
Developing a Scientific Practice in Preservation of 19th Century Royal Malay Songket Shawl

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Abstract: The fabric under study is one of the exquisite songket shawl dated around 19th century housed in National Museum of Malaysia. This study aims to identify the materials, techniques and analyze the texture, motifs and dyes through historical and artistic review as well as scientific analysis, identification of deterioration factors and examining the different causes of damages. In order to conserve and restore the samples, identification of the material technology on natural and metal threads, weaving as well as dye and motifs were carried out. Natural fibers were detected by using chemical analysis, FTIR and FESEM-EDS were used for examination of metallic threads. The condition survey was carried out and analyzed through the original historic samples to identify its feature and behavior against physical and chemical agencies. Examination results showed the fibers are delicate cotton and natural pigments used in dyeing process. Also according to the FESEM results, metal threads was identified as gilt-silver which is deteriorated in some parts and covered with layer of corrosion. A series of internal and external destructive factors as well as improper past repairs caused several damages to the fabric. It became evident that by exposing fabrics to improper storage and display technique had caused considerable physical, chemical and mechanical harm to the parts of sample. Based on the current condition of the fabric proper method of preservation treatment was applied and a specific method of displaying of songket shawl textiles was designed as a guideline for Malaysia's museums.

Keywords: Songket Shawl, Preservation, Restoration, FESEM-EDS, FTIR, Display

1. Introduction

The value of textile is found in their association with a person, or place or an interest in the objects themselves and their construction. Songket hailed as a "the cloth of gold" and "the queen of fabrics" and it is one of the most popular Malay textiles [1]. In the past commoners were not allowed to own the textiles unless they had been given as gifts by royalty, and then they were only allowed to wear them in the palace or its grounds [2]. Songket is woven using what is commonly referred to as the supplementary weft technique. In the songket process, extra golden threads are inserted in special lengths in between the silk weft threads of the main background [3]. The structure of songket shawl consists of

border, body, foot and supporting body [4]. The making of Songket is basically done in two stages: weaving the basic with even or plain weaving construction stage, and weaving the decoration that is an additional part from metal thread [5].

2. Description of Sample Under Study

The sample under study is a purple songket shawl with plaid design from Kedah Museum; kept in National Museum of Malaysia (see figure 1). No registry date number is available however, it has some description on a cotton piece which attached on it as an inventory number (MDR(PK)25/95) dated around late nineteenth century with the length of 255cm and width of 70cm.

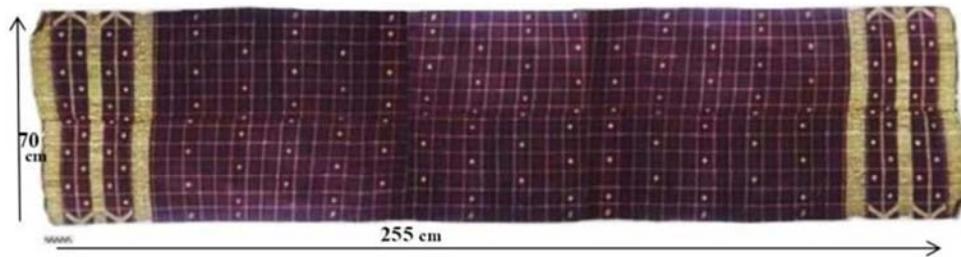


Figure 1. Songket shawl.

3. Research Methodology

In technical studies, identifying the materials used in textile, texture and structure of the object are investigated to introduce the best practice for preservation and restoration along with scientific analysis [6].

4. Historical and Artistic Review

Songket motifs, traditional and modern, can be divided into the following seven categories: flora; fauna; plants; fruits; objects; food and animals [7]. From the analysis as can be seen in the picture below the shawl consists of different motifs which are created by metal thread. According to historical and artistic reviews, songket shawl design represents frieze pattern contain tree and wheat and continuously linked arabesque as well as mushroom, flower and bat elbow motifs and belong to Indonesian art [8] (figure 2).



Figure 2. Motif analysis in songket shawl (author).

