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The conservation of the byzantine icon from Georgios Church, Jordan

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Abstract. *The paper presents the physical, chemical and biological investigations, as well as a detail the process of restoration of a byzantine icon from Church of Saint Georgios in Ajloun, Jordan. Before establishing any treatment or maintenance procedures, it was necessary to obtain complete information about the components of the icon and its condition. Keeping in mind the original aesthetic aspect of the icon. In this effort an integrated analytical approach was used. In order to evaluate the icon's components and degree of degradation, surface and bulk techniques were used. X-ray fluorescence using a Philips Minipal PW4025 spectrometer was used to identify the elemental composition of the preparation layer and background. For the chemical analysis, X-ray diffraction (XRD) was investigation was performed. The FTIR technique was also used to identify the media used in the application of the icon layers, as well as the type of varnish used to insulate the icon. The cleaning process is a key point in the conservation process although it is one of the most important aspects for an artwork and is considering a series of deteriorations and degradations. XRF results of the preparation layer sample revealed it consisted of Gypsum (CaSO4.2H2O), since it contains calcium (Ca) and Sulphate, analysis of red pigments showed that it was comprised of red-lead (Pb_3O_4). The overall efficiency of all conservation process including cleaning seems to be effective.*

Rezumat. *Lucrarea prezintă investigațiile fizice, chimice și biologice, precum și un detaliu al procesului de restaurare al unei icoane bizantine din biserica Sf. Gheorghe din Ajloun, Iordana. Partea procedurală a fost precedată de obținerea de informații complete despre componentele icoanei și starea acesteia, ținându-se cont de aspectul estetic original. În acest efort s-a utilizat o abordare analitică integrată. Pentru a evalua componentele pictogramei și gradul de degradare, s-au folosit tehnici de suprafață și vrac: fluorescența cu raze X, difracția cu raze X (XRD), tehnica de spectroscopie infraroșie de transformare Fourier (FTIR). Procesul de curățare este un punct cheie în procesul de conservare, deși este unul dintre aspectele cele mai importante pentru o lucrare de artă și are în vedere o serie de deteriorări și degradări. Eficacitatea generală a întregului proces de conservare, inclusiv curățarea, pare a fi eficientă.*

Keywords: conservation; icon; Christianity; SEM-EDX; byzantine; animal glue.

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1. Introduction

The word icon, comes from the Greek word εἰκών and means a religious image, and derived from the verb *eikonito* (to look like), then became a term used in the Byzantine period for paintings on wood. Usually these paintings represent Christian religious themes, including images of Jesus, the Apostles, the Virgin Mary, martyrs, saints, and other Christian religious subjects which have been mentioned in the Torah, the Bible, and in Church history.[4] Icons emerged as a tool to help the believers of the new faith (Christianity) to elucidate and simplify religious concepts and principles for the public.[5]

Museums, churches and monasteries around the world, abound with thousands of icons of different types. The icons date back to different periods, from the fourth century to the end of the nineteenth century AD. Icons signify a vital aspect of art in general and in particular Byzantine art. They emphasize religious, artistic, historical and educational values [3].[6] Icons are also considered one of the most important components of worship in the Eastern Church, used in the interpretation and explanation of Bible teaching, as well as an educational medium. Icons are considered as an aid to prayer, supplication and glorification to Jesus Christ.[7]

Jordan is rich in Christian legacy, especially historical churches and monasteries. The Greek Orthodox Church of Saint Georgios in Ajloun is one of the most important historical churches in Jordan, dating back to the late 19th century (1873-1880) (Figure 1). This church, and other churches, contains dozens of Byzantine icons, which were painted on wood in different styles and techniques. They symbolize a variety of different values and concepts. Icons are considered a type of photography that is closely related to Christianity. It is of a great interest for people at the official and individual levels. The church contains many icons of different sizes and shapes. Among these, there is an icon with a very common theme: Saint James the brother of the Lord (Figure 2). It was chosen because of its historical importance and the necessity of its treatment and restoration. The Byzantine icons are characterized by a variety of preparation methods, some of which are painted directly on wood and some with and without a preparation background. Others include a fabric layer (typically linen), as a preparation layer and then a layer of paint. There are many other types of icons produced in different techniques, in which a portrait was painted over a coloured background. Very often the painting was done over a gold background. This one of the most important features of

[4] TADROS 1995, *passim*.

[5] SHEPARD 2009, *passim*.

[6] SKALOVA 1995, 85-90.

[7] MANGO 2002, 10.

Byzantine icons. The Byzantines excelled in decorating gilt backgrounds in different forms of distinctive Christian decorations.[8]

Icons are typically painted on a wooden panel with animal glue or egg tempera paint, over a layer of gypsum and glue (preparation layer). Sometimes, canvas is present between the wood and the preparation layer. Indeed, the prevailing environmental conditions as well as the chemical properties, which are exhibited by the wide spectrum of different varnishes, may lead to a self-destructive process. The damage caused to these layers can be attributed either to internal or external factors. The external factors include, fluctuation in temperature and humidity, other factors include lighting, air pollution, storage, and handling.[9]

