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Intact Middle Kingdom Anthropoid Coffin of Sobekhat from Dahshur North: Discovery, Conservation and X-Ray Analysis

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Richard JAESCHKE[*4], and Masayuki UDA[*5]

Introduction

Since 1996, the Waseda University Egyptian Expedition has conducted excavations at Dahshur North, a large cemetery located in the lower desert approximately 1 km northwest of the pyramid of Senwosret III and 1 km southwest of the pyramid of Khendjer. The initial excavations concentrated in the southeastern area, revealing the typical New Kingdom tomb-chapels of Ipay and Pashedu, and dozens of shaft-tombs and pit-burials (Fig. 1). Since 2004, a new area consisting of a small mound approximately 100 m west of Ipay's tomb has been the focus of our investigations (Fig. 2). Excavation of the small mound revealed it to be a late New Kingdom tomb-chapel of Ta, although the superstructure is now completely destroyed. In subsequent seasons, the investigations around this tomb-chapel have revealed many other New Kingdom shaft-tombs, but also Middle Kingdom ones. This is the first substantial evidence for the existence of Middle Kingdom burials in this cemetery. Moreover, some of these were completely undisturbed and contained intact coffins. So far, we have discovered four intact shaft-tombs belonging to Senu (Shaft 42), an anonymous owner (Shaft 54), Keki (Shaft 64), Sobekhat and Senetites (Shaft 65). Based on the style of the coffins and associated pottery, all Middle Kingdom coffins could be dated from the late Twelfth to Thirteenth Dynasties[1)]. Amongst them, the focus of this paper is on the inner anthropoid coffin of Sobekhat, because the long-running conservation work on his fine and elaborated coffin was recently completed. In addition, X-ray analysis of the materials used on the coffin is reported here.

Archaeological Context of the burial

Excavation in 2007 (12th season) revealed the tomb of Sobekhat and Senetites (Shaft 65) located south of the southern wall of Ta's tomb and immediately east of Senu's tomb. The shaft entrance is oriented north-south, and measures 2.0 x 0.8 m (fig. 3). The shaft itself is 3.6 m deep, and completely filled with *Tafl* chunks (fig. 4). At the bottom of the shaft, two chambers were found to the north and south. Sobekhat, "*Ka*-priest" was buried in the south chamber (fig. 4) and Senetites, "Mistress of the House" in the north (fig. 5). There was no sealing block at the entrances. Both coffins were placed in the ordinary direction as the long side with the eye-panel was facing east. It is remarkable that in this tomb, the funerary process can be traced by the archaeological contexts of a group of pottery placed in the chambers and around the shaft entrance. In the chamber of Sobekhat, nine miniature plates, a small round-bottomed bowl, a flat-based plate and a fragment of so-called beer-bottle were

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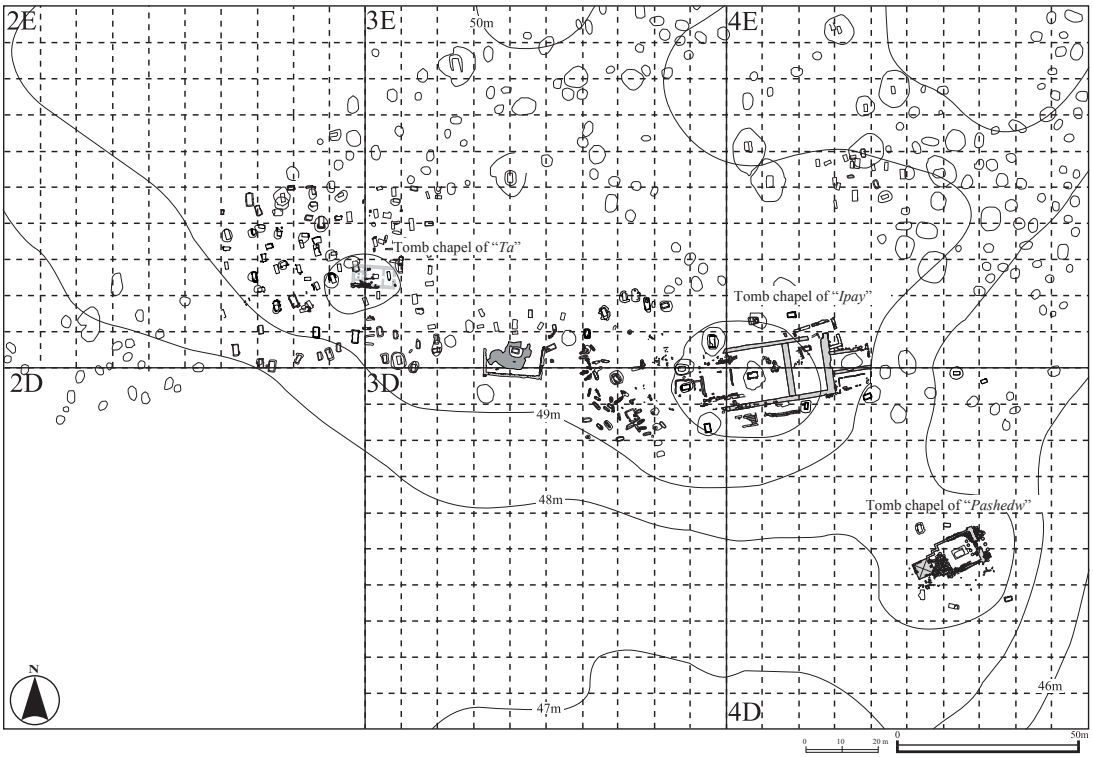