4.1. Visual Analysis and Damage Assessment

Generally, textiles with metal threads are in poorer condition because of the extra stress from the high mass of the materials [9]. Figure below (figure 3) illustrates the overall condition of songket shawl and occurrences of

different types of damages on it. Different parts of fabric degraded by physical, chemical and mechanical factors such as opening and tearing of natural and metal thread, Existence of dirt as agent of deterioration, in the form of solid particles, different stains such as paint and rust lacunas stains and Corrosion and darkening of the metallic surface especially on the margin part [10]. Moreover, this sample highly suffered from improper previous repair.

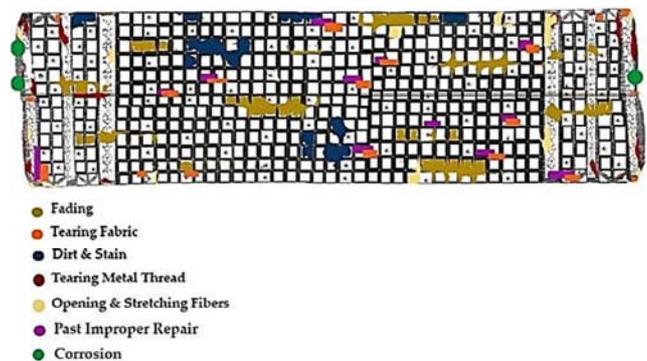


Figure 3. Linear designs of degradations in songket shawl.

4.2. Examination and Scientific Analysis

Songket shawl has been qualitatively characterized for the identification of the type of materials used in the structure through original historical samples with the use of scientific analysis. Analysis was undertaken using FESEM, EDS and Fourier Transform Infrared (FTIR) along with chemical examination to identify the materials used and their behavior in relation to deterioration factors of the songket textile by physical, chemical and biological agencies.

5. Results and Discussion

5.1. Natural Fibers and Metal Threads

In the first step all fibers are examined in different methods such as burning test, chemical analysis and FTIR. Fiber identification includes different processes such as prepare samples from the object, microscopic observation at 100 times or more magnification with the use of Olympus BX51M device and analysis to indicate the fiber morphology [11].

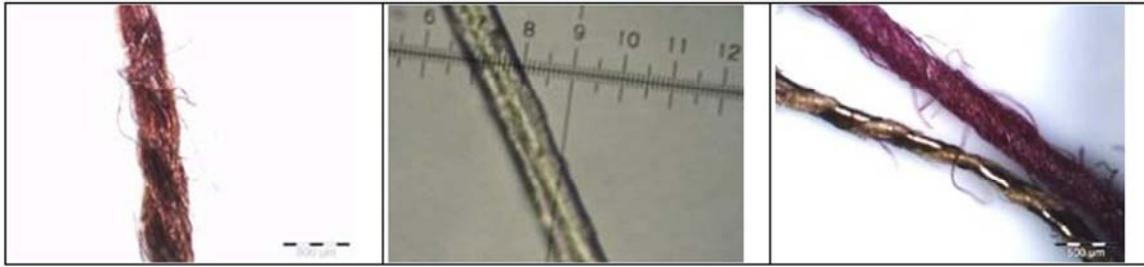


Figure 4. Microscopic image of the object's natural and metal threads (500µm).

5.2. Field Emission Scanning Electron Microscopy Findings

The surface morphology of sample was done and recorded by FESEM with providing clear pictures of surface morphology and characteristics that are helpful to determine the surface structure of the studied samples, the quality of fibers and their vulnerabilities as well. To identify diagnostic

characteristics of fibers, transmitted light microscope with mix of SEM was used. FESEM was used for the micro-morphological study of the metal surfaces as well as of the edges of the solid metal strips with using ZEISS AURIGA device. The surface morphology can provide information on whether the strip had been cut from a metal foil or had been rolled from wire [12] (see figures 5 and 6).