Icon deterioration could be attributed to the aging of materials, tangential carving of the board of which the panel is made up, the aging of the glue as well as unintentional human damage. No icon escapes the process of aging, which over time leads to a change in its appearance. This phenomenon of degradation affects the whole structure of the painting. Due to their delicate components, icons are frequently subjected to damage. The most common problem damaging Byzantine icons is the appearance of cracks on their surface. Varnish oxidation is another phenomenon that can seriously degrade their overall appearance.[10] Dirt, and smoke as well as other degradations, deteriorate their appearance even more. The end result is that, colours fade and the paint appears brown or black. This is particularly true for icons or church murals, where candle smoke degrades icon colours. In many cases, this degradation can affect the artistic value of a painting. Also, it is known that when two factors of damage are combined, the alteration of organic materials occurs more rapidly. The rate of material damage depends largely on the chemical makeup of the icons components, their reactions and the surrounding environmental conditions. [11]

For discovering the proper solutions for the damaged icon, a precise knowledge is required in order to recognize and respond appropriately to the issues; choosing either preventive measures or restoration techniques. The employment of non-destructive analytical methods makes it possible to identify the painting techniques, including the approach to drawing, the choice of materials, and their technique of application. This also makes it possible to determine the extent of damage. Simultaneously, these data provide crucial material for conservators involved in the restoration and cleaning process.

Visual inspection, combined with transmission or penetration techniques (X-ray florescence, SEM, FTIR, X-ray diffraction etc.) provide data on the structure of the icon's components. In order to identify the features of the icon that had been damaged, SEM was used to uncover the changes in the structure of the painting layers as well as in other

[8] HOSSAN EDIN 1984, *passim*.

[9] BURGES 1990, 60.

[10] ABDUL AZIZ 2011, *passim*.

[11] FAKI 2004, 32.

components. Exceptional attention was given to obtaining a descriptive sampling of the icon under consideration and to avoiding further irreversible damage. The cleaning system and the intervention methods were selected taking into consideration the chemical and physical nature of the materials as well as the delicate components of the icon.[12]

2. Icon Description

The icon's dimensions are as follows: Length: 121 cm., Width: 73 cm. and thickness: 2.5 cm., The icon is made up of three panels, the icon's subject is an image of Saint James (brother of the Lord).

A portrait of Saint James, shows him standing in a priest's ceremonial clothes, pointing with his right hand with the sign of blessing (beginning and end) and carrying in his left hand the Bible with colourful decorations of the four gospel writers, with the cover bearing a scene of resurrection (Figure 2). The head is surrounded by a Holiness Halo. in the upper part of the icon above the plaster layer circles carved filled with a rose in shape of a cross. The icon has a gold background. On the upper right part of the icon there is an inscription in Greek "Saint James" and in the upper left part it is written "brother of the Lord."

3. Experimental part

Before establishing any treatment or maintenance procedures, it was necessary to obtain complete information about the components of the icon and its condition. In this effort an integrated analytical approach was used. In order to evaluate the icon's components and degree of degradation, surface and bulk techniques were used. X-ray fluorescence using a Philips Minipal PW4025 spectrometer was used to identify the elemental composition of the preparation layer and background. For the chemical analysis X-ray diffraction (XRD) was conducted using a Shimadzu 6000 Spectrofluorophotometer. The Fourier transform infrared spectroscopy (FTIR) technique was also used to identify the media (bonding material) used in the application of the icon layers, either with the preparation layer or the gilding layer, as well as the type of varnish applied to insulate the icon using a Bruker-Tensor 27 device. All analyses were conducted in the laboratories of the Faculty of Archaeology and Anthropology at Yarmouk University, Jordan. The Minipal PW4025 was operated at 30 kV, 30 mA, 60 s, air and a Kapton filter. The Shimadzu 6000 operated at a wavelength of CuKα equal to 1.5418 ° C, 30 kV and 30 mA. For the FTIR technique, the powder sample was mixed with potassium bromide and the homogeneous mixture disk analysis was done with the Bruker-Tensor 27 in the IR spectrum between 500 and 4000 cm -1 at 4 cm -1 and 32 scan. The analysed sample

[12] ABDEL-GHANI *et alii* 2008, 69-75; ABDEL-GHANI *et alii* 2009, 566-575; AJO *et alii* 2005, 333-348; COLLINART 2001, 1-4; EASTAUGH *et alii* 2004, 241-256; GALE *et alii* 2000, 334-350.

pattern was compared with standard samples of animal glue, yolk and Arabic gum in order to identify the colouring medium.

4. Icon diagnosis

After a thorough diagnosis of the studied icon's damaged features, it was determined which factors should be addressed. The damage was attributed to, in addition to the inappropriate restoration process previously used: aging of materials, accidents, liturgical use and the surrounding environmental conditions. All these factors have led to the warping of the wood panel, cracking due to age, gaps in the paint layers, wearing of the colour layer, aging and darkening of the varnish, with dirt and wax deposits.

4.1. Varnish layer

The icon was in an environment where it was exposed to high temperatures, and the varnish had aged significantly. This led to dryness and shrinkage in the varnish layer. The occurrence of superficial surface cracks was also noted. This was observed especially in places with a thick varnish layer. There the varnish layer had become fragile and weak and turned a dark yellow colour, losing its transparency and turning into a dark layer (Figure 3/a–b).

4.2. Colour layer

Colour medium is the main constituent of the colour layer, this could be made of either gum, glue or albumin, these materials are at high risk and become damaged when temperature and humidity are high. This causes the layer to lose its adhesive property with reduction in its strength of cohesion and bonding. The results: wearing of the colour and darkening (Figure 4).

