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TYPOLOGICAL STUDY AND NON-DESTRUCTIVE ANALYTICAL APPROACHES USED FOR DATING A POLYCHROME GILDED WOODEN STATUETTE AT THE GRAND EGYPTIAN MUSEUM

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ABSTRACT

Wooden statuette belonging to a kind of boxes or chests the "canopic chests", are reported in ancient Egypt from the 2nd millennium BC to Ptolemaic period. Due to their wide use, often the dating or function of such objects is questionable. In this paper we shed the light on dating and original function of this statuette through alternative multi-analytical techniques, such as, Optical Microscopy (OM), Portable X Ray fluorescence (PXRF) and Fourier Transform Infrared Spectroscopy (FTIR-ATR), coupled with archaeological and typological study. The results revealed that it is depicting the God Soker in falcon headed mummy shape and was used to surmount the lid of shrine or naos shape canopic chests. Analytical investigation resulted to the identification of wood species (Ficus sycamore), the preparation layer composed of calcium carbonates, and the pigments used: Egyptian blue, malachite, orpiment and cinnabar, while, the gilded layer is alloy of gold and silver, and the binding media identified as animal glue. The combination of techniques for dating and typological criteria suggests that this statuette can be dated from late 27th dynasty (ca. 525 - 404 BC) to the Greco-Roman period.

KEYWORDS: Canopic Chests, Soker, Late Period, Greco-Roman, Pigments, OM, FTIR, PXRF

1. INTRODUCTION

This statuette is belonging to collection of wooden statuettes stored in "GEM" the Grand Egyptian Museum, Giza, Egypt, with GEM No. 39791, received from the Egyptian museum at Tahrir square without any information about its origin or function. Information from the General Catalogue of the Egyptian Museum this figure represents a hawk or falcon made of wood painted and the old registration number mentioned.

The dimensions are 25 cm. in height and 15 cm. in width, the wood is covered with white preparation layer before being painted, the painting layer almost still in good condition, above the head of the hawk there is a double feathered crown consists of different colours like blue, green, red; which divided into horizontal rows. In the middle of the bottom part of the crown there is a golden sun disk.

The back of the crown was painted with pale yellow pigment, and the previous accession number (12-11/25-4) stuck to it. (Fig. 1 a, b, c, d).

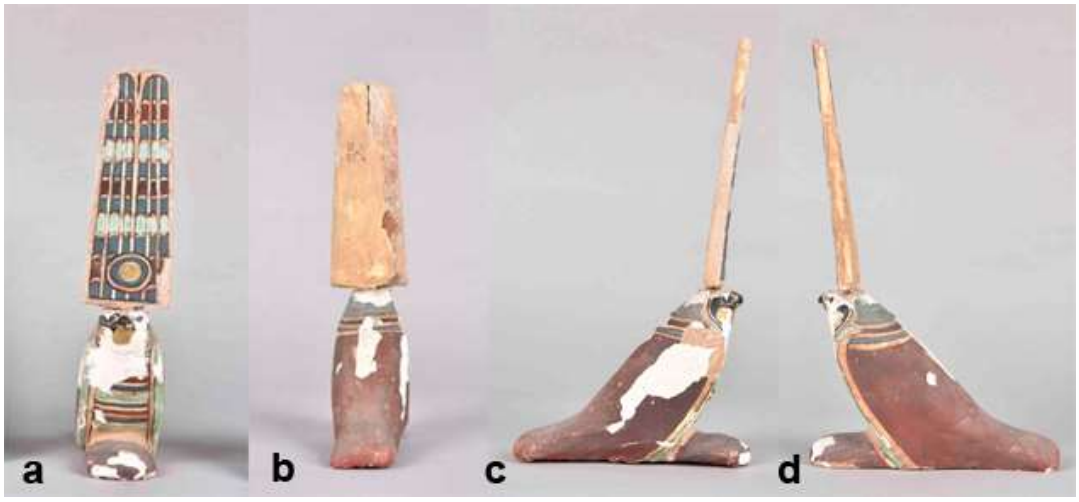

Figure 1: Structure and colour pallet used in polychrome statuette; a. the frontal view, b. the rear of the statuette, c. left aspective view, d. the right aspective view.

The crown height is 15 cm. and fixed into the head through a wooden tenon with using mortise and tenon technique, which is the same technique used to fix the statuette itself to the lid of a canopic chest as per typological study refers to, as the remains of the tenon still exist in the base of the statuette (Fig. 2).

Figure 2: The bottom of the statuette with wooden tenon proving that it was fixed to another wooden object.

The head of the statuette contains the beak and eyes with black colour, including a gilding area in the face indicating that there was gilded layer all over the face area; furthermore; the sun desk is gilded, as well. The front part of the body decorated with parallel lines in blue, green, yellow and red colours, while the base and the back of the hawk is painted with red.

In ancient Egyptian painting; colours have a symbolic and classificatory meaning to the ancient Egyptian, thus; in our case study the main colours like red which symbolized the sign of the sun, strength, victory and the eternal; while the yellow was a solar colour connecting with the sun and the immortality of the afterlife; and green showing the power over new life and resurrection, the blue is the sign of the sky and the place of Ra, symbol of divinity and supernaturalism (Foroughi et al., 2017; Redford, 2011). All the mentioned colours executed in painting the statuette related to the divine figures and afterlife which strongly relating to the objective of the statuette.

Through studying parallel patrons in museums' collections, the study of the physical evidences and composition of the object we found the main objective of this statuette, originate its position and using this information as a dating approach for this statuette. Due to the rapid development of scientific techniques their application shed new light for the interpretation of cultural and archaeological growth and

evolution (Liritzis et al., 2020, Hala et al, 2019; Hussein. et al, 2020).

Here, Non-destructive investigation and analytical techniques is employed to study the structure of the statuette and materials composition of the preparation layer, pigments, wood species identification, and gilding layer; which has helped in dating the object and supported the results of the typological and archaeological studies. Furthermore, the painting technique has been intensively studied with the optical microscopy and provided new information in this regard related to the historical period of the statuette. The studying of gilding layer was a must as it is representing an evolution both from material and technical point of view, furthermore; its symbolic in religious art (Irina et al., 2010).