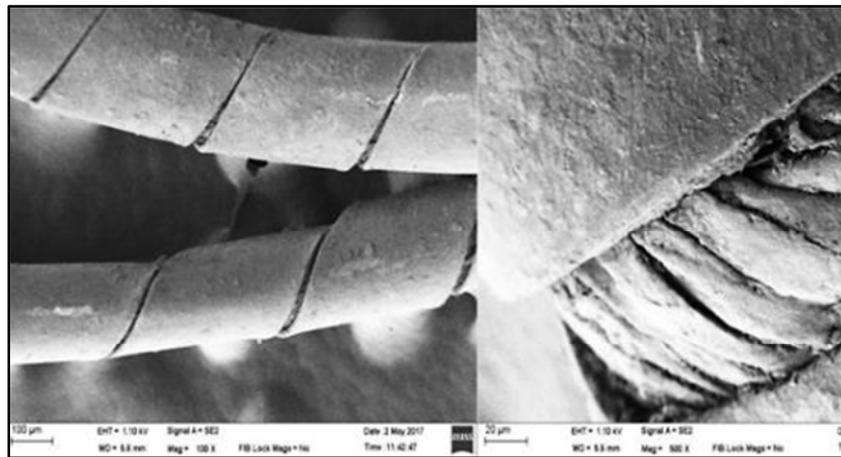


Figure 5. FESEM analysis of metallic strips in sample one (100x and 500x).

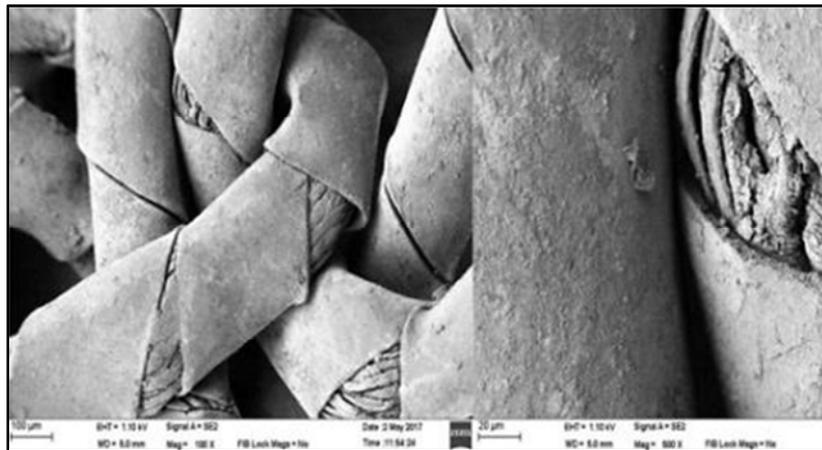


Figure 6. FESEM image of border decorative metal thread, sample one (100x and 500x).

5.2.1. Energy-dispersive X-ray Spectroscopy Findings

Identification of the materials composition of the metal fibers in investigated sample was carried out with the use of Energy Dispersive Spectrometer. The EDS results revealed that the metal threads in songket shawl were involve

impurities such as copper (Cu) and include different kinds of corrosion elements. Also indicates the nature and composition of the corrosion found on the threads. Here, we report both the surface analyses by FESEM and material analysis by EDS in metal thread and cotton yarn in core is shown in figures 7 and 8.

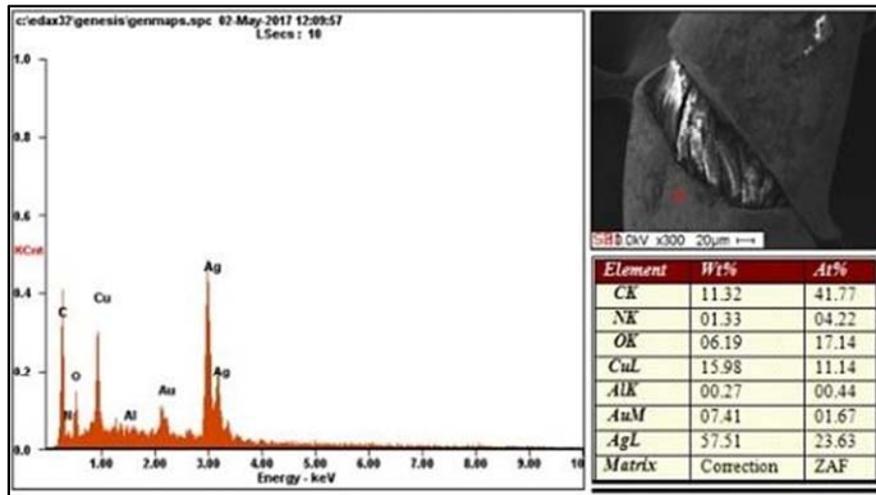


Figure 7. Metal thread material analysis (EDS).