4.3. Gilding Layer

Many cracks, flakes and scratches are also seen in the bearing layer above which the colouring layer and the gilding layer are applied. Especially in the carved parts on the preparation layer (Figure 5).

4.4. Preparation Layer

The application of the preparation layer is a very crucial step in preventing the wood panel from absorbing the colour layer. It provides a suitable background for the paints, and enables

a smooth movement for the brush throughout the painting process. Due to its liturgical use, and the heat emitted by candles, the icon developed cracks and breaks in the preparation layer. A serious weakening of the paint layers, general wearing of the colour and flaking in the paint layer can be seen (Figure 6). The high temperature inside the church led to severe dehydration, loss of elasticity, increasing the layer's hardness with some breakage occurring. The expansion and shrinkage of the linen holder caused cracks and gaps in the preparation layer.

4.5. Wood Panel

The wooden panel of the icon is an organic material characterized by hygroscopic properties (i.e., the ability to absorb and lose water due to the fluctuation of the surrounding relative humidity). As a consequence of this desiccation, the wood lost its mechanical properties which led to bending, cracking and curving (Figure 7/a–b). The separation of large-sized wooden knots can be observed; as a result of relative humidity fluctuations. This confirms that these knots were not processed during preparation phase (Figure 7/c–d).

4.6. Previous Intervention

Inspection made it clear that the icon had been improperly restored, and colours were added. During the previous restoration, workers used a black colour for the outer frame, which is not in tune with the original colour scheme or in terms of chemical composition. The frame is decorated with random gilt styles using bronze powder which is evidence of a restorer's attempts to stabilize it (David — Figure 8/a). They used a modern white coating for the posterior side of the icon which was not in harmony with proper archaeological restoration. In addition to the completion of the preparation layer, colouring was completed in an inappropriate manner and done without cleaning or removal of dirt and candle droppings (Figure 8/b).

5. Results and Discussion

Representative samples taken from the preparation layer, gilding layer and from the red pigments were analysed using Philips Minipal 2 PW4025 spectrometer. In order to insure the ongoing examinations were in line with conservation ethics and aesthetics, our analysis was restricted to damaged and separated parts. XRF results of the preparation layer sample revealed it consisted of gypsum ($CaSO_4.2H_2O$), since it contains calcium (Ca) and Sulphate (S) (Table 1; Figure 9). The XRF pattern of the gilding layer sample, shows the presence of

Table.1 XRF analysis of the preparation and the gilding layer

reta1 9912300000
D 10 <Standard 9000
C S 20.70650 % S 141.9545 9000
C Ca 57.48506 % Ca 785.2401 9000
C Fe 1.59412 % Fe 67.5032 9000
C Co 0.02713 % Co 1.3730 9000
C Cu 0.40028 % Cu 27.0630 9000
C Zn 0.11816 % Zn 9.0854 9000
C Sr 0.65180 % Sr 38.3870 9000
C Pd 6.04907 % Pd 23.1617 9000
C Te 2.75618 % Te 19.7070 9000
CAu 10.21169 % Au 441

Table. 2 XRF analysis of the red pigments

D 13 <Standard 9000
C K 1.10532 % K 5.6934 9000
C Ca 49.28591 % Ca 319.9489 9000
C Sc 0.47837 % Sc 2.8347 9000
C Fe 5.17448 % Fe 118.4832 9000
C Co 0.12094 % Co 3.2967 9000
C Cu 0.96343 % Cu 33.5760 9000
C Zn 0.66162 % Zn 26.1058 9000
C As 1.05612 % As 43.5671 9000
C Pd 10.84057 % Pd 22.6308 9000
C Te 2.00645 % Te 6.6982 9000
C Re 0.08230 % Re 1.6185 9000
C Au 0.82971 % Au 17.5160 9000
C Pb 27.39478 % Pb 586.3795 9000

gold (Au) with a percentage of copper (Cu). This indicates the use of high quality gold in the preparation layer. The presence of high zinc content (Zn) was added to the preparation layer to obtain a smooth background for the base gilding layer. The presence of Fe content refers to the presence of Hematite (Fe_2O_3) which was used to improve the properties of the preparation layer, this was consistent with period icon gliding methods.

XRF analysis of red pigments showed that it was comprised of red-lead (Pb_3O_4). It is characterized by its vitality, strong colouring and smooth texture.[13] Red-lead was a main component in the sample in addition to the white zinc which gives the shiny appearance. (Table 2: Figure 10).

X-Ray Diffraction spectrum of the icon's preparation layer can be seen in Figure 11. The preparation layer consisted of Gypsum ($CaSo_4.2H_2O$ Figure 11).

Fourier transform infrared spectroscopy (FTIR), is one of the most important methods for the analysis of colour bonding materials. It was used to identify the material applied to the preparation layer. After comparing the spectrum with standard samples it seems they used animal glue. From the FTIR spectrum, absorption occur at 604 cm^{-1} which is characteristic of bone, indicating that the adhesive protein contains animal glue (Figure 12). For the varnish sample, the FTIR spectrum showed that the varnish used was mastic varnish, after comparing the results with a mastic standard sample. These methods and techniques were widely spread in Greece, the Baltic countries and Russia (Azemard,2014p143). FTIR spectrum for the varnish

[13] LUCAS, HARRIS 1962, 348.

sample (Figure 13) shows the increase in the hydroxyl group's O-H absorption intensity at 3404 cm^{-1}, stretching and the expansion of the carbonyl group at 1714 cm^{-1}, 2936 cm^{-1} and at 11 1181 cm^{-1} these wave numbers are distinctive features for mastic varnish.