The aim of this research is the dating of the polychrome gilded statuette according to its materials' composition, painting technique with colour symbolism indication and its typology. C-14 dating as a destructive method of direct dating the wood is not allowed. Thus, alternative ways were chosen employing different non-destructive analytical methods to examine and identify the components of the statuette and finally attribute a dating of construction.

2. MATERIALS AND METHODS

2.1 Archaeological and typological study

The information about this kind of figures is mainly based on comparative examples that are found in different museums' collections around the world and in Egypt. It has been found that this kind of small statues "statuettes" were not present as single statues inside the tomb but related to a kind of boxes or chests called "canopic chests". This guide us to physically examined the object for an evidence that it was fixed or connected to other piece of work. Indeed there appears a tenon in the bottom of the base of the statuette, which assert the potential that the figure was used as a couchant statuette on the lid of the canopic chests, which significantly evolved through ages of ancient Egyptian history.

The wooden statuette depicting a figure of a mummified falcon which was representing the God Soker; one of the ancient Egyptian deities who were considered protectors of the temples and the throne, and a symbol of the incarnation of the Spirit of heaven in ancient Egypt, also as a symbol of the eternally reborn sun and signified rebirth, and considered one of the necropolis guardians in ancient Egyptian cult (Bunson et al., 2002; Teeter, 2003).

Among the greatest festivals in ancient Egypt which enlivened the life of imperial Thebes, the festival of Sokar; the deity which represent our object, the scenes of the festival occupy the whole of the upper register on the south wall of the second court of Ramses III's at Madinet Habu, (Gaballa et al., 1969). The earliest representation of such a rite of festival of Sokar was in the temple of Amenophis III at Luxor (1388 BC to 1351 BC/1350 BC), while the first known example of a representation of this rite from a private tomb was from the chapel of Mose, and the scenes were representing the sacrifices and offerings of Oryx and its head to Sokar (Gaballa, 1972).

Falcon as a representation of God Soker used widely in the burial and funeral equipment specially from the late period until the Greco-Roman Period, beside used as a couchant of the canopic boxes like our case study, it has been used as falcon-headed coffins and mummy cartonnages, while on royal burials the human face was replaced by that of falcon, which might reflect the King's identification with Horus or with the funerary god Soker. (Broekman, 2009).

This may illustrate the using of falcon Soker shape to be a couchant figure on top of the canopic chests which used to contain and protect the canopic jars of the deceased inside the tomb, furthermore, Qebehsenuef (Falcon) was used as a protector of the canopic jar that preserve the intestines (Teeter, 2003).

Canopic jars had symbolic importance in the burials and were considered to be integral to a proper burial, some canopic jars from the old and middle kingdom were placed in the tombs, and in the third intermediate period (Dynasties 21-25, 1069- 656 B.C.) (Kitchen, 1991), the mummified internal organs of the deceased were usually returned to the thorax and abdomen of the mummy. Canopic jars are ritual vessels for the storage of embalmed viscera removed from the body during the mummification process; Canopic jars are ritual vessels for the storage of embalmed viscera removed from the body during the mummification process, and were made of sets of four jars, every lid was presenting one of the following protecting deities; Duamotef (Jackal) who protect the stomach, Qebehsenuef (Falcon) who protects the intestines, Hapi (Ape) who protected the lungs and Imsety (Human) who guarded the liver (Teeter, 2003).

From the Middle Kingdom, canopic jars might be put inside a canopic box, which from the New Kingdom began to take the shape of a naos or a shrine, sometimes being decorated with a figure of a falcon or a jackal (Ouda, 2012).

David A.Aston (2000) has studied the evolution of canopic chests from the twenty first dynasty to the Greco-Roman period and mentioned that kind of boxes which having a couchant Sokar falcon mummy (akhem) figure on top of the flat lid but without the feather crown, like Warsaw MN 143423, Courte-

sy of the National Museum Warsaw, which similar to Cairo CG 41055 which made for Neskhons III who died in circa 600BC the twenty six dynasty "late period". While the canopic box of Djehutymes who dated to the late fourth century BC (400BC) which considered end of the late period and beginning of the Greco-Roman period, was a wooden box with a flat lid bearing a wooden figure of a couchant falcon mummy with a sun's disc and double feather, that exactly like our selected object in description and Similar to Amsterdam Bybels Museum no. 29 Courtesy the Bybels museum.

At the Grand Egyptian Museum there are two completed canopic chests stored dated to the late period and received recently from the Egyptian museum in Tahrir Square, representing the similar appearance of the falcon mummy figure" Soker" on top of the lid of chest. One of them with the GEM No. 69751, with all the face gilded and the sun disk of the crown as well, with feathered crown painted with blue, red and green colors (Fig. 3).

Figure 3: A similar object at the Grand Egyptian museum storage room with the GEM No. 69751, fixed on top of the canopic chest.

The other object with Gem No.: 69750, with double feathered crown painted with the same technique of our case study, with gilded sun desk, surmounting the shrine shape canopic chest's lid (Fig. 4).

Figure 4: A falcon with double feathered crown in complete context surmounting the canopic chest's lid – The Grand Egyptian Museum – GEM No. 69750

The National Gallery of Victoria in Melbourne – Australia is hosing one of the canopic chests; accession No.: D97.a-c-1982, which dated to the period from (332 to 30 BCE) which means the Greco-Roman till the Ptolemaic period. The Lid of the chest is composed of piece of wood with the figure of a seated falcon wearing the double feather crown. The crown is dowelled into the top of the head. The falcon represents the god Sokar (Fig. 5).

Figure 5 : Complete shrine shape canopic chest dated to the beginning of Ptolemaic period at NGV with mummy falcon shape surmounting the lid of the chest. (source: https://www.ngv.vic.gov.au/explore/collection/work/1331/)

The Museum of Fine Arts in Boston – USA is hosting a canopic chest in the shape of a shrine and a mummy form falcon representing the funerary deity Sokar stands on top with feather crown with sun's disk; accession No.: 98.1128, dated to (305 - 30 BC) the Ptolemaic period (Fig. 6).

Figure 6 : Complete canopic chest with mummy form falcon representing the funerary deity Sokar stands on top of canopic chest- Museum of Fine Arts in Boston – USA (source: https://collections.mfa.org)

Below we present the analytical results of the studied object employing archaeometrical techniques.