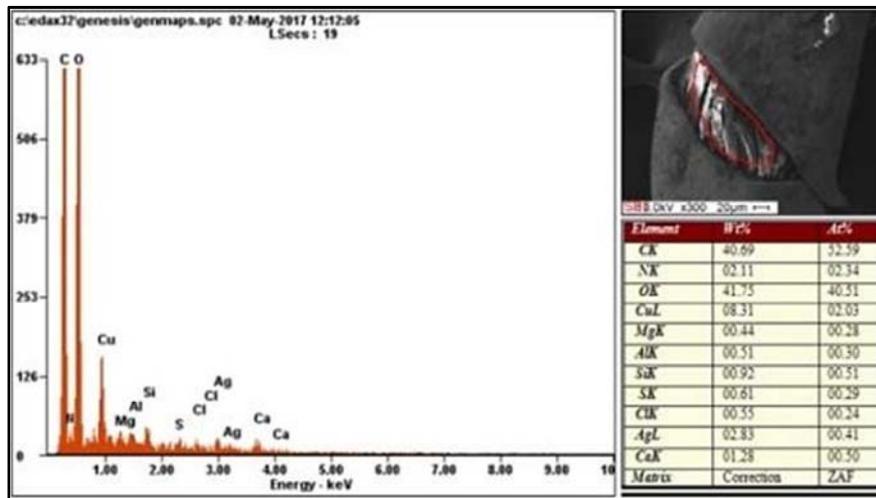


Figure 8. EDS analysis of cotton yarn inside metal thread.

5.2.2. FTIR Finding of Natural Threads

For doing more reliable experiments on natural fibers, Fourier Transform Infrared (FTIR) examination was used to characterize two samples of natural fibers from songket part of studied object. In this study Thermo Scientific Nicolet iS50

FT-IR Spectrometer was used for analysis. FTIR results indicate that the natural fibers in shawl are 100% cotton in red and purple color weft and warp. All evidences have been shown in figures below.

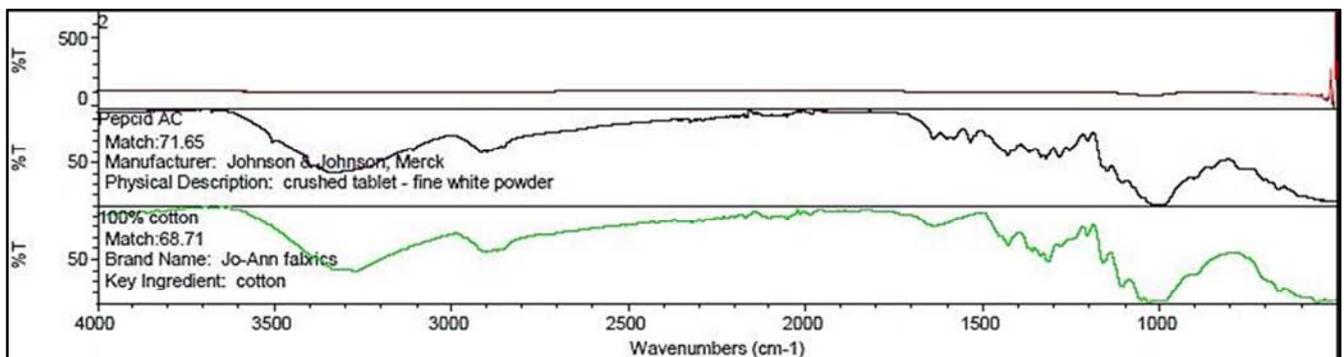


Figure 9. FTIR result of background warp fiber (Purple: 100% cotton).