5.1. Linen canvas

A sample was taken from the flaking formed on the damaged background, where the weave of the canvas could be seen even by the naked eye. The analysis through SEM revealed the textile used to be a flax, as illustrated in Figure 14/a.

5.2. Ultraviolet Imaging

Through UV and visible reflectography, both the front and the back of the icons were analysed. A series of evolutionary deteriorations and degradations of the painting, polychrome layer, and of the support were identified. Traces of mechanical impacts, multiple small gaps and fly holes were observed. These discoveries help identify new interventions to be undertaken, which otherwise would have not been detected by the naked eye (Figure 15/a–b). The panel was examined through ultraviolet radiation, bulb with a wave length of 254 nm.

6. Conservation and Cleaning

Restoration is an important and necessary process for preserving and refurbishing damaged icons. This requires careful attention to avoid irreversible errors. The cleaning products to be used must be tested, because inappropriate cleaning products can affect the integrity of the noble patina and degrade the polychrome layers, which can be easily washed away.[14] It was necessary to conduct a comprehensive analysis for ascertaining a full understanding of the icon's components and the complete certainty that the materials applied would result in a successful conservation. The mechanical cleaning of the accumulated dust was done using soft brushes, scalpels, hand tools, and with more abrasive brushes, removing the existing dirt. Each piece, all cleaning and every intervention process was monitored and documented.

6.1. Treatments of the Reverse Side

Cleaning the reverse side has been carried out through physicochemical methods, with compatible substances, established after cleaning and solubility tests. Paints were removed

[14] MAYER 1978, 245.

from the back using DMF- Dimethyl formamide (C_3H_7No) with solvent pads and cotton. Care was taken to make sure no excess use of the solvent would leak through the cracks and joints between the wooden panels, or seep through the joints to the pictorial layer.

6.2. Straightening the Curvature

One of the main reasons for the curvature of the wood panel was the removal of the rear reinforcing bars, which caused the tearing and cracking and separation of wood panels. The wooden panel was flattened by pressing using a bench vise. Before starting the flattening process, the wood panel was wetted with an 80% ethyl alcohol solution to restore the internal water content to assist in flexing under pressure (Figure 16/a). The pressed panel was left for one week with the increase of the pressure ratio gradually until it became straight. The back side was then coated with a 10% diluted solution of alcohol and shellac resin to fill the pores of the panel and to prevent future curvature. After fully adjusting the wooden panel, a bench vise was used, as well as using polyvinyl alcohol as adhesive to fix the split in the wood panel figure 16/b. The rear surface was consolidated using 5% paraloid 72% to prevent future dust and moisture interaction.

6.3. Pictorial Layer Treatments

Initial tests of cleaning solvents, effectiveness and sensitivity should be conducted prior any interventions.[15] The process of cleaning the pictorial layer started by removing dust and staining, using soft brushes and a vacuum, and then simple or mixed cleaning solutions were used to remove the dirt. The adherent deposits on the pictorial layer were removed quite easily, with 10 ml acetone, turpentine, 20 ml n-butyl alcohol and 5 ml ethylene glycol-based solutions giving good results. The residue of candle soot was removed using ethyl alcohol and turpentine (2:1) in a safe and effective manner.

6.4. Removing Old Varnish

Removing varnish is one of the most complicated processes in the treatment of oil paintings. All agreed that it was necessary to remove the old varnish, due to the agglomerations and its disturbing browny appearance. The removal process was done by using a mixture of ethyl alcohol and turpentine (1:3) on a cotton swap which gave good results.[16] For sensitive and delicate places, soaked pads of dimethyl was used, as well as medical scalpels.[17] Toluene

[15] LOWENDGARD 2007, *passim*.

[16] ALDRIDGE 1984, 67.

[17] KNUT 1999, 22.

(methyl benzene $C_6 H_5 CH_3$) was also used in some places and gave good results (Figure 17/a–b).

6.5. Clean the Gilding Layer

The most efficient and simple method of cleaning the gilded layer was to use pure ethyl alcohol in proportion which gave satisfactory results. This method eliminates the gold layer components from oxidation and chemical reactions Figure 18/a–b.

6.6. Removal of the Added Embossed Black Colour on the Outer Frame

The icon had been recently restored using new colours. Those added colours were not compatible with the original colour, in terms of chemical structure, and appearance. That added colour was removed by using soaked pads of Dimethyl formamide (DMF C_3H_7NO) solvent as well with a medical scalpel. It was safely removed, the original colours of the frame appeared, golden and red separated with fine white line. (Figure 18/a–b)

6.7. Filling Gaps and Holes in the Preparation Layer

A mixture of calcium sulphate, gypsum (in accordance with the results of the analysis of the original substrate) and polyvinyl alcohol (PVAL) was prepared in the form of a light-textured paste with the addition of a sodium fungicide (Sodium-Fluoride) and using knives for dental filler to fill the small holes and micro-cracks completely.[18] The large gaps on the lower and upper sides of the icon, as well as the joints between the wooden knots and the holder, were reinforced by using yarns of raw linen fabric with animal glue to help increase the cohesion of the preparation layer (Figure 19/a–d). The wood panel was coated with 5% of PVC glue to be a base for the preparation layer to insure the cohesion of the next layers, taking into consideration the thickness of the original preparation layer. The first layer was applied using (coarse gypsum): with (10%) of Concentrate PVC Vinyl Adhesive, after a complete drying, a second layer of fine gypsum consisting of a lower emulsion from the previous texture with 5% of PVC (Vinyl Acetate) was placed. The finished layers were kept in a clean room at room temperature for 48 hours, later after a complete drying the surface was smoothed using glass paper and readied for colouring.