Fig.1 Map of Dahshur North site

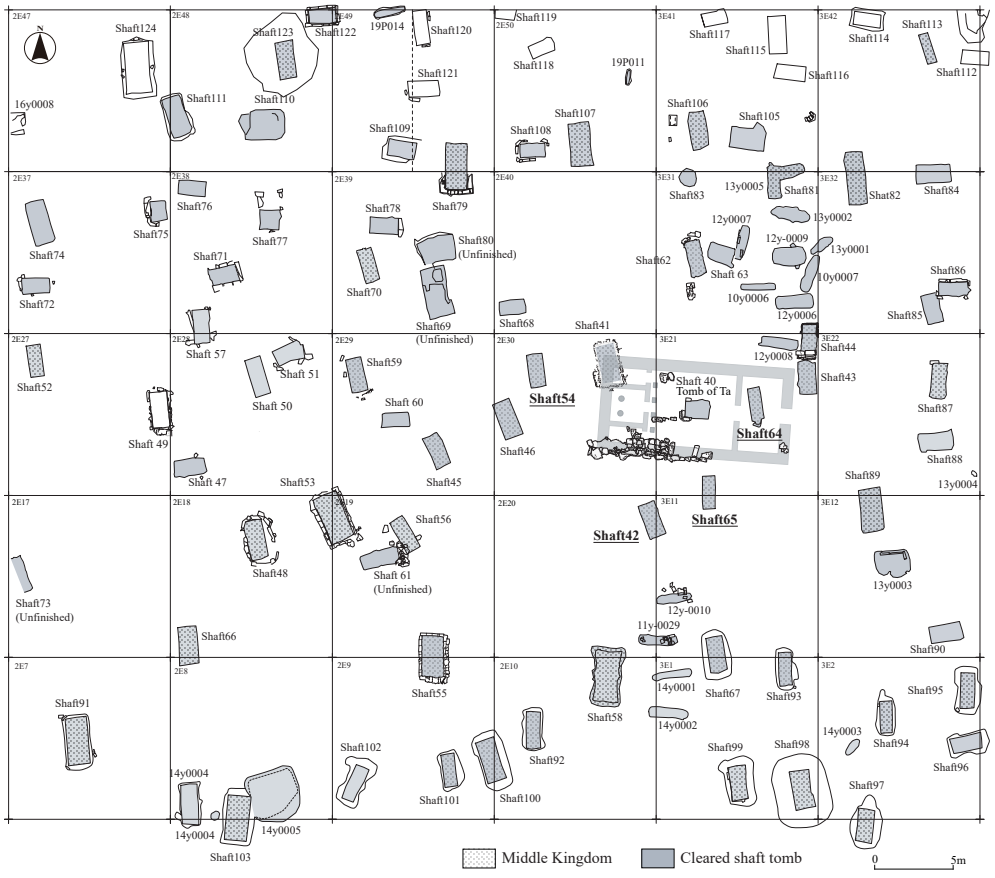
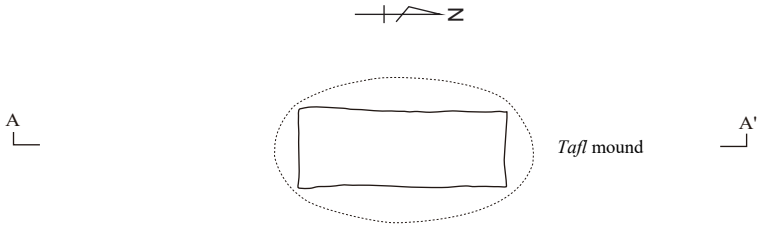
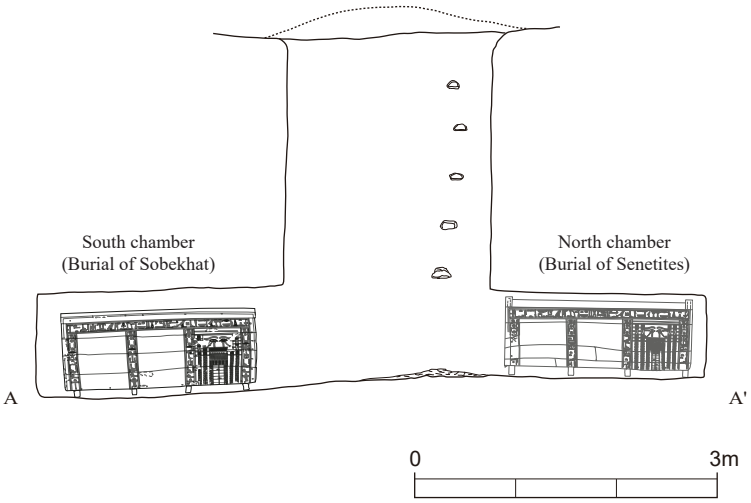


Fig.2 Excavaton area around the tomb-chapel of Ta (Shaft 40)



Plan of Shaft 65



A-A' section of Shaft 65

Fig.3 Plan and section of Shaft 65

Fig.4 Removing *Tafl* chunks filled in the shaft (Shaft 65)

