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PRACTICAL STUDY ON TREATMENT OF SELECTED DECORATED TAPESTRY IN APPLIED ART MUSEUM, CAIRO

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Abstract

The paper presents the method of treatment of tapestry textile, that considers the most common technique used in decoration of textile since the new kingdom until now, it is called Kabaty. The paper deals with selected piece of museum of Applied Art Faculty in Cairo. Treatment procedure was performed by several stages; firstly, Dating by comparing the decoration technique, the type of material and the decorative motifs existed in the object with another one known its date. Then samples taken from object were examined by optical microscope, scanning electron microscope to identify type of fibers and surface morphology .x-ray analysis was performed to identify mordant and dust. FTIR analysis to identify dyes in dyed samples. Then, the paper deal with the treatment of tapestry pieces by testing sensitive of fiber to water, mechanical cleaning and chemical cleaning to remove stain, washing stage using distilled water, and finally consolidation the object by fixed on support of natural linen which was stretched on wooden frame treated by anti-fungal substance.

Keywords: *tapestry; anti-fungi; analytical technique; treatment*

Introduction

The tapestry woven called ***"kabaty"*** is one of the most important techniques for decoration textile [1], its techniques depending on used weft thread non extend through the loom [2]. Planning process begins with good design before starting weaving, where specialists work sketches of designs for their choice of the best, apply the design on the cartoons prepared in the beginning. After that settling on the design that they want the tissues begin start-up phase in choosing the right colors, where it is possible to forget the colors factor at work [3-12], as it have various kind of fiber, dyes and details, so the operation of restoration for these type of textile consider a challenge for every restorer [6, 7].

The paper aim to deal with a complex object of tapestry by investigation and analysis fibers and dyes to know every details about case of damage to be able to make suitable strategy for conservation to this technique, so the paper present the treatment stage such as cleaning, remove old restoration, complete loss part, consolidation by fixed in support of raw linen with frame of treated wood frame [13-21].

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Description of Archaeological pieces

The object was stored in wooden case no.115/3 in applied art museum, Cairo. It dated to 5-7 century according to the comparison study of the selected object and known date pieces as shown in figure 1. the object consisted of two separated pieces was waved by tapestry technique, they had the same motifs in decoration which consisted of plant and religious decoration arranged in vertical and horizontal tapes of Coptic symbol such as grapes leafs, in addition to many medallions decorated by Coptic motifs of sign of the cross inside it plant decoration of grapes leaves. The first piece is 51x33.5cm and second 62x29.5cm. The decoration was waved of brown dyed wool. There are many signs of damage on this object such as, many separate parts from the edges, loss parts, weakened fibers, and brittleness combined with other previous repairs, hardness, old restoration error (such as using red thread used in restoration) staining and dust (Fig. 2).