2.2 Optical and Digital Microscopy

Representative wooden traces samples have been examined through cutting into the three principal anatomical directions: transverse section (TS), tangential longitudinal section (TLS) and radial longitudinal section (RLS). These three thin sections were mounted on glass sheet to be observed under transmitted light using Optika Microscopy (Italy) equipped with an Optika B 9 Digital Camera.

Digital Microscopic images were taken using VHX-900F Series Digital microscope with progressive scanning system, frame rate 50 F/s (max.) and 1/1.8-inch - CMOS image sensor, for investigating the painted surface and studying the painting technique.

2.3 FTIR-ATR data

Two representative samples were analysed from detached parts of ground and painting layer from the object in order to be analysed by non-destructive method without any sample preparation by Fourier transformed infrared spectroscopy Attenuated Total Reflectance (ATR - FTIR spectrometer) (VERTEX 70, Bruker) equipped with an attenuated total reflection (ATR) technique, spectrum in the range 4000-400 cm^{-1}, range with resolution of $4cm^{-1}$, was used to address the binding media used in the ground preparation and painting layers.

2.4 portable X-Ray Fluorescence (pXRF)

The measurements were conducted with a Niton XL3t GOLDD hand held XRF spectrophotometer using the NITON XL3t X-ray tube based analyser with Ag anode, 50 kV and 0-200 µA max. The instrument head was placed in contact with the selected areas, irradiating an area of at about 3 mm radius. All points were exposed for tens of seconds. XRF spectra were produced using Niton Data Transfer (NDT) software.

3. RESULTS AND DISCUSION

Optical Microscopy

Microscopic investigation using Optica microscopy, used for identifying wood species, indicated that the sycamore fig (*ficus sycomorus*) was used for modelling the wooden body of the statuette. It was very common in ancient Egypt to use native woods such as acacia, tamarisk and sycamore fig covered with gesso layer (Rifai & El Hadidi, 2010) Microphotographs of wood thin sections showed the diagnostic characteristic of Ficus Sycamore (Fig.7. A, B, C, Fig.7 D, E, F for Thin sections). In the radial longitude section which shows simple perforation plates, vessel-ray pits with distinct borders, the ray cell with large horizontal or vertical apertures, body ray cells procumbent with 1 to 4 rows of upright and square marginal cells, prismatic crystals present in axial parenchyma cells. Transverse section shows growth ring indistinct or absent, wood diffuse-porous, vessels solitary or in radial multiple of 2 to 4, fibres thin to thick-walled, Tension wood present, Apotracheal parenchyma diffuse, Axial parenchyma vasicentric often confluent or in bands more than three cells wide and finally in tangential section shows rays of two distinct sizes larger rays commonly 4 to 10 series**.** (Crivellaro et al., 2013; Wheeler et al., 1989).

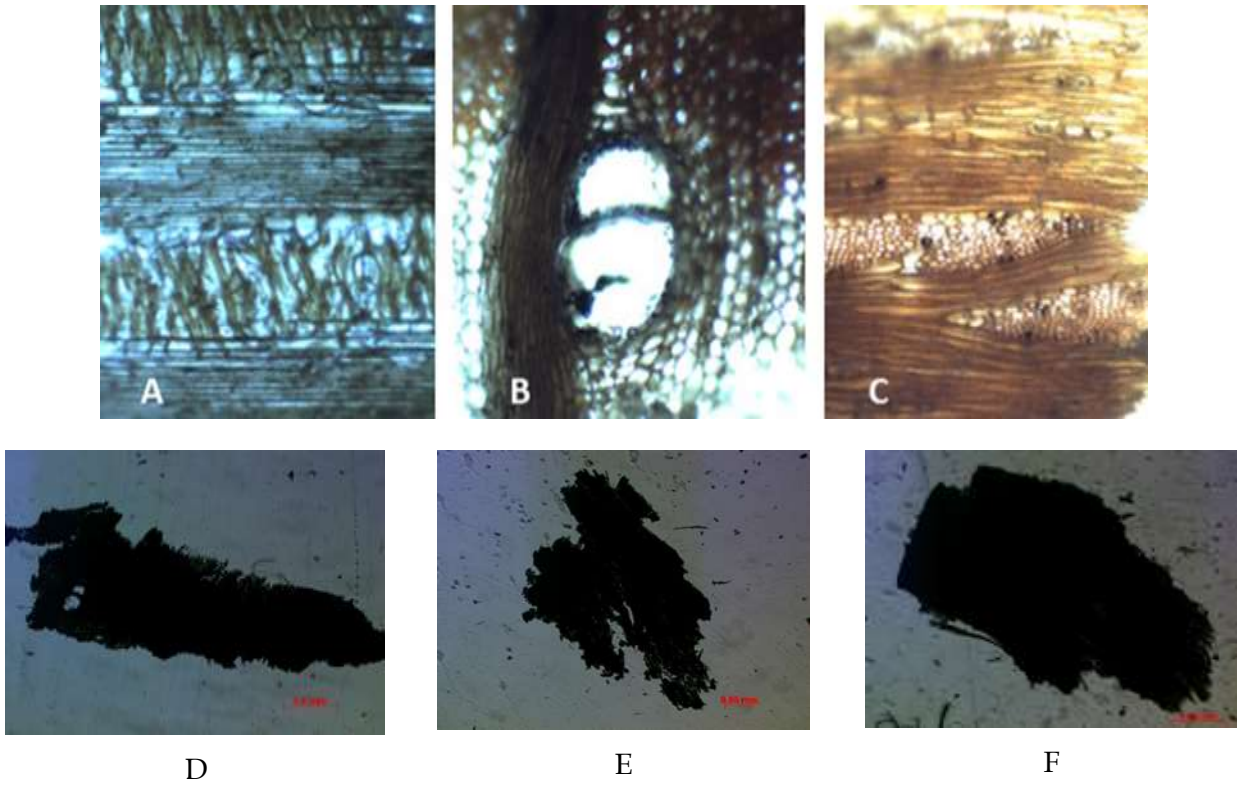

Figure 7: Light microscope images of A – radial longitude section (RLS); B – transverse section (TS); C – tangential longitudinal section (TLS) of sycamore wood (magn. scale: 10X / 0.25 - 160/0.17); D- Cross sectioned with scale; E- Radial section 50X with scale; F-Tangential section 50X, with scale.