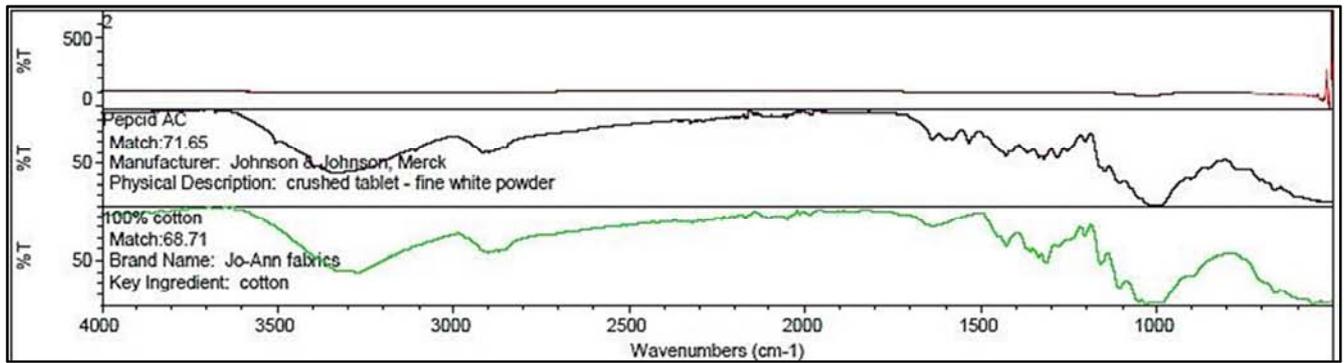


Figure 10. FTIR result of background warp fiber (Red: 100% cotton).

Table 1. Summary of technical study and scientific analysis of songket shawl (author).

TECHNICAL STUDY OF SAMPLE UNDER STUDY (SONGKET SHAWL)	
SONGKET SHAWL	
INVENTORY No.	MDR(PK)25/95
DIMENSION	255 × 70 Cm
TEXTURE DESIGN	
MOTIFS	MUSHROOM, BAT ELBOW, MOUNTAIN, TREE, FLOWER, WHEAT
WARP	COTTON
COLOR	PURPLE
WARP TWIST Z, S	
WEFT 1	COTTON
COLOR	PURPLE
TWIST	
WEFT 2	COTTON
COLOR	RED
TWIST	
WEFT 3	COTTON
COLOR	CREAM
TWIST	
DENSITY	24/Cm
METAL THREAD	STRIP WOUND AROUND COTTON THREAD
MATEIAL	GILT SILVER
METAL THREAD TWIST	
YARN INSIDE METAL THREAD	COTTON
COLOR	CREAM
BORDER DECORATIVE METAL THREAD	GILT SILVER

6. Structural Preservation

6.1. Pre Conservation Process

The examined sample was subjected to pH measurement and dye-fastness test. The result shows that the fabric is acidic with pH: 5 and there is not any bleeding fiber among sample under research. Dye was stable and blue stain was solvable color and removed during washing process.

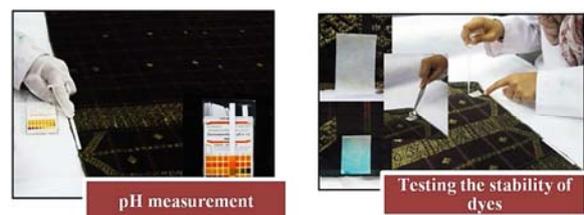


Figure 11. pH measurement and testing the stability of dyes in songket shawl.

6.2. Conservation Treatment

6.2.1. Stain Removal

After examination, some stains were removed by using a solution of water and ethanol (10% + 90%). However, the other stains such as adhesive stain were removed with the use of Acetone. Acetone on cotton swab was used to lift dirt off the stickers and to remove adhesive deposits on different parts of fabric. The result shows that applying of ethanol and acetone was very successful method for removing stains as the process is shown in figure below.

