THE APPLICATION OF HEAT-SETTING ON TEXTILES

HO KA HEI CAROLINE

BA(Hons)Scheme in Fashion and Textiles
(Fashion and Textiles Design Specialism)

INSTITUTE OF TEXTILES & CLOTHING

THE HONG KONG POLYTECHNIC UNIVERSITY

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Dr. Kinor Jiang

by Ho Ka Hei Caroline

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CERTIFICATE OF ORIGINALITY

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ABSTRACT

Shibori was the earliest textile dyeing technique found in the history of Japan. It can be dated from eighth century but it became popular only since 1960s. In 21st century, many textile designers continue to study the technique of shibori and tend to focus on the heat-setting effects resulted from shibori. It gave a three-dimensional property to a two-dimensional fabric, which struck many fashion admirers.

In this paper, the spider-web, wood-grain and board-clamping shibori will be chosen for experiment. Their heat-setting effects will be investigated on fabrics of different fiber content, including silk and polyester. The result will also be discussed to recommend the suitable combination of shibori and fabric for a finest heat-setting effect.

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CHAPTER 1

Introduction

1.1 Background of the Study

Textile can be regarded as an interlacing network of yarn made from natural or manmade fibres. In the long history of textile, cotton, linen, silk, wool and synthetic fibres are common materials for producing fabrics. Fabrics made of these materials are generally soft, flexible and contour to human body shape.

Shibori is a textile finishing technique well known in the late 1960s. More of the techniques of shibori may come from Japan. It includes dyeing patterns on cloth and also giving two-dimensional cloth a permanent three-dimensional shape by different methods. Binding, folding, crumpling, twisting or plucking are some traditional methods. In addition, shibori also encompasses high-tech processes like heat-setting and dévorée.

The way that heat-setting of shibori turns a two-dimensional cloth into a three-dimensional object attracted me the most and it is the reason I emphasized, in this study, on the heat-setting on different textiles.

1.2 Objectives of the Study

In this study, there are four main objectives.

a. To study the various methods of shibori and focus on the methods which create obvious sculptural effects.

b. To conduct experiments on textiles to create three-dimensional effects by heat-setting of shibori. The combinations of heat-setting on different type of textiles and conditions to create three-dimensional effects are recorded accordingly.

c. To compare the results of experiments and suggest recommendation of the suitable types of fabrics for different types of heat-setting.

d. To develop a series of fashion collection by using the results obtained from experiments.

1.3 Scope of Study

In this project, there will be three major scopes of study: the methods of shibori, the textiles of shibori and examples of heat-setting works.

1.3.1 The methods of Shibori

Shibori has been used for centuries but it was well known only in the late 1960s. Products of shibori had been found around the world but most of the techniques of shibori were believed to be originated from Japan.

Shibori includes creating dyed patterns on cloth. But shibori is much more than this. In the process of dyeing, a two-dimensional cloth is given a three-dimensional permanent shape by bounding, twisting or folding etc. Despite the traditional methods, some new technologies are invented to give neo prospect to shibori. For example, heat-setting of Polyester, melting-off on metallic fabric, felting of natural fibers and devoree.

In this study, the history an methods of shibori will be investigated, espeically the types of shibor that create obvious heat-setting sculptural effects. The information facilitate the laboratory testings implement at the later stage.

Different types of shibori methods create different three-dimensioanl effects. In the study, spider-web shibori, wood-grain shibori and board-clamping shibori were mainly studied. These three types of shibori consist of the major techiques used in all shibori methods and hence can create three-dimensional effects that found on most textiles.

1.3.2 The textiles of shibori

Shibori is widely applied on textile products, especially in fashion, to achieve aesthetical effects. Among the various methods of shibori, those methods that can create three-dimensional effects on cloth were investigated.

Besides the methods, the types of fabrics undergo treatments is also important. Different fiber content and different fabric structure were studied. These fabric samples possess of various physical properties. For example, silk chiffon is much softer than polyester organza. Therefore, in this paper, fiber content such as silk and polyester were taken in. Fabric structure such as organza, chiffon and sateen were also included.

1.3.3 Examples of heat-setting works

Six textile designers and their works were included in this paper. In alphabetical order, Ana Lisa Hedstrom, Barbara Rogers, Jean Williams Cacicedo, Jun`ichi Arai, Mascha Mioni and Tsuyoshi Kuno. They were the participants of the textile exhibition "Transformation: Material˙ Magic˙ Memory" which was hosted by the Institute of Textiles & Clothing, The Hong Kong Polytechnic University in March 2010. The fabulous textile artworks of these artists were an inspiration and started off the experiments of this paper.

1.4 Methodology

a. Literature on the shibori helps to understand the history, methods and materials used for creating three-dimensional effects on cloth.

b. Referencing the artworks of many shibori artists helps to appreciate the aesthetical achievement of shibori.

c. Related research materials of the effects of shibori on different fabrics. The main focus will be on heat-setting. It helps to filter the kinds of treatments and fabrics for the laboratory tests.