Sycamore fig is recorded as native to Egypt and was used extensively in ancient Egypt with other indigenous wood, besides having considerable religious significance; furthermore its fruits in particular, were associated with the goddess Nut (Abdrabou et al., 2017), hence it was considerably used in ancient Egyptian tombs equipment's like our object which was a fragment of a canopic chest which considered one of the most important tomb equipment's. This kind of wood has been used extensively for manufacturing different kinds of wooden artifacts in ancient Egypt since at least the fifth dynasty till the Graeco - Roman period (Abdrabou et al., 2018).

Digital Microscopy

VHX-900F Series Digital microscope used to study the painting technique executed in the statuette and results revealed some indications which we can depend on when studying the painting technique employed in our case study statuette, especially in the plumed feather crown which comprises different colours with accurate shapes. It is obvious from the microscopic images of the frontal part of the plump crown that there is a base background color with the yellow pigment "Orpiment" as defined in the XRF results, and for outlines that define the borders a black solid colour was used over the yellow background; and finally filled in with red, green and blue colours as solid colours repeatedly, this technique used for the frontal part of the bird breast, the back of the crown is fully with only yellow while the rest of body is fully with red colour.

Yellow has been used as a background colour in the polychrome painted wooden funerary figurines and Shabti during the new kingdom and yellow orpiment was used extensively in Ancient Egyptian art. (Dodd et al., 2009), and the background of many paintings, especially those related to the afterlife, is depicted in yellow colour (Foroughi et al., 2017). It remained in use down to the latter part of the Twenty-first Dynasty in the anthropoid inner and outer coffins (Dodson, 2015). Furthermore; it is recorded that a collection of coffins dated to the late period at MCCM (The Michael C.Carlos Museum) at Emory university in Atlanta – Georgia, used almost the same painting technique as the background paints are frequently white or yellow, and the coarse frit-like blue and green pigments were often applied last, and due to their sandy texture may appeared less precisely or skilfully painted, where they are applied out of outline (Dawson et al., 2010). (Fig. 8 A, B)

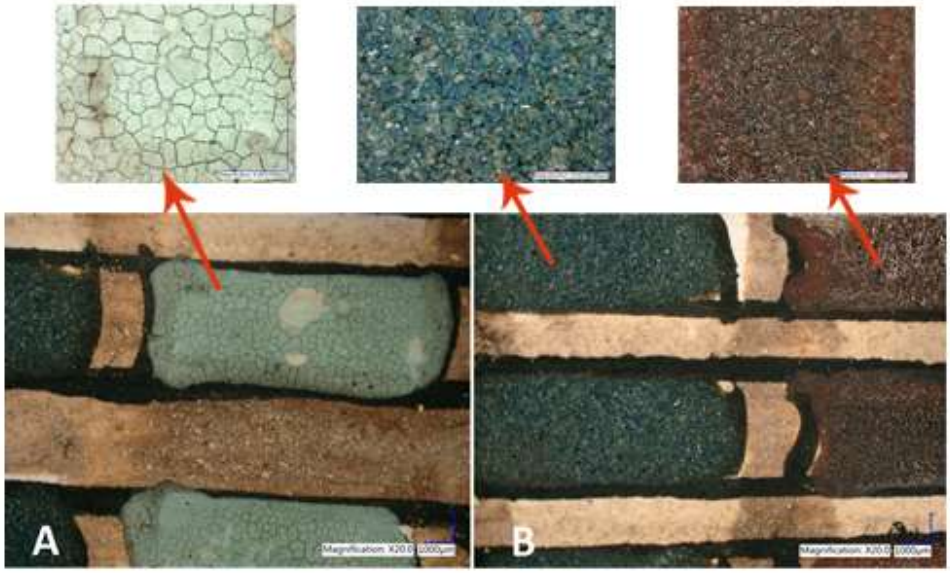

Figure 8 : Detailed images of the painting layer on the crown of the statuette, A: the yellow background with black outline and the green pigment applied last, B: another part with the yellow background with black outline then the red and the frit like blue applied unskilfully.

FTIR-ATR results

FTIR analysis has been conducted for two separated traces; one of the preparation layers and the other of the painting layer with traces of red pigment; to identify the binding media used. The first sample of the preparation layer revealed that the medium used to bind calcite particles is the animal glue, and the sample from the painting layer indicates the same presence of the proteinaceous binder animal glue (Fig. 9) that wide speared used as paint medium (Hala et al., 2011). The characteristic bands of animal glue shows typical protein vibrations; taking into account the absorption bands in two characteristic spectral windows: C–H stretching and carbonyl band which can be seen in amide I (C=O stretching at 1620 cm^{-1}), amide II (N–H deformation vibration at 1409 cm^{-1}) and amide III (C–O stretching 1002 cm^{-1}). (Falk et al., 2009; Sarmiento et al., 2011).