6.8. Re-gilding the Background

[18] MANDELSTAM 1982, *passim*.

The missing parts of the gilded background and frame were replaced with new gold leaf. After preparing and finishing, the preparation layer was coated with three layers of 10% Shellac resin solution dissolved in alcohol. A thin layer of masonry resin was applied and before drying, gold foil was glued and polished with cotton pads (Figure 20/a–b). Finally, to protect it, the gilding layer was coated with two layers of 10% shellac resin solution in alcohol and shellac varnish lacquer.

6.9. Recolouring the Missing Parts

The icon chromatic integration was done with respect to the original uniform appearance. Recolouring was restricted only to the places with cracks, each colour is lighter than the original colour[19] When the painting was done the icon was set aside and allowed to dry completely in a clean room. The icon was opened in horizontal position, with quick moves, with a soft hair brush, in a room equipped with an exhaust system. After a complete drying, the pictorial layer was coated with a new varnish layer. The icon was laid flat, and the varnish poured over it in a thick coat. Throughout the day, the varnish was absorbed by the paint, as it thickened, and formed a film on the surface of the paint. The varnish also deepened and enhanced the colours. When all was done and well dried out, the final work began-applying the 3% of Poly Metha Crylate which was used to ensure that the painted surface will "lock together" and have a protective surface.

7. Conclusion

Control of environmental conditions appears to have been particularly poor and had a high negative impact on the icon's quality. The use of cleaning tests is obligatory, because the cleaning process can affect the integrity of the icon, and can damage rather than conserve it.

The study confirmed the danger of liturgical use (lighting candles, incense, writing names, launching Nero oil) inside the churches. The use of organic solvents was very successful and had a positive impact on the icon components. Curvature and torsion caused by the improper hanging and placing the icon on the walls directly. The complementary employment of XRD and XRF contributed and resolved the identity of icon components. The XRF technique revealed the identity of the white background which was composed of $CaSO_4.2H_2$ and the red colour was composed of hematite. While red colour of the preparation layer beneath the gilding layer consisted of red-lead (Pb_3O_4). The gilding layer consisted of high-grade gold metal.

[19] EMILE 1976, *passim*.

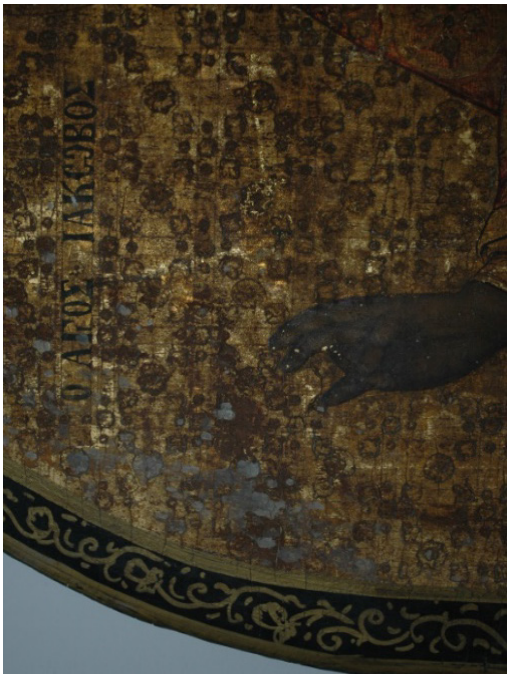
One can conclude through FTIR analysis that the binding material of the golden leaf and the calcium sulphate used in the preparation layer was animal glue. The same technology showed that the varnish used for colour isolation was mastic varnish.

Linen was the main constituent in the textile layer which was used as a support for the wooden panels. The study also highlighted the importance of removing the worn varnish layer and re-applying another lacquer layer to restore the colours to their original lustre and brilliance (Figures 21–22).

Acknowledgment. The authors are grateful to Jim Corley for his technical and proofreading assistance.

Figure 1. Image showing the templon of Georgios church

Figure 2. The Byzantine Icon of saint James



a

b

Figure 3. a–b – the damage feature of the varnish layer

Figure 4. The darkening and cracking of the colour layer

Figure 5. The cracks and damage in the gilding background

a b

Figure 6. a – flaking of the preparation layer; b – wearing and fading of colours

a b

c d

Figure 7. Images showing: a — bending, curving; b — cracking of the icon;
c and d — the separation of large-sized wooden knots