For this study, research of information and laboratory testing are crucial. There are two tasks to facilitate the study.

1.4.1 Categorizing Information: tables and charts

Information from literature review and the results from experiments are analyzed and organized in tables and charts for easy comparison and referencing. It helps to find out the methods for making three-dimensional effects on cloth.

1.4.2 Laboratory Testing

Shibori on fabrics will be carried out in the laboratory. The combinations of different treatments, kinds of textiles and conditions to create various three-dimensional effects are recorded accordingly.

Chapter 2

Literature Review

2.1 Introduction

Heat setting an effect caused by textile treatments, mainly Shibori. In the process of Shibori, high temperature and suitable pressure are applied to a fabric under controlled conditions, so that the physical properties of the fabric are altered. In another words, the amount of pressure and type of resist determine the 3D shapes created on fabrics.

Shibori is more than creating patterns on cloth. It can turn fabric from a two-dimensional into a three-dimensional object. (Wada, 2002, p. 8)

Therefore, to understand the technique of heat-setting, the knowledge of Shibori should be studied.

2.2 Definition of Shibori

According to Wada (2002), "Shibori is a Japanese word that refers to a variety of ways of embellishing textiles by shaping cloth and securing it before dyeing." (P. 8)

Wada, Rice & Barton (1999) stated that "The word comes from the verb root shiboru, 'to wring, squeeze, press`… Rather than treating cloth as a two-dimensional surface, with Shibori it is give a three-dimensional form by folding, crumpling, stitching, plaiting, or plucking and twisting. Cloth shaped by these methods is secured in a number of ways, such as binding and knotting." (P. 7)

Shibori is much more than the tie-dye. The techniques of Shibori are quite distinct but often confused with tie-dye. In the process of ikat, the yarns are tie-dyed before weaving while in Shibori, the whole fabric is tie-dyed. These two techniques produce different effects.

"When the cloth is returned to its two-dimensional form, the design that emerges is the result of the three-dimensional shape, the type of resist, and the amount of pressure exerted by the thread or clamp that secured the shape during the cloth`s exposure to the dye...This is the essence of Shibori.” (Wada, 2002, p. 8)

2.3 History of Shibori

Shape-resist dyeing techniques have a long and thorough development but more than half of the known techniques were originated in Japan.

Scholars have yet to determine exactly where and where it first appeared. At the Nara National Museum there is a collection of the treasures of Emperor Shomu in A.D. 749. There are three types of resist-dyed fabric –kokechi (tied or bound resist), rokechi (wax resist), and kyokechi (clamp resist). These examples seem likely to be originated from China. (Wada, 2002, p. 36)

2.4 Methods of Heat-setting

Among the many types of Shibori, most of them can create three-dimensional shapes on fabrics, with different extent of sculptural effects. By the different types of Shibori methods, cloth is shaped by folding, stitching, plucking, crumpling, twisting, knotting, clamping and binding. Some of these methods are combined to form different sculptural effects while in some cases, methods such as knotting, clamping and binding are used for securing the shaping cloth. In order to demonstrate the heat-setting property of different materials, three kinds of shibori were employed accordingly. There are numerous types of shibori existing in the industry but these three types of them can produce obvious sculptural effects that demonstrate the heat-setting properties of fabrics.

2.4.1 Twisting and Binding- Spiderweb shibori

To achieve three-dimensional effect, the cloth can be wounded in a protruding way. The more the amount of cloth is wounded, the better the sculptural effect can be obtained.

Thread-resisted ring (ne-maki) shibori is one of the examples using twisting and binding skills to create sculptural effects and dyed patterns on cloth. In a thread-resisted ring shibori, white thread is used as a resist for dyeing dark colors on cloth. The binding can be arranged in various ways according to the design. (Wada, Rice & Barton, 1983, p. 55-56)

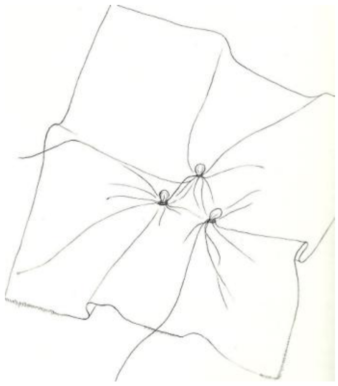


Fig. 2.4.1a Thread-resisted ring shibori

The binding itself is naturally limited to circle or square-like shapes. Binding can be carried out by wounding a thread tightly around the cloth. Usually, the thread acts as a resist in the dyeing process of Shibori.