Fig.4 Coffin of Sobekhat found *in situ*

Fig.5 Coffin of Senetites found *in situ*

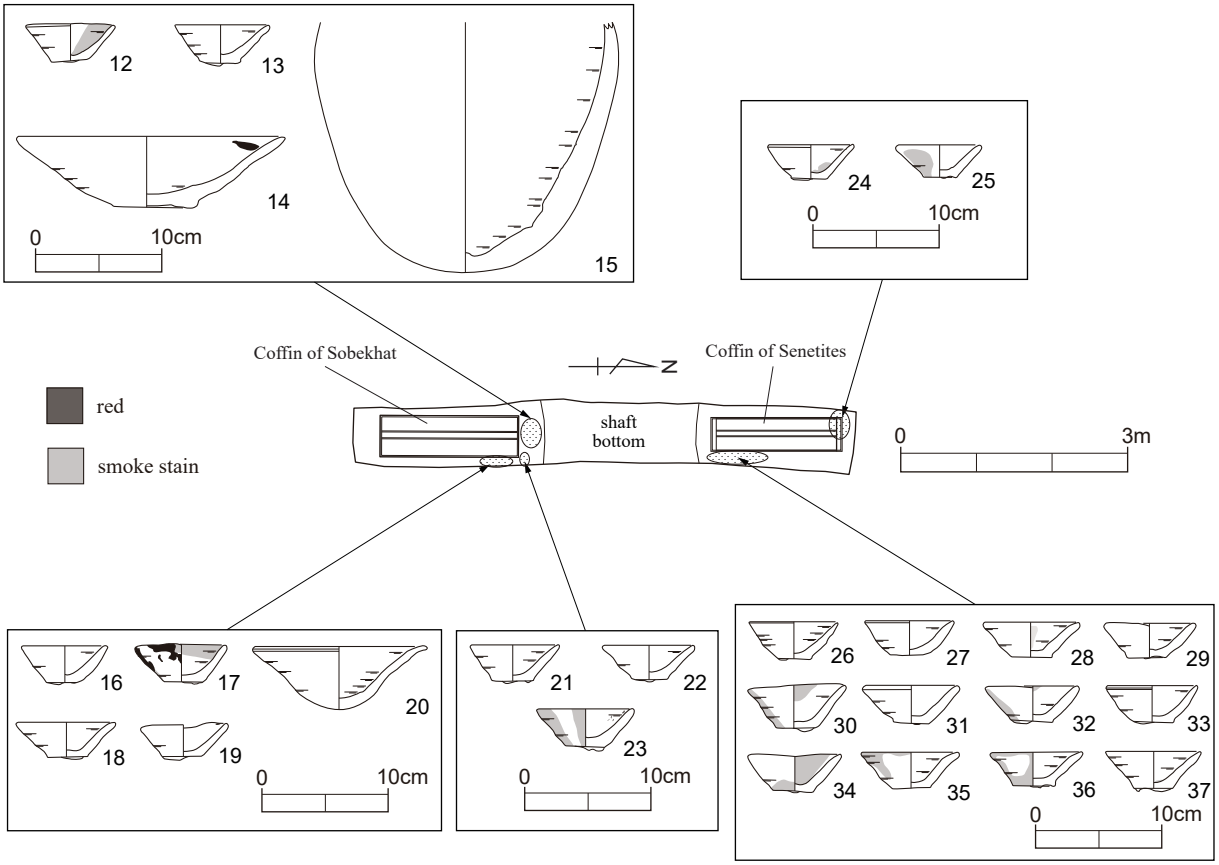


Fig.6 Pottery fragments scattered around the *Tafl* mound over Shaft 65

distributed on the floor, and mainly concentrated in front of the eye-panel on the east side of the coffin (fig. 6)[2]. In the chamber of Senetites, however, 14 miniature plates were found, mainly around the south end of the east side of the coffin (fig. 6), which is probably due to the pottery being placed after the installation of the coffin. Most of the miniature plates have black stains and some had contained a kind of plant grains. They appear to have served as offering containers for incense and food. In contrast, the entrance of the shaft was artificially capped with a small *Tafl* mound, from which many pottery sherds were retrieved (fig. 7). There were at least 11 pottery vessels including small hemispherical cups with a red slip on the rim, a small ring-based cup, a flat-based beaker, a jar with a spout, a globular jar and a bottom fragment of the so-called beer bottle (fig. 8)[3]. It is intriguing that almost all are probably related to liquid contents. This evidence, thus, suggests that after offering to the deceased and filling the shaft, the relatives or participants in the ritual conducted a ceremony which included drinking around the tomb and then discarded the containers. The last performance seems to be a protective ritual such as the “Breaking the Red pots”[4].

Fig.7 *Tafl* mound over Shaft 65, partly removed

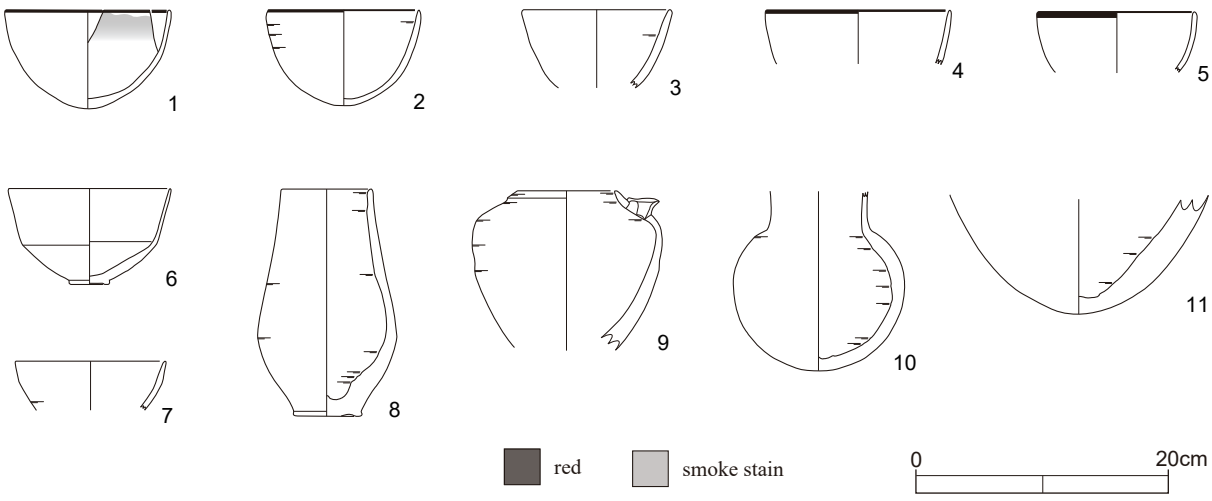


Fig.8 Pottery fragments scattered around the *Tafl* mound over Shaft 65

Inner Anthropoid Coffin of Sobekhat (12o-0180)

The mummy of Sobekhat was placed within the double coffins. Inside the rectangular coffin[5], the anthropoid coffin, covered with a shroud, was placed on its left side with the head pointing to the north (figs. 9. 10). This inner anthropoid coffin is made of a wooden frame and cartonnage. The body was painted in red and the broad collar was finely represented with polychrome painting (fig. 11). It is noteworthy that the white bands of the headdress were overlaid with rows of small black ornaments (fig. 12)[6]; the result of X-ray analysis of these is shown below. Another distinctive feature is the garment of papyrus and lotus, or lilies, painted symmetrically on the chest to represent Lower and Upper Egypt (fig. 13)[7]. The central column is inscribed with the *hetep-di-nesut* formula, which in this case consists of an invocation for the Memphite God Ptah-Sokar-Osiris (fig. 14). Intriguingly, his name and title at the end of the column were written in a small space with blue pigment in a fairly cursory manner, different to the other characters (fig. 15). Therefore, it is probable that the space for a name and title had formerly been left blank, and then it was filled after the owner was decided. This means that

Fig.9 Anthropoid coffin of Sobekhat placed in his outer box coffin

Fig.10 Anthropoid coffin covered with a shroud

Fig.11 Orthographic view of the anthropoid coffin of Sobekhat after conservation

Fig.12 Headdress of the anthropoid coffin overlaid with rows of small black ornaments

