made measurements under the same conditions (direct light, polarized) for a sample of synthetic red pigment cinnabar. The observation was performed by comparison.



**Fig. 6. OM image of red cinnabar pigment granules synthetic
a. the reflected light b. in polarized light**

It was observed under the microscope that aspect at cinnabar synthetic particles is very fine. The particle size is typically less than $1 \mu\text{m}$.

3. Conclusions

Cinnabar is produced industrially, wet, since the XVIII century (1785) and marketed under the name of vermilion. The icon representing St. Nicholas, the church Nicoriță is recorded as research dating back to 1794. The nature of the pigment was imposed by the existence of the two pigments in the same period.

Natural Cinnabar has perfect cleavage, and the particles are uneven. The particles are rectangular or columnar. Particle size distribution is

often uneven. Internal reflections are strong, causing the crystal to shine.

The synthetic pigment particles are nearly spherical uniform. The color is deep red with no reflections. OM microscopy demonstrates that the pigment used in paint layer analyzed was obtained from a natural mineral.

4. Bibliography

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