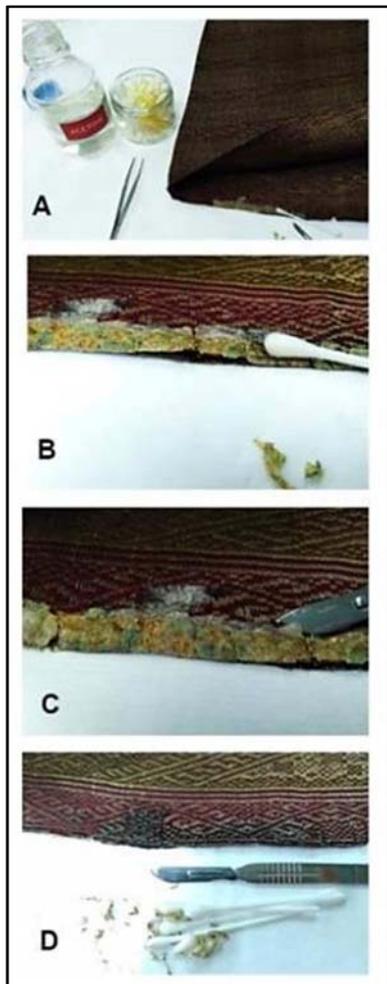


Figure 12. Remove sticker and adhesive with using solvent (A. prepared Acetone and cotton swab, B. apply acetone to solve the adhesive, C. remove the stain with using scalpel, D. View of the fabric after cleaning).

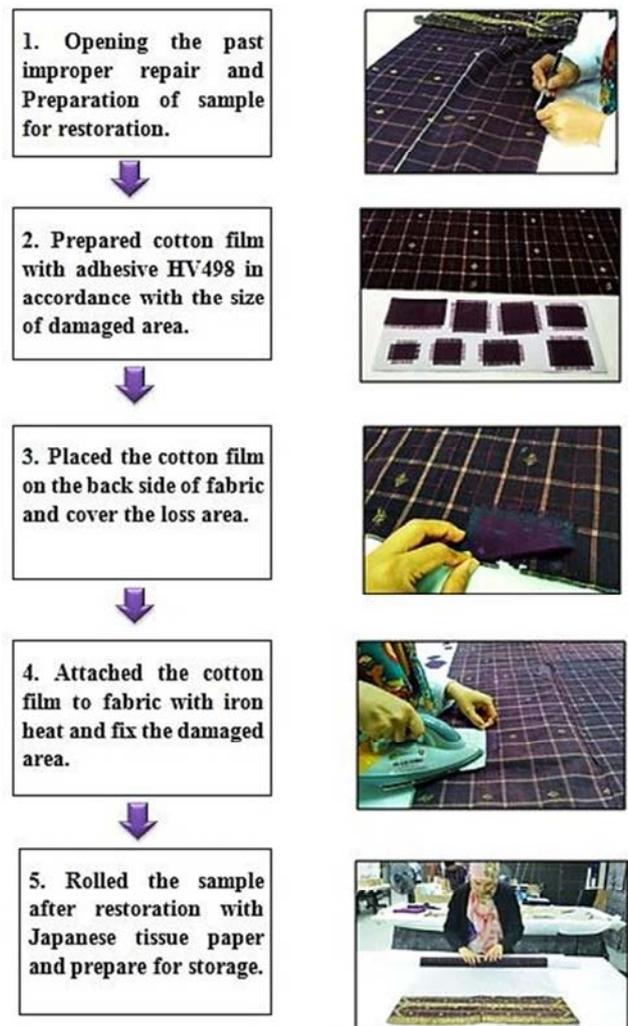
6.2.2. Stabilization

In order to achieve the objectives of the project, the

purposed treatment is taken the following steps:

- 1) The fabric surface was cleaned using brush and vacuum cleaner;
- 2) The front and back of the fabric were washed using distilled water, ethanol and special detergent for delicate fabric;
- 3) The solvent was employed to clean the stain of fabric;
- 4) The front and back of the fabric were dried using blotted paper and cold winds of dryer;
- 5) The ruptured area was restored and the lack area was filled with appropriate colored fabric.
- 6) The metallic yarn was restored and connected to the background through the sew method;
- 7) The fabric was covered with a non-acidic tissue paper to store.

According to the observations using soluble adhesive is a proper method for restoration of fragile areas. Conservators at the National Museum of Malaysia were surprised that the layer of delicate Japanese tissue with alkaline adhesive was used to increase the strength of the songket textiles in weak areas, but our experience in this project shows that removing a very thin layer of adhesive from a very fragile textile is less harmful than do stitching [13]. Summary of whole steps of restoration is shown in figure below.