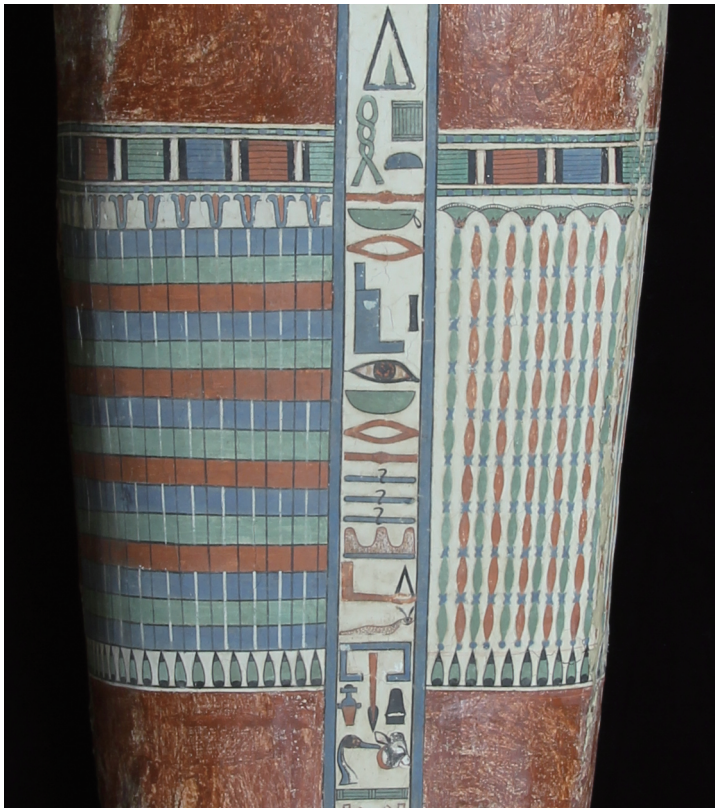


Fig.13 Garment decoration of papyrus and lotus/lilies on the chest

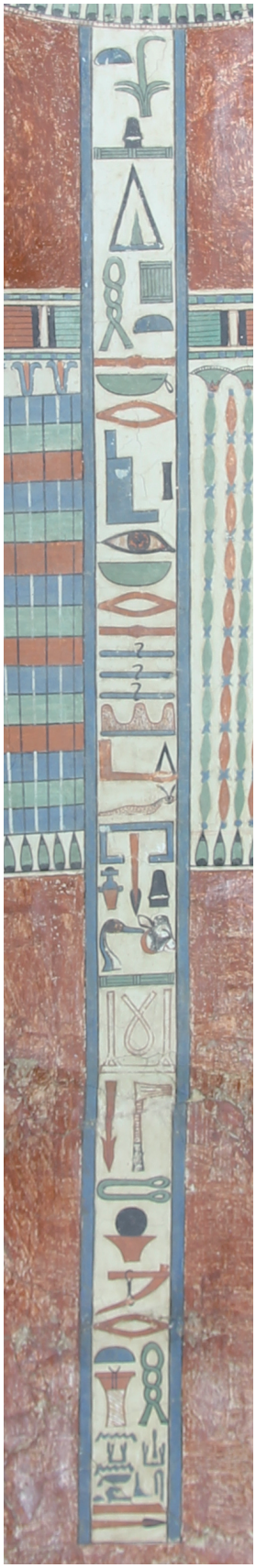


Fig.14 Central column inscribed with hetep-di-nesut formula

Fig.15 Name and title of Sobekhat at the bottom of the central column

this coffin had already been prepared with the space intended to receive the name of the deceased left blank. Therefore, the coffin is a ready-made product and Sobekhat's name and title were added after he or his relatives chose it. This kind of production system regarding funerary items has already been noted[8]. The textual contents in the column is as follows.

ḥtp-di-nswt Ptḥ-Skr-Wsir nb r(ȝ)-stȝw di.f prt-ḫrw kȝ ȝpd šs mnḫt snṯr mrḥt n kȝ n ḥm kȝ Sbk-ḥȝt mȝʿ-ḫrw

An offering which the king gives to Ptah-Sokar-Osiris, lord of Rosetau, so that he may give voice-offerings of bread and beer, oxen and fowl, alabaster and linen, incense and oil, for the *Ka* of *Ka*-priest, Sobekhat, justified.

Conservation

Conservation treatment of the inner coffin of Sobekhat was carried out by R. Jaeschke in collaboration with the Egyptian conservators at the Saqqara magazine.

When we first encountered the painted linen, gesso and wooden coffin in 2011, some conservation treatment had already been undertaken. Some joins in the wooden structure had been stabilised with an adhesive and some gaps filled. Lifting areas of linen and gesso had been packed with cotton wool filler and a resin consolidant (fig. 16). There were no conservation records available of this earlier treatment, but some of the materials used remained. The most dramatic of the previous treatments was the covering of the entire outer painted surface with Japanese paper tissue using Klucel G (hydroxypropylcellulose) as an adhesive (fig. 17). This is a cellulose ether soluble in water, alcohol and other polar solvents, which is normally used to consolidate leather. The justification for the application of this facing was not clear, as the painted surface of the coffin had appeared reasonably sound in excavation photographs. Small strips of Japanese tissue had previously been applied to bridge cracks and hold down loose fragments. The full covering with Japanese tissue had been applied over the top of these strips. While the joints in the wooden structure had been secured with adhesives and cotton wool mixed with a consolidating resin, there had apparently been no attempt to re-align distorted areas. As a result, gaps and misplaced components had been fixed into place and the true shape of the coffin obscured. Evidence of the incorrect profile and surface position of the coffin could be seen where marks in the wood or areas of paint were no longer properly aligned and the surface deformed (fig. 18). The packing of the gaps with cotton wool

Fig.16 Cotton wool used as a gapfill

Fig.17 Paper facing on painted surface

Fig.18 Distorted surface with misaligned break edges

Fig.19 Paper facing covering broken and distorted surface

Fig.20 Sections of red paint lifting off with paper facing

and consolidant had further compounded the distortion at this stage, preventing joints in the wood being brought together or lifting areas of the surface being laid back into place. The problem caused by the application of the paper facing became clear upon further examination. The linen and gesso outer layers of the coffin were cracked and distorted. The paper covered over the cracks and prevented any attempts at re-alignment or strengthening of the painted gesso itself (fig. 19). In addition, and most dramatically, the use of Klucel G as an adhesive for the facing had clearly not been tested before application on the different areas of the painted surface. The majority of the coffin surface had been decorated with a red paint which covered all the outer surface of the base and most of the lid, apart from the head and a central band down the centre. The red paint was laid in a thin layer with a shiny surface and may have had a different binder from the other colours (black, blue, green and white) or a coating applied on top. Klucel G is soluble in ethanol. When this solvent was applied to release the paper facing from the other colours it was possible to release the paper facing without too much difficulty (fig. 20). However, the presence of ethanol caused the red paint to soften and remain attached to the paper facing. Any further application of ethanol would cause the paint to dissolve into a slurry between the lifting paper and the gesso base layer, resulting in severe damage to the red paint layer. Other solvents were tested, and either failed to soften the Klucel G or had a similar softening effect on the red paint.

Conservation treatment began with the removal of the previous interventions of cotton wool packing and some of the misaligned gap filling in the structure of the wooden body of the coffin. This was done mechanically with forceps. Where necessary acetone was injected to soften and dissolve the consolidant resin that had been used.

The misaligned areas were then treated with a 20% solution weight/volume of Paraloid B72 (an acrylic copolymer of methyl acrylate and ethyl methacrylate) in acetone. This was injected using a pipette into the cracks and gaps in an area of the coffin. The solution was allowed to saturate the internal areas of displacement for a few minutes. The edges of breaks were coated with a more viscous solution of Paraloid B72 in acetone as an adhesive. The displaced area was then realigned and held in place using webbing straps and padded clamps (fig. 21). The realignment procedure was carried out, area by area, across the entire coffin. Once one area was correctly aligned and made secure, it was possible to see how the next area should be treated. Once the misalignment was corrected, all the cracks and gaps in the area would close up and the decoration would become correctly aligned once more (fig. 22).

The paper facing was removed by dripping a tiny amount of ethanol on the surface of the paper to soak through. The edge of the paper was carefully lifted with forceps (fig. 23) and more ethanol dripped under the edge (fig. 24). This enabled the paper facing to be slowly peeled away from the underlying paint. The softened slurry of red pigment was packed down using a very small metal spatula tip, onto the gesso surface beneath (fig. 25). This allowed the paper to be removed and the surface paint relaid onto the surface where it had detached.