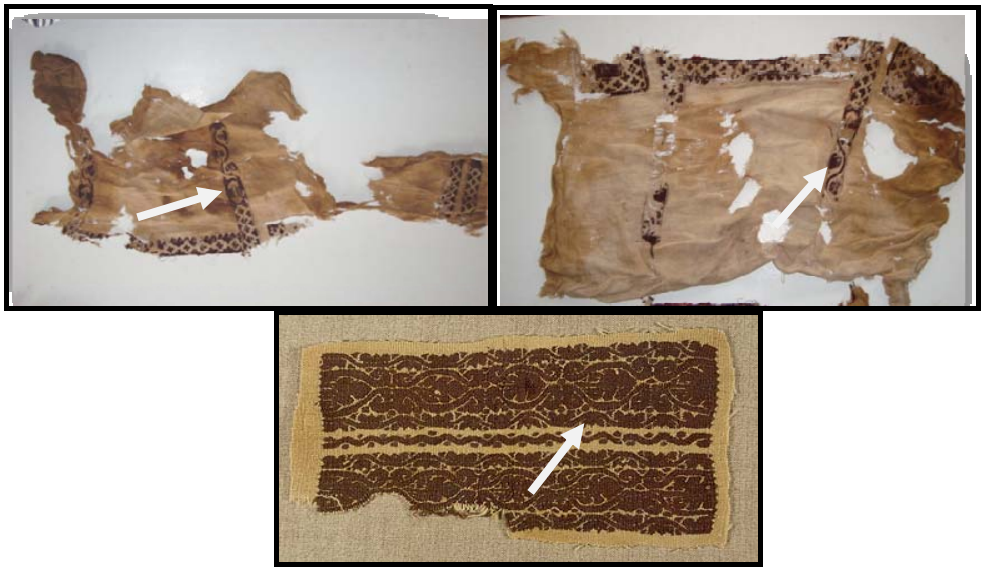

Fig.1. Two pieces of the object dates back to 4-5 Century, which is extremely similar to the dated one shown in the third picture, as a part of similar objects

Fig. 2. Different type of deteriorations such as dust, grease, losses, separated parts, weakened fibers, and brittleness

Testing and analysis

Visual examination

Initial examination indicated that two pieces condition was as follows: the whole surface was very dirty, stiff and hard due to solid, sandy dust accumulated. There were also some different additional stains on it. There were enormous holes, the selvedges and edges suffered from wear and abrasion. There are several Cuttings and tears in different parts as show in figure 1.

SEM-EDX

The morphology of the surface of the fabrics was investigated using Scanning Electron Microscope (SEM), Philips XL30, at micro analytical center-Cairo university Egypt. Small samples were taken from two pieces from Different parts, to show the damage aspects on these fibers. SEM Photos of examined pieces of textile are illustrated in figures 3, 4 and 5) showing the samples of fibers that were identified from different parts of the object. The fibers are extremely damaged, transverse cracking and longitudinal scratches and holes in addition to lose in parts of pieces. Furthermore, one can see the dust, dirt that covered the fiber as shown in figures 6, 7 and 8).

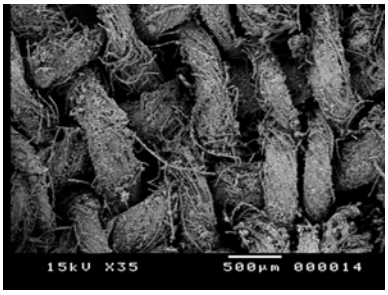

Fig. 3. Sample of tissue from the undercoating place of the first piece shows the accumulation of dust particles through the fibers and on the surface 35x

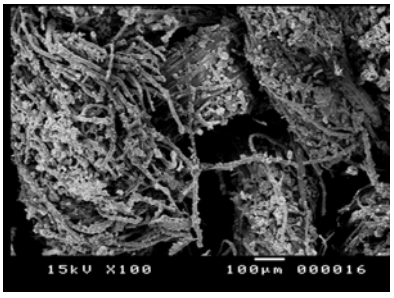

Fig. 4. Tissue sample from the floor of the first piece shows the spread of dust and dirt, 100X

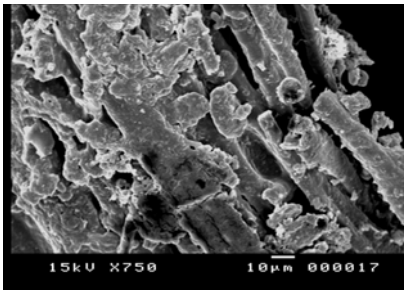

Fig. 5. Dyed sample of the fabric of the trappings of the first piece of brown shows the accumulation of dirt in fiber, 750X

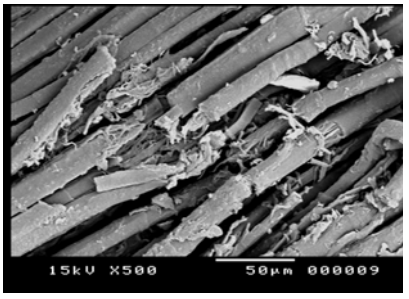

Fig. 6. Tissue sample from the floor of the first piece show the case of cracking and erosion and the collapse of the surface properties 500X