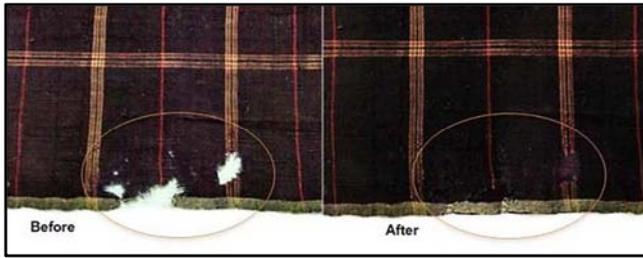


Figure 13. Summarized the whole steps of restoration of songket shawl with the view of before and after treatment.

6.2.3. Cleaning Decorative Metal Threads (Removing the Corrosion)

Metal threads were dirty and heavily oxidized; some parts were detached; threads were broken and corrosion layer was covered some areas of decorative margin. Different amounts of ethanol solvent were applied to remove the corrosion layer from the surface of the metallic threads. The process was carried out by submerging a piece of cotton swab into the ethanol solution and placing on the surface of the metal threads and gently moved. Loosed metal threads and border decorative lace were secured carefully by stitching with delicate cotton thread. The view of the decorative metallic threads before and after cleaning process is can be seen in figure 14.



Figure 14. Metal threads cleaning procedure and removing the corrosion by applying ethanol and using cotton swab.

7. Displaying and Storage of Songket Shawl

For large textiles like songket shawl, a combination of flat and roll storage could be useful method for safe storage in box. In fact songket shawl in this method could be stored flat and rolled in the corner fold; the fold needs to be padded with wrinkled acid-free tissue or thin cotton sausage. This sausage can be made from a tube of white clean cotton filled with anti-insect fibers.

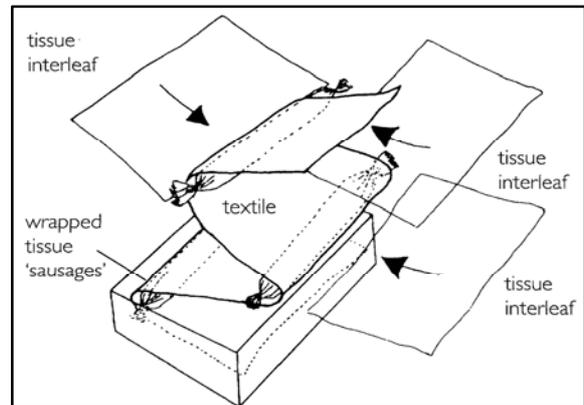


Figure 15. Flat-rolled storage for songket shawl by using box.

Large flat textiles such as songket shawl are better matched to display in open position. Figure 16 shows the open display method that is quite easy for displaying fabric and gives it adequate support while on display. A padded stand should be covered by the fine fabric in conservation quality. In this method most of the fabric weight is supported by the stand.

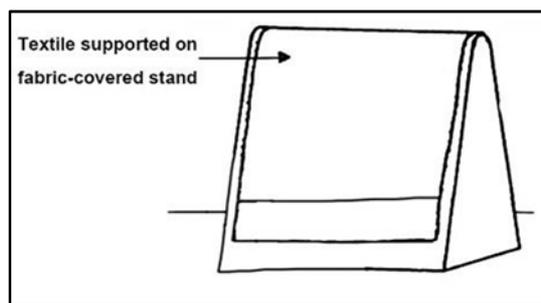


Figure 16. Display stands for songket shawl (author).

8. Conclusion

The present article describes the analysis and preservation of historical songket shawl decorated with metal threads. The conservation method for sample under study was involved various steps such as cleaning, scientific analysis and identification, restoration and prepare it for storage or display. The conservation intervention, which included removing the corrosion layers and cleaning and mounting the damaged and missing area on a fabric support, had the objective of increasing its stability. Both the cleaning method and the suggested adhesive investigated in this study are suitable, effective and acceptable for the use in preservation of historical Songket textiles. The experiments have shown that it is indeed possible to introduce new insight and techniques of preservation and restoration of historic textile, into old system. The restoration process was a time-consuming due to the delicacy of sample and lots of damages on it; however, it had a good result at the end. The purpose of the restoration of the songket textiles is to improve the appearance of the woven, and increase the strength of the structure of the fabrics for long time. These treatments have been highly successful and have provided a taste of the level of both visual and structural improvement in songket shawl.

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