Fig.21 Realigning consolidated areas using straps and clamps

Fig.22 Realigning areas of the coffin lid

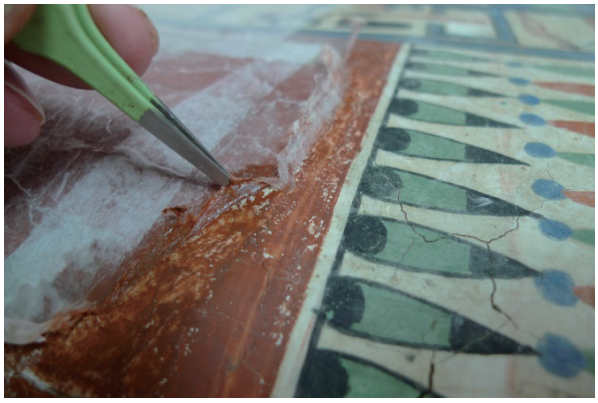


Fig.23 Lifting the paper after first application of ethanol

Fig.24 The paint forms a slurry after the application of further ethanol to release the paper facing

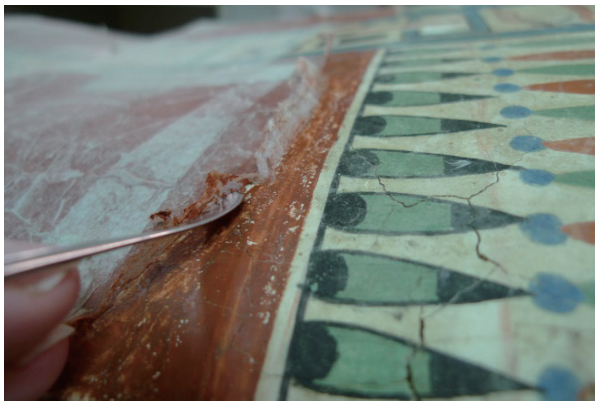


Fig.25 Relaying the slurry using a small spatula tip

Fig.26 Broken and displaced fragments under the paper facing

Fig.27 After the fragments are relocated, the area can be correctly reshaped

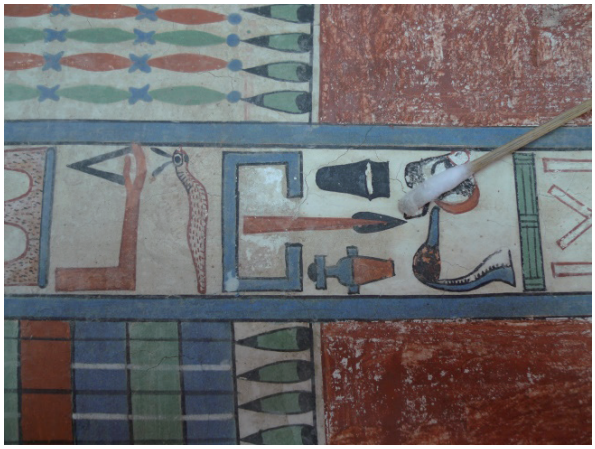


Fig.28 Cleaning the surface with swabs of acetone

In areas where the red paint had not been used – the head and central stripe of hieroglyphs – it was possible to release the paper facing using ethanol and forceps without the paint softening.

In some areas another problem was encountered while removing the facing paper, over both the fugitive red pigment areas and the areas with more robust colour decoration. No consolidation or strengthening had been carried out on the cracked and broken areas of the gesso before the facing paper had been applied. Some areas

may have broken after the paper was applied.

This resulted in very fragile, and often misaligned, areas being attached to the paper facing but out of place on the coffin (fig. 26). The paper had to be removed to free up the fragments before their proper placement could be determined. This was carried out, area by area, by detaching the paper from the gesso fragments with ethanol. The fragments were left in the general area until the area was free of the paper facing. Then the fragments could be identified and correctly repositioned by following the shapes of the broken edges, the painted decoration and even original tool marks in the gesso from when it was applied in ancient times. Once the small fragments were correctly located on the body of the coffin, they could be attached using the viscous solution of Paraloid B72 in acetone as an adhesive. After this had hardened and the surface was secure, the alignment of larger areas could be corrected using the 20% solution of Paraloid B72 in acetone to soften the underlying body of the gesso and webbing clamps and padded straps to hold it in the correct position until the consolidant had hardened (fig. 27).

The head area was very distorted in the face and wig cover. Many of the faience beads had been detached. The distortion could be seen most dramatically in the misalignment of the stripes in the painted wig cover.

No attempt had been made during the earlier conservation treatment to clean the surface of the coffin, which retained a considerable amount of dust and dirt from the burial. Dirt on the painted surface was removed using cotton wool swabs of acetone, gently rolled to and fro across the surface (fig. 28). Although this dirt is often water-soluble rather than being soluble in organic solvents, the presence of the consolidant enables the dirt to be removed with acetone.

Once the surface had been cleaned as much as possible, fragments of gesso which could be accurately relocated were put back in their original position and attached using Paraloid B72 in acetone as an adhesive (figs. 29, 30). There were 220 places on the wig cover for faience beads of which 161 remained. Those that could be identified were attached to their original positions, using the shape of the underlying gesso or the remains of the painted stripes to match beads to their locations. The remainder were placed in the empty locations on the left side of the head and their positions marked so that it would be possible to identify them in future. The viscous solution of Paraloid B72 in acetone was used as the adhesive.

Areas where the gesso surface was missing or where cracks could not be completely closed up were filled using a mixture of glass microballoons mixed with Paraloid B72 in acetone as a gapfill. Once hardened, this was carved down mechanically to the correct shape and toned to match using acrylic inks.

Fig.29 Loose fragments of gesso were only reattached if their original position could be clearly identified

Fig.30 This fragment could be identified by its surface details and break edges

X-Ray Analysis

X-ray analysis on the anthropoid coffin was conducted by M. Uda at the Saqqara magazine in October 2009. This investigation aimed to identify the constituents of the small black ornaments overlaid on the headdress as well as the pigments used in the polychrome painting. In particular, it was important to determine whether the black shiny ornaments were made of faience or glass (fig. 31).

The analysis was performed using an X-ray Diffractometer equipped with an X-ray Fluorescence spectrometer (XRDF) which was specially designed for X-ray archaeology (fig. 32). A diffraction pattern and a fluorescence spectrum can both be obtained by the XRDF from the same small area on the surface of the specimen.