a b

Figure 8. a – traces of the previous restoration; b – improper colouring

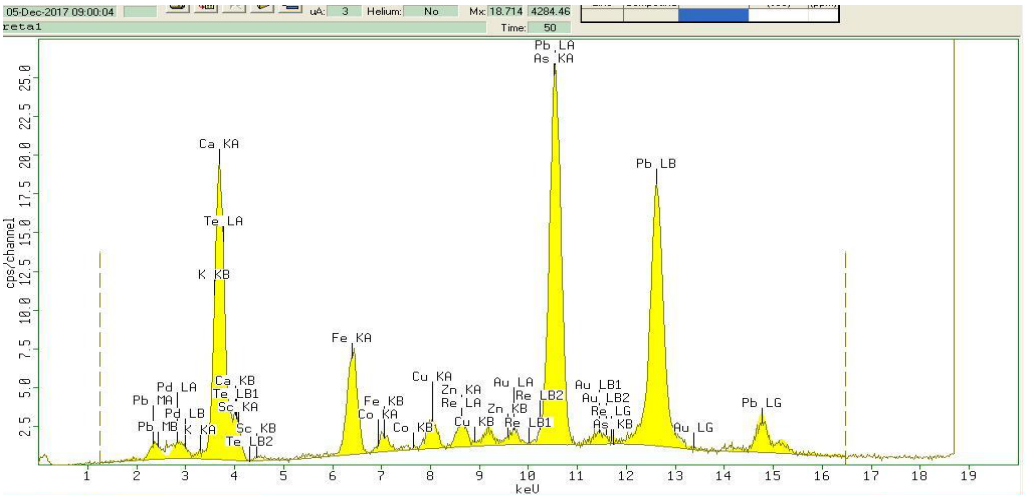


Figure 9. XRF patterns for the preparation and the gilding layer

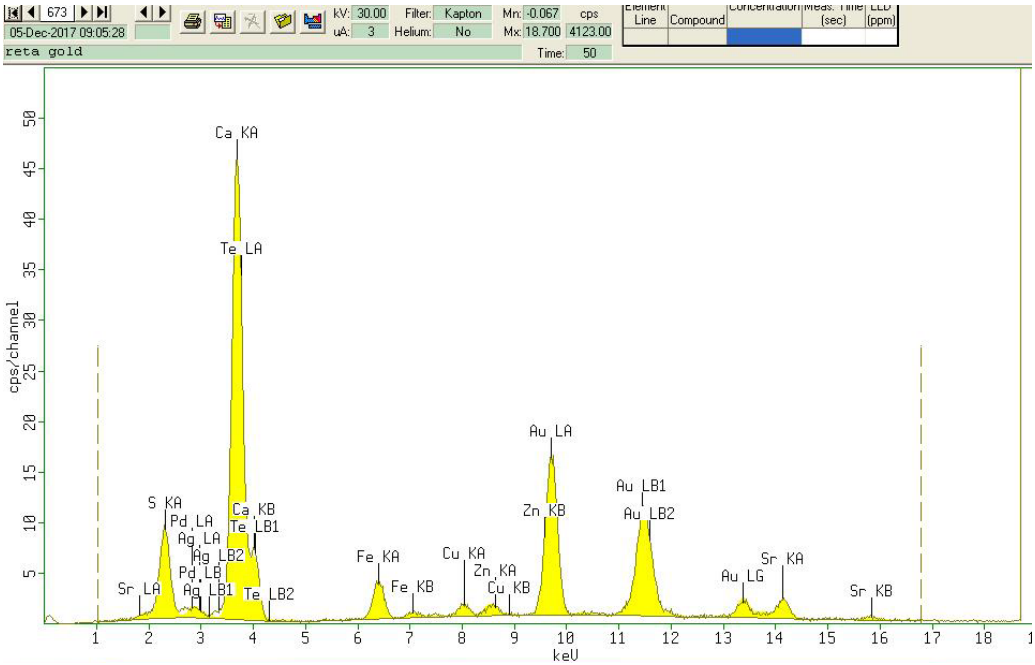


Figure 10. XRF patterns for the red pigments

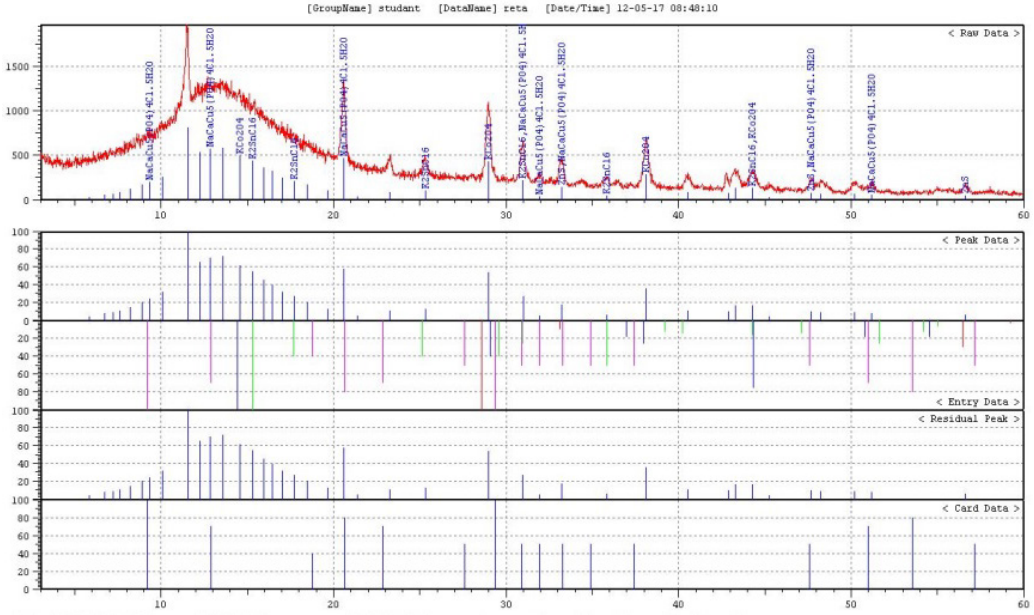