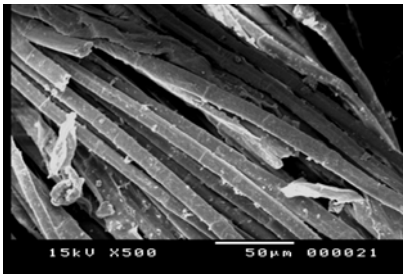

Fig. 7. Sample of tissue from the undercoating region of the second piece show the same damage of embrittlement, weakness and fraction 200X

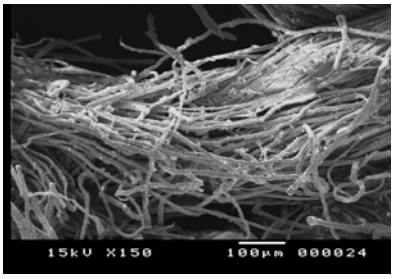

Fig. 8. Tissue sample from the floor of the second piece show bad statement of fibers and losing it morphology appearance as a result of drastic drying 150X

Scanning Electron Microscope (SEM) equipped with EDX analysis

Samples of brown wool were analyzed by EDX attached to a SEM (Philips XL30). In two different points and the results were confirmed for obvious damage and deterioration of the object ,one can find different element such as Silicon which can be interpreted as one of the basic components of the soil accumulated on the surface of the fiber, and sulfur considered one of the air pollutants that can accumulate on the surface of the fibers in the industrial atmosphere, copper and iron: was existed in small proportions in the sample evidence that they are one of the components of accumulated dust and dirt on the surface of the sample.

A qualitative and quantitative assessment of the elements on the surface of the fiber in two different points was performed with the results presented in tables 1 and 2, and figures 9 and 10.

Table 1. EDX analysis of archaeological sample

Element	Weight percent	Atomic percents
Si	25.97	34.85
S	24.25	28.50
Ca	23.54	22.13
Fe	12.24	8.26
Cu	6.24	3.70
In	7.77	2.55

Table 2. The EDX analysis of archaeological sample taken from the first piece illustrated the presence of silicon as a basic component of dust addition to sulfur, calcium, copper, iron, but in different proportions for the first point

Element	Weight percent	Atomic percents
Si	26.45	35.44
S	24.40	28.64
Ca	23.32	21.90
Fe	10.55	7.11
Cu	7.18	4.25
In	8.10	2.66

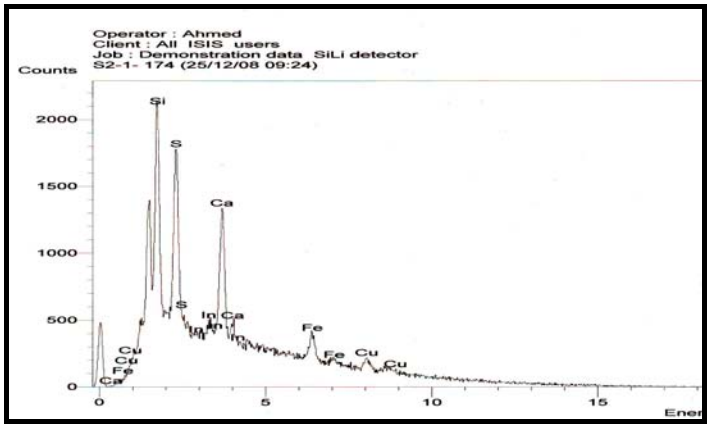

Fig. 9 .The SEM analysis provider unit EDX archaeological sample identified from the first piece is evident that the elements found in the sample representing mordant used in the dyeing or represent one of the components of dust