Small black ornaments

The cross section of the ornament was investigated by XRDF (fig. 33). The data taken from the body shown in Fig. 34 confirmed that the internal body was composed of crystalline SiO_2 (quartz) and contained no amorphous phase. Observed XRF data were converted from wt % to atomic ratios. This was necessary due to the fact that XRDF experiments were performed in the open air, and then light elements such as H, C, O, etc. could not be detected. In such a case, atomic ratios are more convenient to compare with the other data than wt %, because the atomic ratios remain unchanged even if the experiments are performed in vacuum. A main element detected here was Si, but only atomic ratios of minor elements observed in this experiment were inserted in Fig. 34. This situation is also true for following XRD figures. The blackish colour of the body was originated from small amounts of unidentified crystalline phases including K, Ca, Mn, Fe, Cu and Ba. The glazed surface of

Fig.31 Black ornaments overlaid on the headdress of the coffin

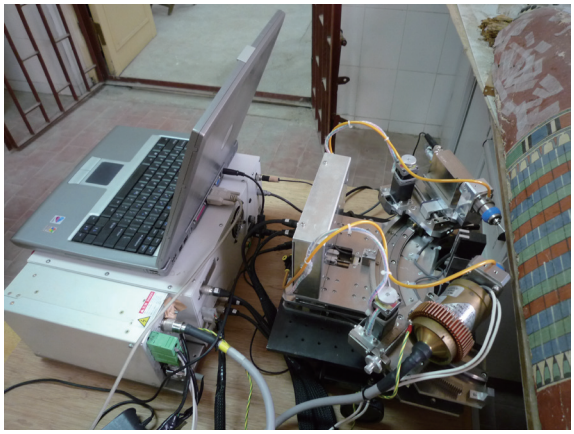


Fig.32 Experiment of XRDF on site

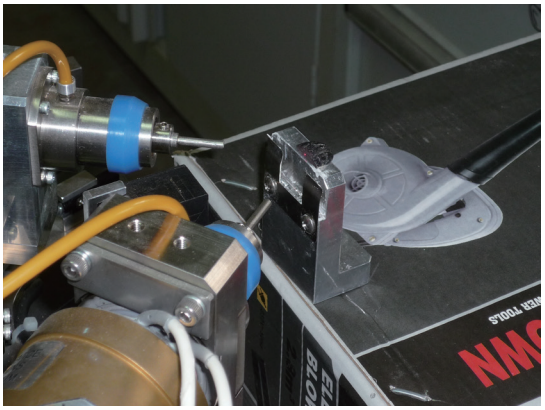


Fig.33 X-ray Analysis on a broken ornament

the ornament (fig. 35) was composed of an amorphous phase and crystalline SiO_2. The blackish or dark purple colour of the surface was also originated from K, Ca, Mn, Fe, Cu and Ba in both the glazed and crystalline parts. These analytical results indicate that the ornament was made of faience, but not glass. The glazed surface of the ornament was composed of a glassy material and crystalline quartz.

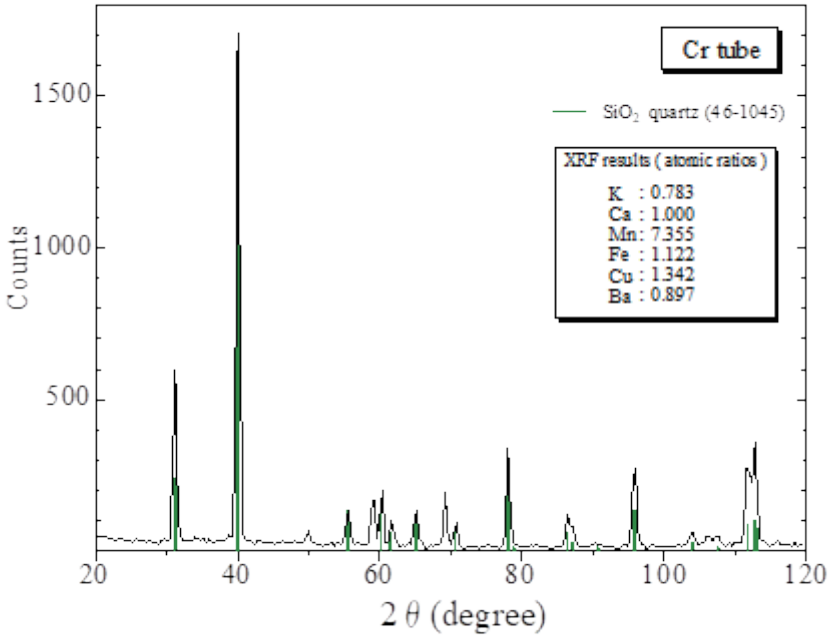


Fig.34 XRD spectrum taken from the cross section of the ornament

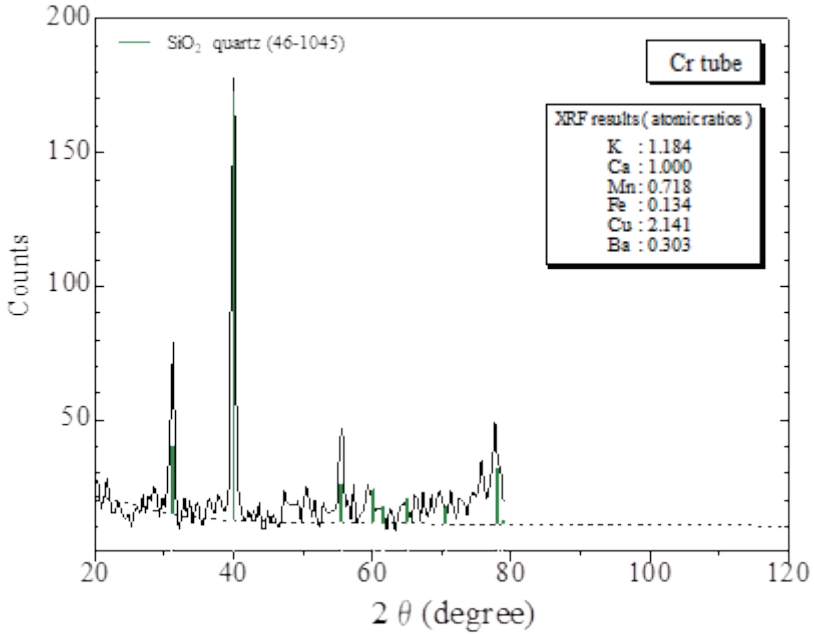


Fig.35 XRD spectrum taken from the surface of the ornament

Pigments of the garment

Samples of blue, green, red and white pigments on the garment were analyzed with XRDF (fig. 36). Data taken from the blue part (fig. 37) revealed that this is the Egyptian blue (CaO CuO $4SiO_2$), which included small amounts of calcite ($CaCO_3$), gypsum ($CaSO_4$ $2H_2O$), quartz (SiO_2), and halite (NaCl). For the green, the data (fig. 38) shows that it was painted with paratacamite ($CuCl(OH)_3$), which were mixed with small amounts of quartz, calcite, gypsum and halite. Paratacamite is a rare mineral but was also found on the outer rectangular coffin of Sobekhat. The red pigment (fig. 39) was composed mainly of hematite, α-Fe_2O_3 which were mixed with quartz, calcite and gypsum. The white pigment (fig. 40) was composed of calcite together with small amounts of quartz and gypsum.