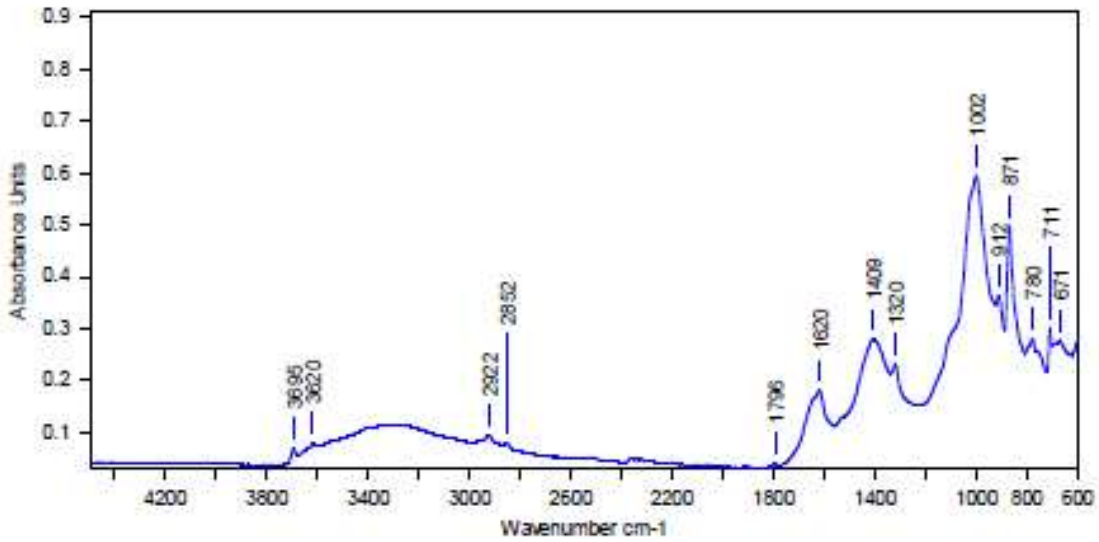

Figure 9 : FTIR spectra shows the presence of animal glue used as binder

FTIR analysis for the preparation layer showed the presence of Calcite ($CaCO_3$). The stretching vibrations of calcium carbonate, $CaCO_3$, peaked at 1390, 870 and 719 cm^{-1} were identified since the substrate was just a calcarenite (Fig. 10). (Hala, 2011).

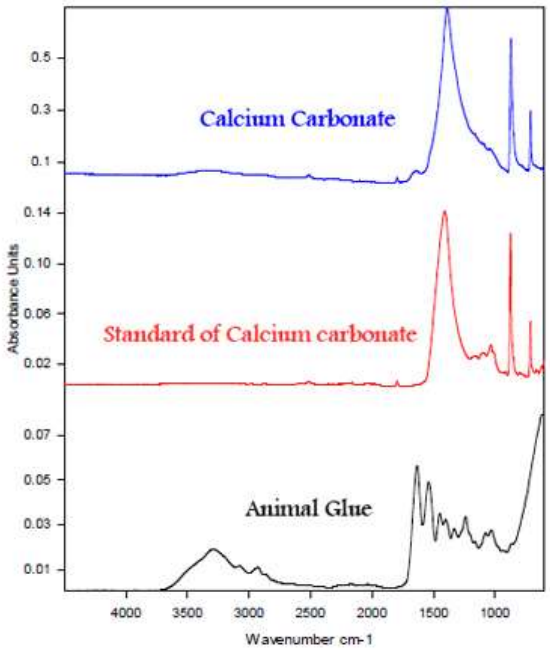

Figure 10 : FTIR spectra of the preparation layer shows the presence of Calcium Carbonates $CaCO_3$ with animal glue used as binder

By analyzing sample of the painting layer using FTIR revealed the presence of kaolin (Fig. 11) which may be related to the red pigment used in painting process which may indicate that it is red ochre (Abdel-Ghani et al., 2009), but after conducting the PXRF analysis we confirmed that it is not related to the red traces because the red pigment used is cinnabar, and this may be added to the preparation layer adhered to the painting layer.

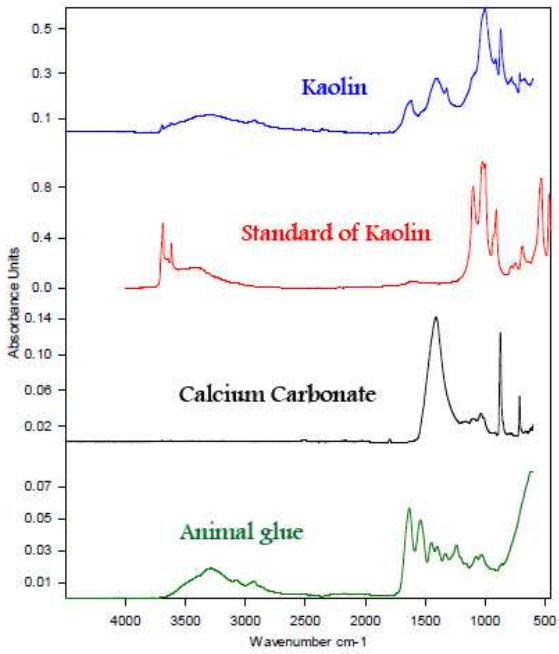

Figure 11: FTIR spectra of the painting layer with red pigment traces shows the presence of Calcium Carbonates $CaCO_3$ with animal glue used as binder and kaolin

Portable X-Ray Fluorescence data

The main drawback of carrying out analysis of artworks and artifacts belonging to museum collections is the transportation to a laboratory. Therefore, the use of a portable system like portable XRF has a crucial importance and enables to perform the analyses *in situ* and it is the most widely used investigative technique in the field of archaeometry due to a number of favourable analytical characteristics such as multi-elemental, non-destructive analysis, high sensitivity and applicability to a wide range of samples (Calza et al., 2009) (Fig. 12).

Figure 12: XRF spots locations and the PXRF instrument analysis in situ.

Preparation layer

The XRF spectra, acquired on the white preparation layer surface, showed the peaks of calcium (Fig. 12), related to using Calcium Carbonates ($CaCO_3$) in the preparation layer. Iron, copper, titanium, and strontium signals were also observed. These elements can be found as common impurities in rocks used to prepare ground layers. (Abdrabou et al., 2018). These elements suggest that the preparation layer is calcium carbonates ($CaCO_3$). In the infrared spectrum of the preparation layer, calcium carbonate ($CaCO_3$) was detected (bands at: 1796, 1645, 1390,870 and 712 cm^{-1}). The preparation layer in ancient Egyptian artifacts which usually consists of calcium carbonates filler mixed with an organic binder was used to cover wood surface to create a more uniform surface prior to painting and gilding layers and to supress the defects or any unevenness of the wood surface (Safa-Abdelkader, 2013). Moreover, it was used in ancient Egyptian paintings to improve long term adhesion and essentially cautions the brittle paint from the swilling and contracting of the underlined wooded support (Dawson et al., 2010).