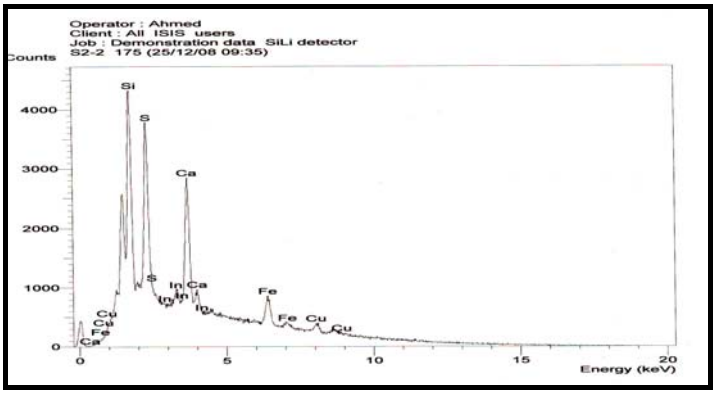

Fig. 10. The SEM analysis provider unit EDX in the second point is evident that the elements that are found representing mordant used in the dyeing or one of the components of dust, or as products of hydrolysis

X-ray diffraction analysis

X-ray diffraction of fabrics was carried out with a SIEMENS X-Ray Diffract meter–D 5000 (Archeology Faculty, Cairo University, X-Ray unite) to show the kinds of mordent and dust (sand) on the surface and through the fibers. The result of analysis show that the mordant used in the two objects is Alum (potassium aluminum sulphate) in the first piece as shown in figure 11 and tin in the second piece of the object in figure 12 for the samples of archaeological brown fiber taken from two objects.

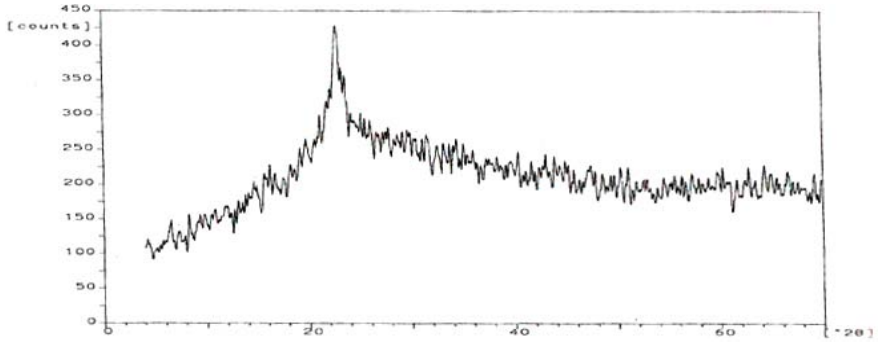

Fig. 11. XRD analysis of sample taken from archaeological second piece and it is clear that used mordant is $SnCl_4$

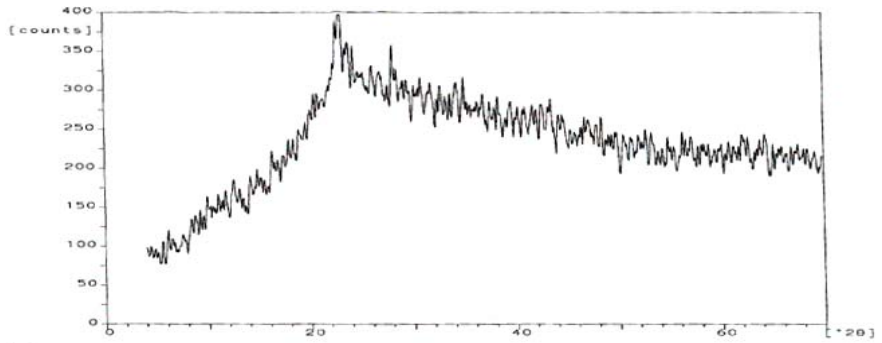

Fig. 12. XRD analysis of sample taken from archaeological first piece and it is clear that used mordant is $KAlSO_4$

Fourier Transform infrared spectral analysis (FTIR)

FTIR analysis of solid phase samples can be typically performed using two different methodologies. The first, more traditional and widely used approach, FTIR–KBr, utilizes a pellet of potassium bromide (KBr) which is transparent in the mid-infrared region, as a Support medium for the sample.

Infrared Analysis was performed to a sample of brown wool and compare the results with the results of infrared analysis of the natural dye known standard, which help know the dye used in fiber The results of the two charts of the first pieces show that the source of this color is Indian cutch and the second piece show that the dye used is also cutch which confirm that the two pieces is a part of one object as shown in table 3.