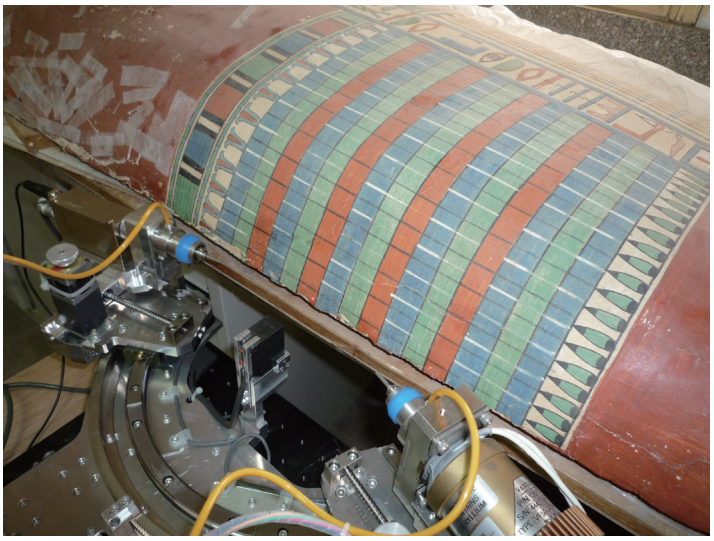


Fig.36 X-ray analysis for colored parts of the garment

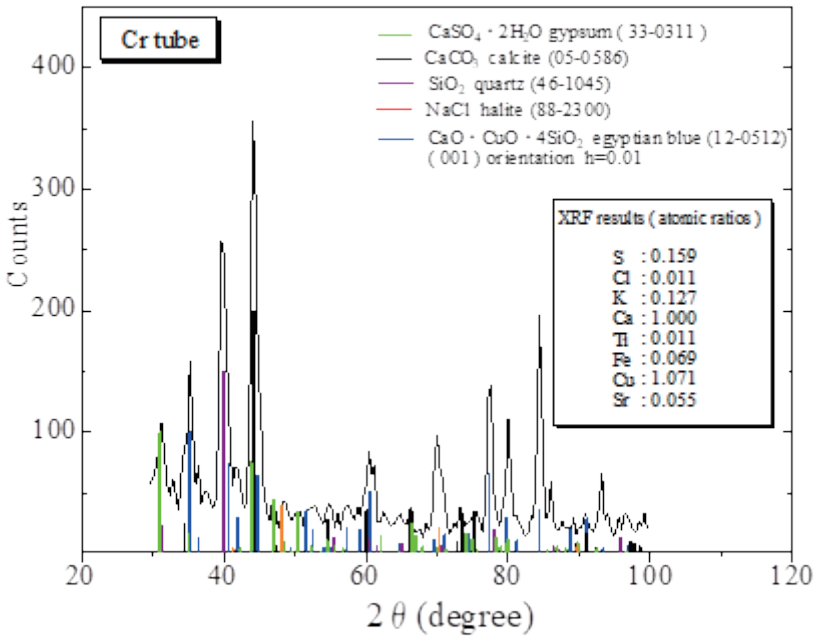


Fig.37 XRD spectrum taken from a blue part

In sum, it was revealed that the blue, green, red and white pigments were mainly composed of Egyptian blue, paratacamite, hematite and calcite, respectively. The gypsum detected from the analyzed area seems to have been used as a binder for these pigments. Halite may have been used as an antiseptic.