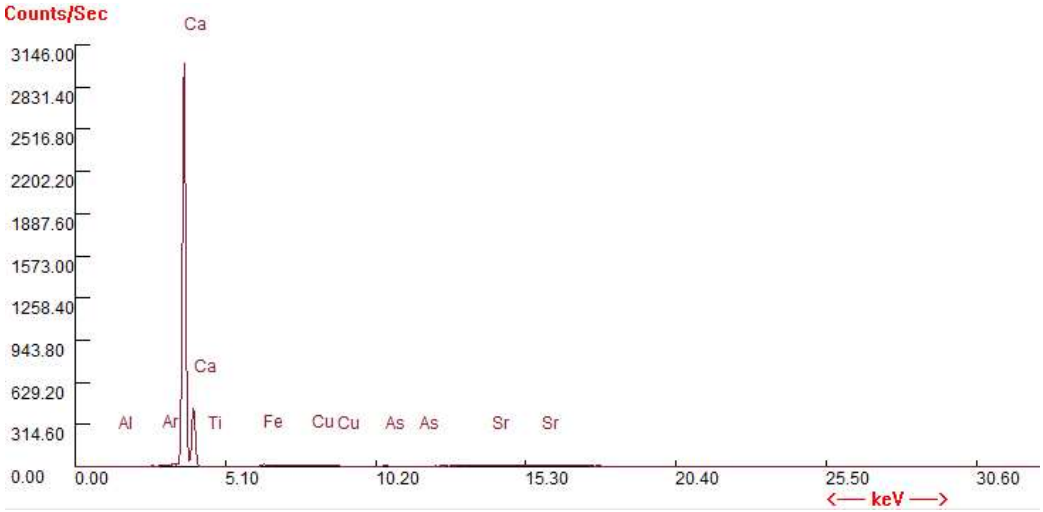

Figure 13 : XRF spectra of the preparation layer

Red pigment

The predominant chemical element in all spectra taken from the red spot of the figurine body is Hg, which reveals that the red pigment applied is cinnabar (Fig. 13). (Križnar et al., 2008). The red pigment cinnabar (HgS) has been used as a painting material considering one of the very costly pigments that widely used until the Roman period; it was preferred because of its deep red, special gloss, good covering characteristics; it was the material most suitable for colouring surfaces, due to its resistant to oxidation or acid rain; many archaeological objects still show an unaltered bright red colour. (Cardell et al., 2009; Nöller, 2014).

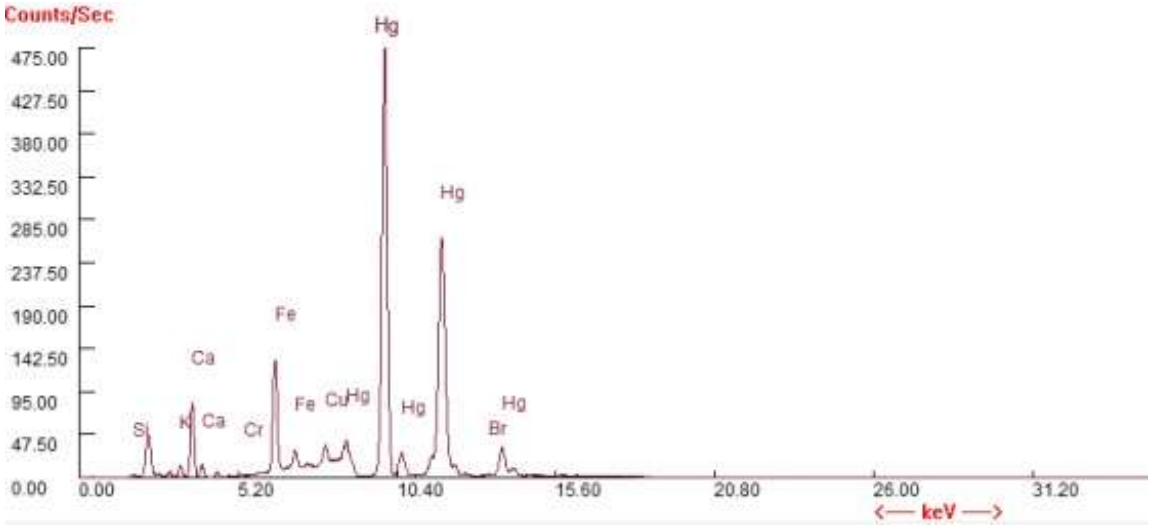

Figure 14 : XRF spectra of the red pigment

Green pigment

The XRF revealed the presence of Cu, Ca, Fe and traces of Ti and Mg In the green color, which indicates the use of malachite ($CuCO_3.Cu(OH)_2$) (Fig. 14). Malachite is probably the oldest known green pigment and comprising basic copper carbonate, and occurs as natural minerals in Egypt (Calza et al., 2011). Malachite was used in ancient Egyptian painting and particularly in the context of female "green faced" coffins from the 26th Dynasty (Saite Period, 7th Century BCE) (see, Siddall, 2018). In ancient Egypt, green was a colour associated with freshness, flourishing, fertility, newness, and with the resurrection of Osiris (Scott, 2010) which elucidating using the green like malachite in this sacred statuette figure.