Table 3. The correspondence between the patterns of infrared analysis of a brown sample of two pieces and infrared analysis of a sample of Indian cutch dye

Absorption peaks No . of Archeology Cutch (cm^{-1})	Absorption peaks No . of standard Indian Cutch (cm^{-1})	Functional Group
3802	3862	NH stretch over laps
3387	3346	OH-stretch=Broad band
2925	2924	CH stretch
1629	1645	C=C ring stretch couples with NH ,OH Band
1522	1549	C=O Stretch

Treatment procedure

Testing the stability of dyes

The dry fabric (the object) was softened by spraying distilled Water, to counter its extremely dry condition. The next step was to test the stability of the colored parts to wet cleaning by immersing a piece of cotton wrapped round a wooden stick into water and the cleaning solutions and placing it in contact with the colorful parts of the object, each color was individually tested. It was found that all the dyes were stable and did not fade with the wet cleaning solution.

The final step was to apply a primary support to the historical textile by placing it between two webbed support fabrics, and stabilizing it using appropriately thin needles and fine silk thread in order to protect the parts of the textile from disintegrating during the different cleaning processes.

Cleaning procedure

Various types of fine brushes are used to remove free dust and dirt (i.e., not attached to textile fibers).

This cleaning procedure used water with other detergent agents, to assist the cleaning process. The ratio was one part detergent saponin to 100 parts of distilled water. The water was allowed to penetrate through the fibers to release the dirt particles, for 15 min. at 30ºC. Then a second cleaning bath with distilled water only was applied for 10 mins again with water agitation, and then a third bath with distilled water only, for 10 mins as shown in figure 13. The wet cleaning reduced the dust and relaxed the fibers by using roll to pressure on the fibers as shown in figure 14. Then samples of bath water were taken to note the difference between the stages of wet cleaning process.

Fig. 13. The wet cleaning procedure of objects using frame of treated wood covered of polyethylene sheets filled with distillated water

Fig. 14. The wet cleaning procedure of objects using roll to make little pressure on fiber to release of dust from fibers

The drying process

To dry the object was experimented with a Japanese tissue sandwich using different tissues used to absorb the remaining water of washing stage, so we used several of tissue paper to make the object dry as possible. Then, the object was left uncovered to complete drying at ambient conditions in figure 15. In air drying, the process can be shifted towards evaporation in several ways: by ensuring that the wet textile is settled in a place (i.e. workroom) that is sufficiently large in comparison to the size and surface area of the drying textile; and by ensuring that water vapor is removed as soon as it is formed e.g. with the help of dehumidifiers and/or effective ventilation.

Fig. 15. Drying process by tissue paper

Fixing of the pieces

The margins were weak and stiff. The stiffness was removed by Water and separated edge was fixed from four sides by a linen band of 5cm width with Fine silky stitches, which have the same color of the part we wanted to support.

Support preparation

We prepare wooden support treated by anti-fungi to prevent fungi from attack the fibers and dyes, then prepare linen support stretched on the previous support of wood by Thick cotton

thread was used for fixing the metallic ring linen support perforated on the edges support (Fig. 16). In the beginning of the final stage, the edges of the object all around were attached by sewing with a small stitch technique (blanket stitch) and afterwards the edges of the missing parts were attached by small stitches. Similarly, sized stitches were used to attach the body of the object. It could be displayed in a suitable manner according to the museum requirements. One can see the object in final stage in figure 17.

Fig. 16. The preparation of new support to fix the archaeological pieces

Fig. 17. The fixing the objects on the support by with non-dyed raw silk yarn.

Conclusions

The paper present scientific restoration for two pieces of tapestry weaving at applied art museum in Cairo, Egypt. The archaeological documentation had been explained, scientific examination and analysis had applied on specimen of selected pieces to record the deterioration levels of object, the restoration of objects has been performed in scientific way start with mechanical and chemical cleaning then, washing the objects, consolidation by fixed on linen support with different stitches and final display.

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