Figure 11. XRD patterns for the preparation layer sample

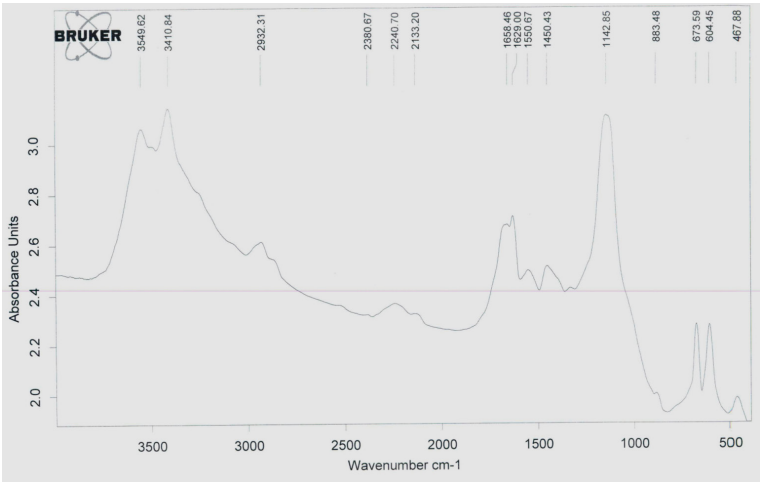


Figure 12. FTIR spectrum for the preparation layer sample

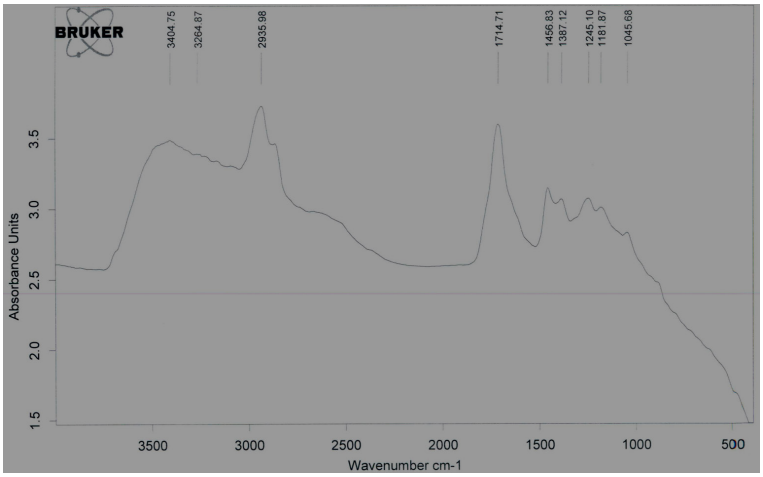
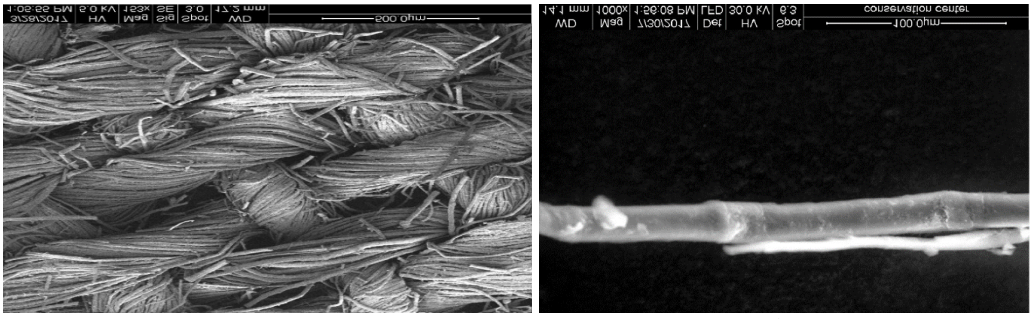
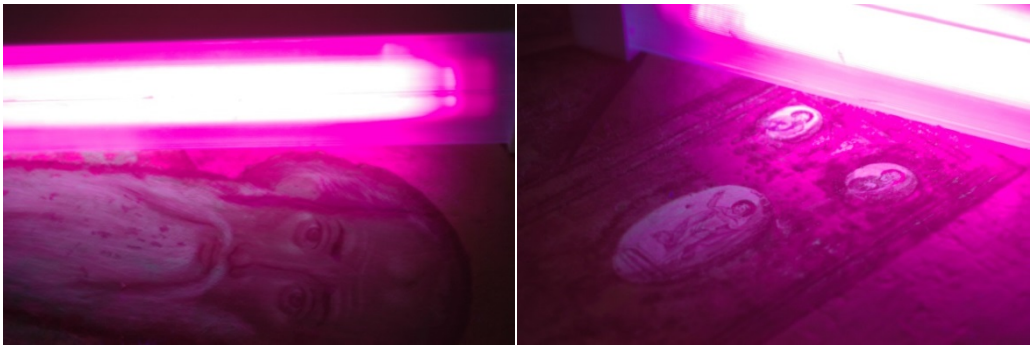