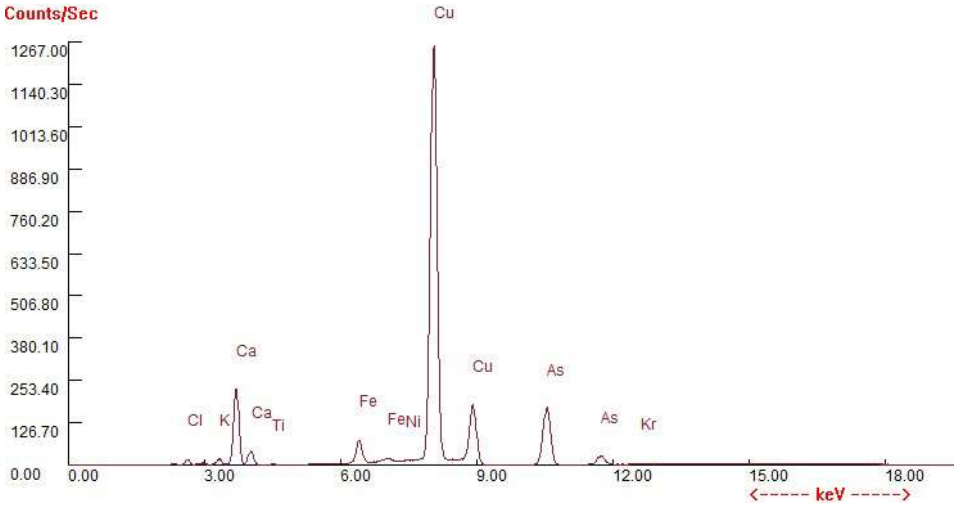

Figure 15 : XRF spectra of the green pigment

Blue pigment

XRF spectrum of the blue painting layer, showed up the elements that presented the highest concentrations were silicon (Si), copper (Cu), and Calcium (Ca). (Fig. 15) This result provides evidence for the presence of copper-based pigment that is most likely Egyptian blue. (Pagès -Camagna et al., 2006; Scott, 2010). It is confirmed that the main constituent of the archaeological Egyptian blue is Cuprorivaite in the 21st Dynasty, 25th Dynasty and Ptolemaic period coffin specimens, and in some samples contains carbon which believed that it's added to produce a darker blue colour (Pagès -Camagna et al., 2006; Edwards et al. 2004). Egyptian blue used from about 4th Dynasty through to the end of Roman Period in Europe and beyond (c. 800AD). (Scott, 2010; Verri, 2009). It was used to decorate various Egyptian artifacts and the extensive use of this pigment widespread in the Mediterranean areas under Roman influence (Pagès-Camagnaet al., 1999; Pagès-Camagna et al., 2001)

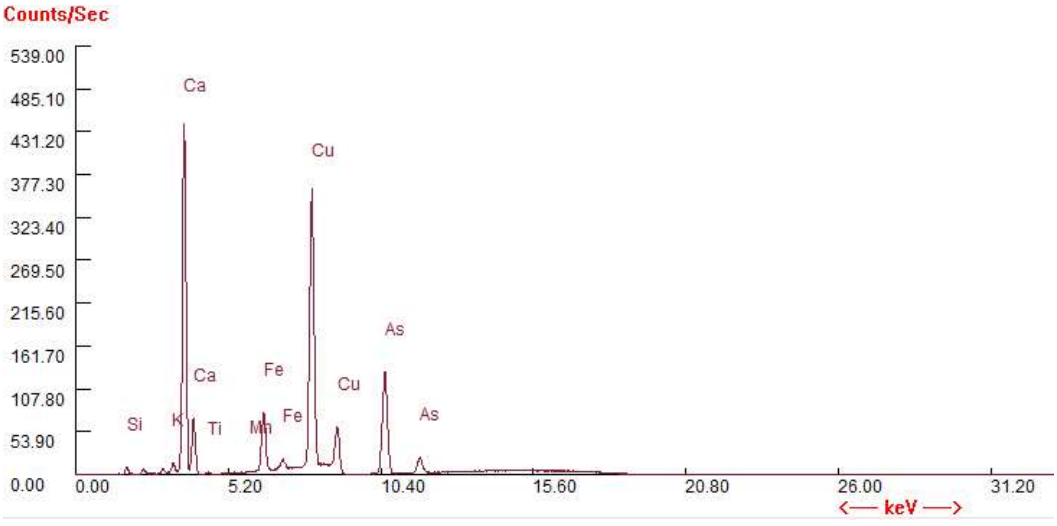

Figure 16 : XRF spectra of the blue pigment

Yellow pigment

The spectrum of the yellow pigment showed a high intensity of arsenic and sulphur. This result provides strong evidence for the presence of an arsenic sulphide pigment which is most likely orpiment (Fig. 16).

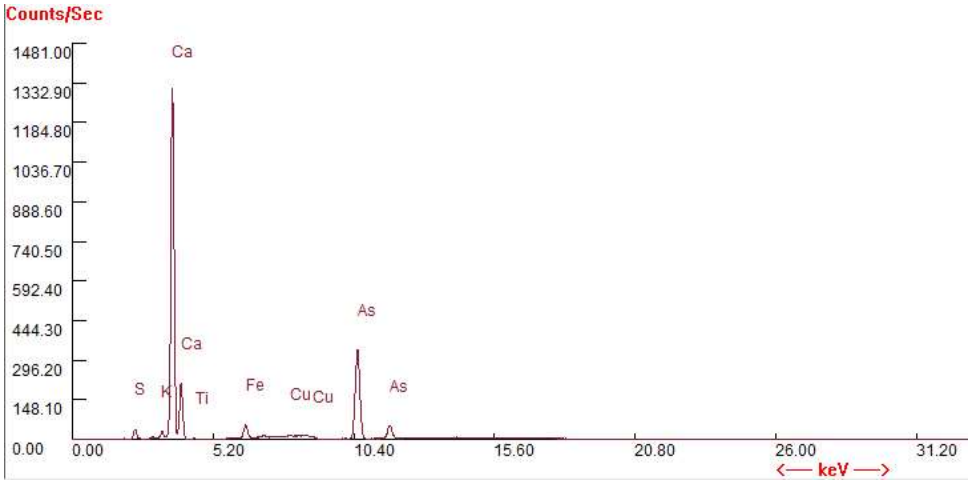

Figure 17 : XRF spectra of the yellow pigment

Owing to its bright yellow colour (Fig. 17), orpiment could be used as a gold substitute symbolizing Re's spirit because it is more intense in colour than ochre or iron oxides (Pagès-Camagna et al., 2001). And based on the fact that the color of the pigment clarified the nature and details of the artwork or monument and lent it symbolic meaning, this may explain the use of orpiment as yellow colour in our divine Hawak "God Soker" depicting the spirit of Re in the eternity (Redford, 2011).

Figure 18 : Orpiment rough morphology with glowing crystals

Orpiment is known to have been used in Egypt not earlier than the 18th dynasty (Chiavar et al., 1995); and there are documented examples of the use of orpiment throughout the Ptolemaic period; While the Egyptian deities were believed to have skin made of gold (Catherine, 2013). The historical evidence of using this pigment until the Ptolemaic period may support the archeometric data, as reported in the Introduction of the archaeological study.