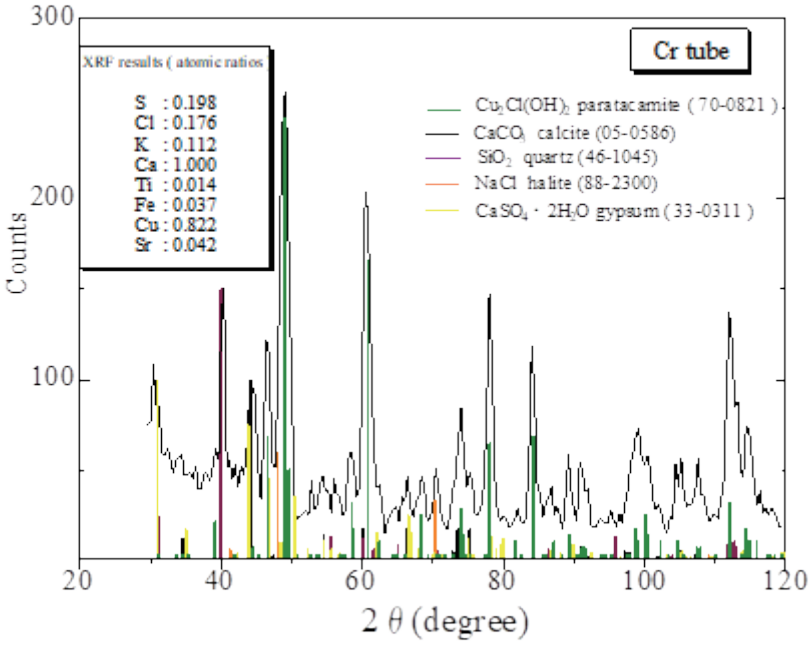


Fig.38 XRD spectrum taken from a green part

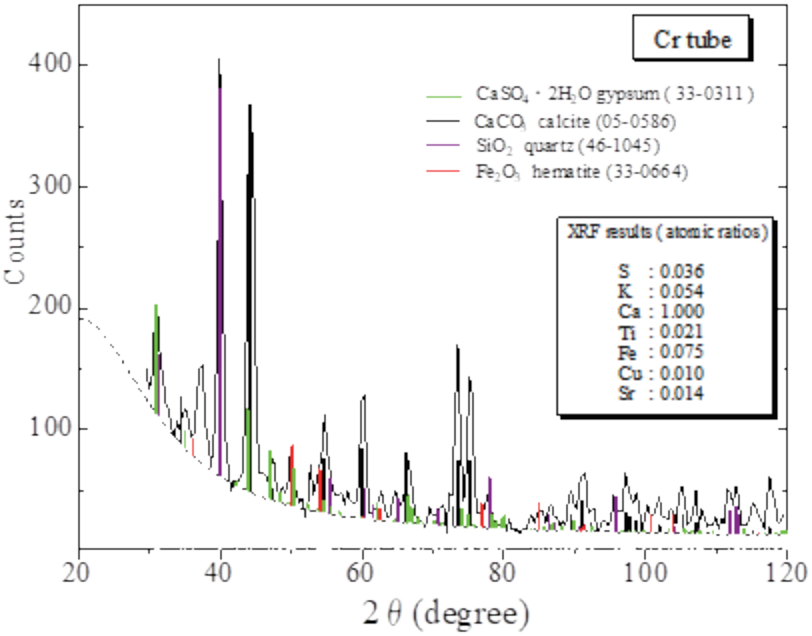


Fig.39 XRD spectrum taken from a red part

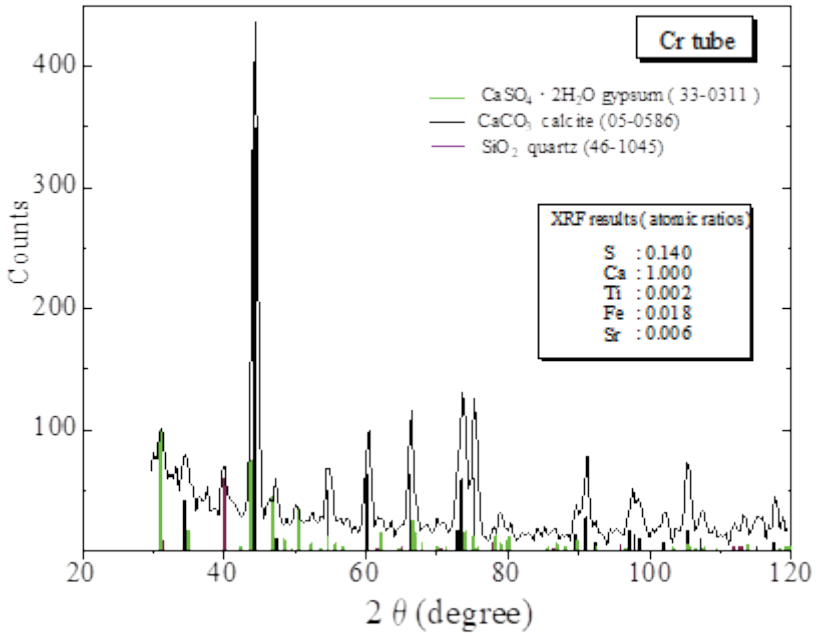


Fig.40 XRD spectrum taken from a white part

Pigments of the face

The face of the anthropoid coffin was painted in a grey colour (fig. 41), which symbolically represents the dead Sobekhat as Osiris. XRDF data taken from the face' surface (fig. 42) shows that the grey was made of a mixture of cassiterite (SnO_2) and quartz. Calcite and halite detected were used for the binder and the antiseptic, respectively. Cassiterite is quite rare in the ancient Egyptian objects, however, our analysis on grey face of the Senu's mask also observed this material, in association with galena (PbS).

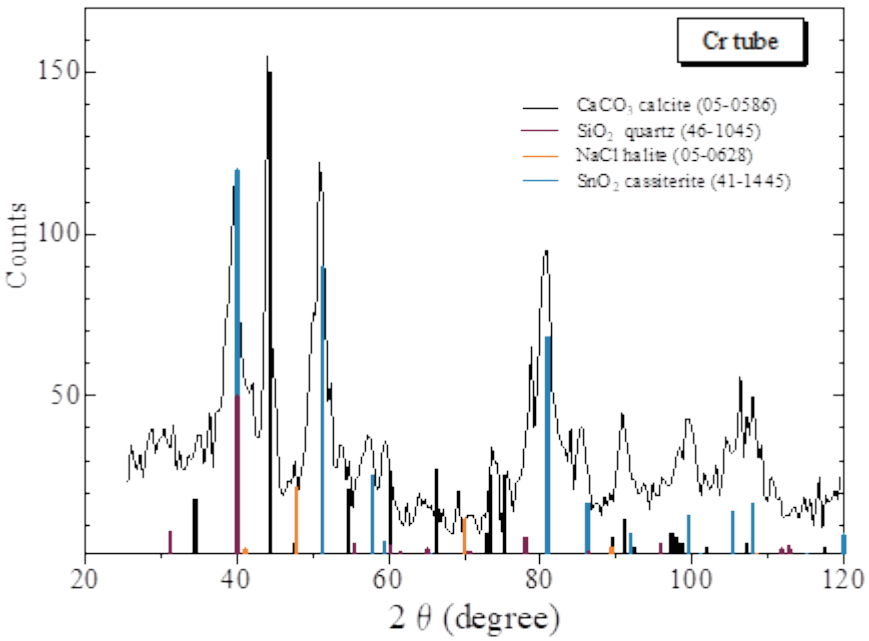


Fig.40 XRD spectrum taken from a gray face

Acknowledgments

We would like to express our deepest appreciation to all members of the Egyptian Ministry of Antiquities, in particular to Dr. Khaled El-Anany (the Minister of Antiquities) and Dr. Zahi Hawass (the former Minister of Antiquities) for granting us the permission for our excavations and conservation. Special thanks are due to Dr Nadia Ibrahim Lokma (the former General Director of Conservation S.C.O. Project Sector) and conservators from the Saqqara inspectorate. Without cooperation with her team, conservation works could not have been successfully completed. We also must offer our great thanks to Mr. Atushi Ishizaki (Riken Keiki Co., Ltd.) who supported all X-ray analyses. Finally, we would like to thank Helena Jaeschke for her correction of our English.

Footnote

1) These Middle Kingdom tombs have been already reported in the following articles: Baba 2014, Baba and Yoshimura 2011, Baba and Yazawa 2015, Baba and Yoshimura 2015. Broad picture of the cemetery during the Middle Kingdom and its relation to the adjacent royal cemeteries were discussed in Yazawa 2017.
2) The miniature plates and small bowl were made of Nile B2 and the flat-based plate and a beer bottle of Nile C.
3) The hemispherical cups were made of Nile B1, the ring-based cup, spouted jar and globular jar of Nile B2, and beaker and beer bottle of Nile C. The vessel indices of two complete hemispherical cups are 169 and 161, the range of which, according to Do. Arnold, places them in the late Twelfth to early Thirteenth Dynasties (Do. Arnold 1988: 140-1).
4) The ritual of “Breaking the Red Pots” is suggested to be performed at the end of the funeral (Willems 2001: 321).
5) For the detail of the outer rectangular coffin, see Baba and Yazawa 2015: 6-7.
6) This type of decoration is similar to the black coffin of Hapi-Ankhtifi from Meir, which is now in the Metropolitan Museum of Art (Hayes 1953: 312, fig. 203).
7) A similar garment was painted on the coffin of Sep from Deir el-Bersheh (Lacau 1904: CG 28084), and that of Senebtisi from Lisht which is made of beads (Hayes 1953: 308-9; Patch 1995).
8) John Garstang commented on this kind of production system (Garstang 2002: 48).

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