Figure 13. FTIR spectrum for the varnish sample



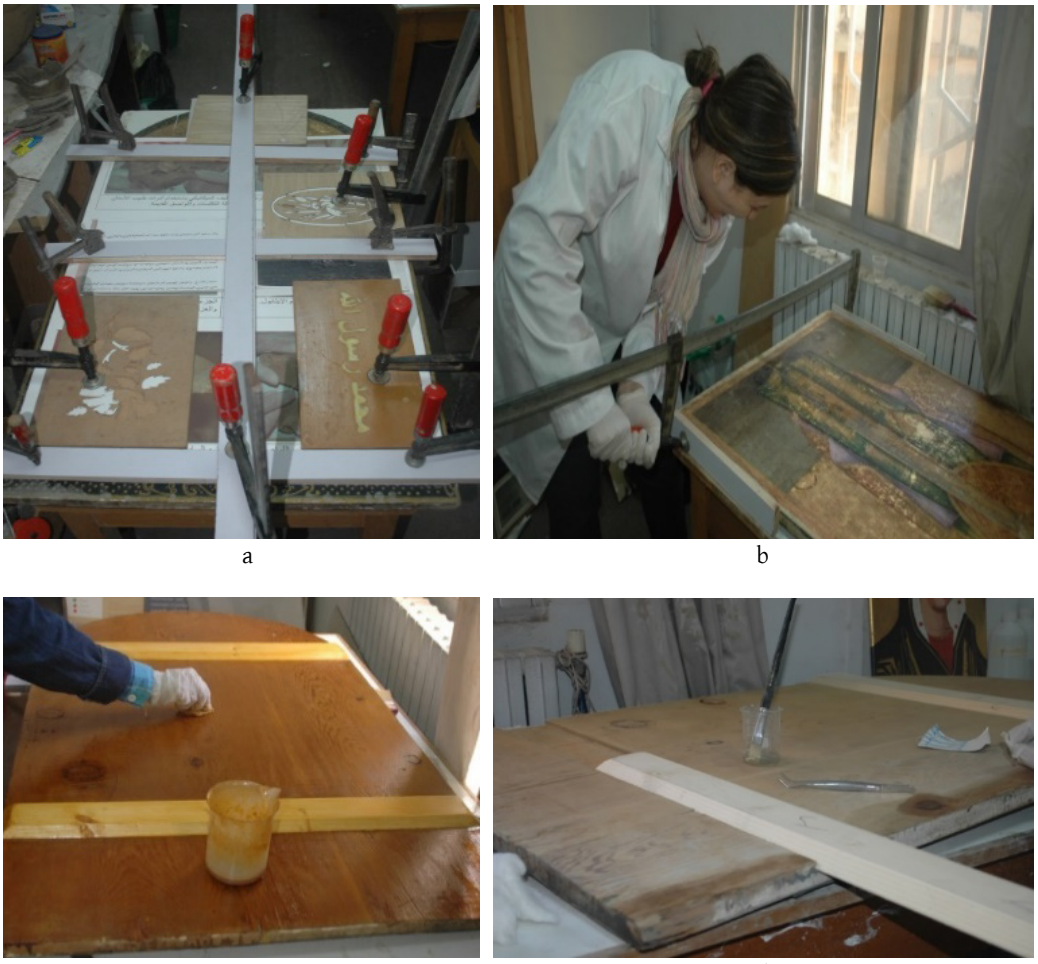
a b

Figure 14. SEM image: a–b – linen textile



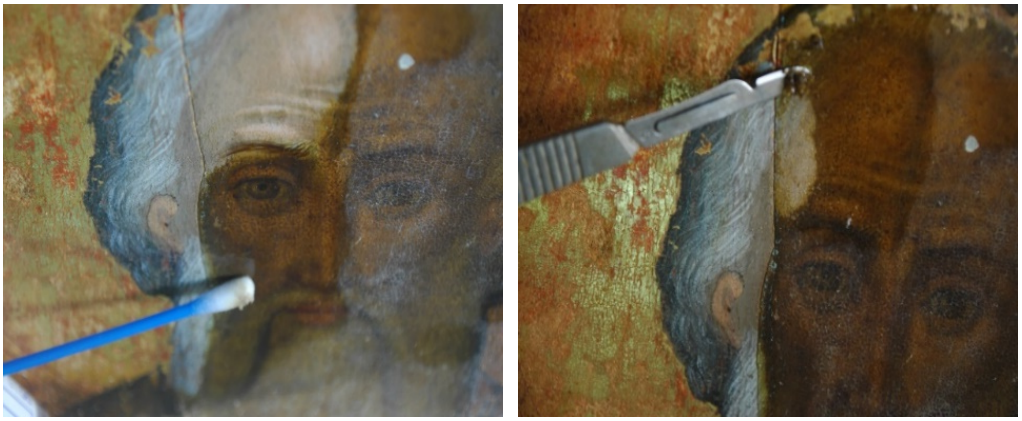
a b

Figure 15. a–b — UV inspection images



a b c d

Figure 16. a–b – the straitening the curvature in the icon; c–d – the treatment of the reverse side



a b

c

Figure 17. a – soaked pads of dimethyl used to remove old varnish; b – medical scalpels used in cleaning; c – gilding layer after cleaning; d – before cleaning

a b

Figure 18. a–b – removal of colour from the previous intervention

a b

Figure 20. Restoring the gold leaf and recolouring the missing colour

a b

Figure 21. a – the icon after conservation; b – the icon before conservation

a b

Figure 22. a – backside of the icon after conservation; b – backside before conservation

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