Gilding layer

The XRF spectrum of the gilding layer (Fig. 18) revealed that the main elements to form the gold layer is Au (Gold) and Ag (Silver) which admit that gold-base alloy used to form the gilding layer in our object (Darque-Ceretti et al., 2011). The addition of silver to the gold was also motivated by the necessity to increase the resistance of gold foils, while the gold silver alloy is clearer and have a major property to reflect the light (Irina et al. 2010)

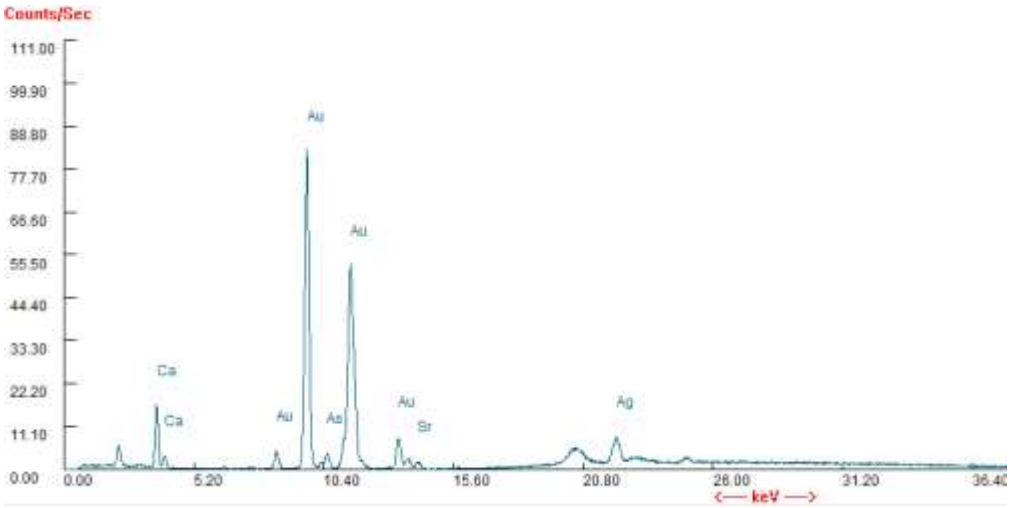

Figure 19: The XRF spectrum of the gilding layer

Gold was widely used particularly in terms of gilding of funerary objects (Davies, 2001; Abdel-Ghani et al., 2020; Abdel-Ghani, 2009), because of its symbolic which associated with immortality, and employed to represent the flesh of Re and other divine beings (Pages-Camagna and Colinart, 2011). Thus; in the statuette our case study; the gold used in gilding the sun desk one of Re symbols existing on the feathered crown of the Hawk and for a part of the face (Fig.19 A, B).

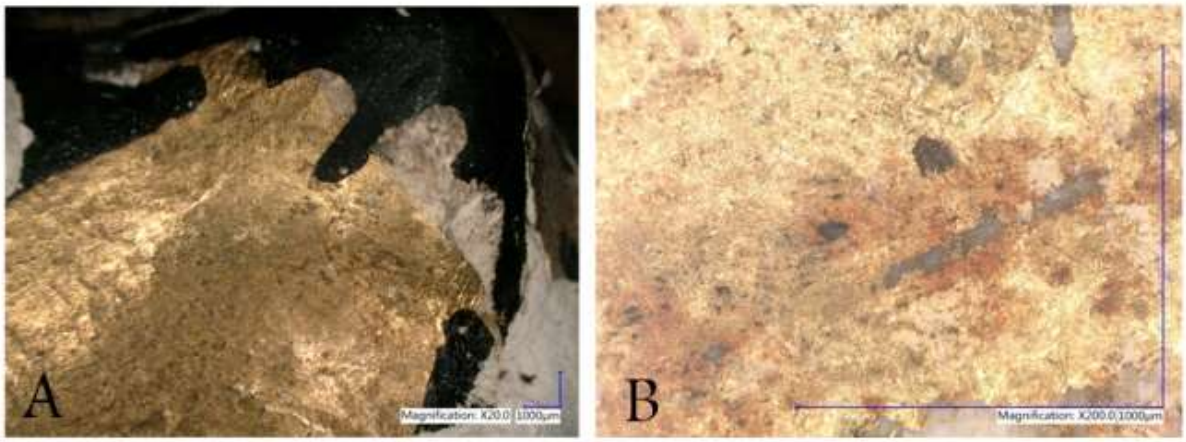

Figure 20: Microscopic investigation for the gilding layer, A: part of the gilded layer on the face area, B: details of the gilding layer.

The most ancient gilded surface were made of pure or highly pure gold leaf, beaten out to form a leaf or as powder mixed with an organic binder, the investigation of the gild sample shows the canary hue of the pigment applied in form of a single layer on the plaster. (Ali et al., 2016).

4. CONCLUSION

The archaeological study of the statuette showed that it is depicting a figure of a mummified falcon which was representing the God Soker; one of the ancient Egyptian deities who protects temples and thrones, and related to the eternally reborn sun, also considered one of the necropolis guardians in ancient Egyptian cult. This gave him the privilege to be surmounting the canopic chests so may it protect the viscera of the dead body in the afterlife inside the tomb. From the typological study with similar examples in different museums we discovered the original position and function of this statuette, and that it's a part of the canopic chests which began to be used during the late period instead of using four separated canopic jars before, and continue during the Ptolemaic period.

These results were supported by multi-analytical methods for investigation and analysis of the compounds of the object and the painting technique used. The object composed on wooden support identified from the microscopic investigation as "Ficus Sycamore" which was widely used in ancient Egyp-

tian wooden objects till the Greco roman period; the XRF results proved that the preparation layer composed of Calcium Carbonates $CaCO_3$ only and covered with painting layer containing variety of pigments' pallet like the Egyptian blue which considered the first artificial pigment in the ancient Egypt and has an extensive use in the Mediterranean areas under Roman influence; the green pigment used is the malachite, while the yellow pigment was the orpiment which could be used as a gold substitute symbolizing Re's spirit and this may lent it symbolic meaning to be used in our divine deity "God Soker" depicting the spirit of Re in the eternity, furthermore; it is used in Egypt not earlier than the 18th dynasty and start to widely used from the late period till the Greco-Roman period; the red pigment used is the cinnabar. In ancient Egypt it was believed that red had protective powers against evil and that it provided life giving powers in a funerary context.

The statuette can be dated approximately from the end of the late period (the 27th dynasty) to the beginning of the Ptolemaic period according to the typological and archaeological study and the pigments used during this period and employed on the painting layer. Due to the prohibition of detaching some wood for Carbon-14 dating (it requires a relatively high weight of wood sample which not available in our case), we applied alternative methodology of using non-destructive methods for investigation and analysis with the typological and archaeological study for dating the statuette.

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