Marble shibori is a type of shibori that can demonstrate knotting and binding techniques. In the process of Shibori, marbles are wrapped around by the cloth so that the cloth is heat-set to the knotted and bound shape. Binding must be needed for this shibori to be carried out. Usually, the cloth is bound by thread with a marble wrapped inside. This kind of binding with an object allows the shaped cloth to extremely obvious three-dimensional effect.

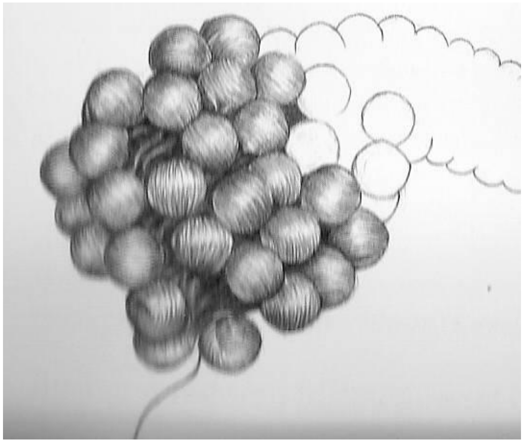


Fig. 2.4.1b   Marble Shibori

Another shibori that combine twisting technique would be spiderweb (Kumo) Shibori. Spiderweb Shibori has a long history in Japan. In this shibori, the cloth is finely twisted and bounded to create delicate spider web pattern. If the shibori is done by hand, much skills and time are required. Therefore, nowadays, handmade spiderweb shibori is very uncommon.

For the ease of binding, some tools were developed since twentieth century. One of them were a tying stand with a fine hook which was invented in Narumi area, Japan, for holding a cloth taut. The root parts of the hooked tips are then tightened by thread. This is called tool-aided spiderweb shibori.

The spiderweb shibori was used in this study as an indicator to compare the heat-setting properties of different types of fabrics.

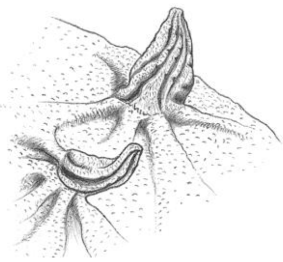
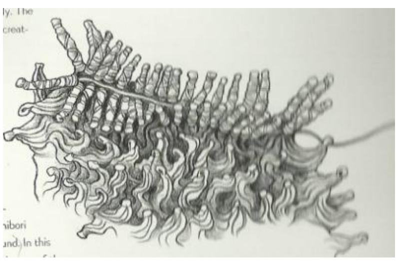




Fig. 2.4.1c Fig. 2.4.1d Fig.2.4.1e

Spiderweb Shibori

2.4.2 Gathering and Knotting- Wood-grain Shibori

Gathers on fabric can be created by plucking or stitching on cloth. Both the methods can produce intense creases on cloth. When knotting combines with stitching technique, it is used as a securing method for heat-setting the fabric.

Plucking (yokobiki) shibori is a kind of shibori that create gathering effect by plucking a tiny bit of cloth and bind it with thread. The thread is not bound very tightly as the gathering effect is the focus of this kind of plucking shibori.

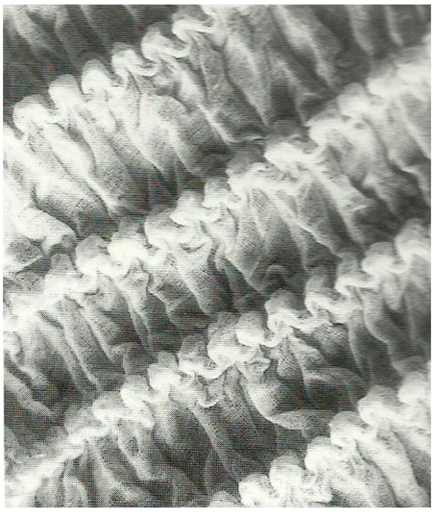


Fig. 2.4.2a Plucking shibori

Traditionally, stitching acts as a kind of thread resist for dyeing in Shibori. After stitching, the fabric would be gathered as the stitching thread being secured by knotting.

In the thorough development of stitched shibori, textile designers created a great variety of creased design especially in fifteen and sixteenth centuries. The variation were mainly depends on the stitch type and arrangement of cloth. Basically running stitch is used for stitching in shibori. The stitching is evenly spaced and constantly moved forward.

A line of running stitch on one layer of fabric is called wood grain (mokume) shibori. Usually the stitching is done in parallel to the weft of fabric as a shorter thread can be used. Theoretically, the parallel stitching can be in any direction to achieve the wood grain sculptural effect. A knot is drawn up at the end of thread to hold the gathers. Besides wood grain shibori, there are a lot of variations by manipulating the folding of cloth and the arrangement of stitches. For example, Japanese larch (karamatsu) shibori, linked circle (shippo-tsunagi) patterned shibori and chevron stripes (maki-nui) shibori.

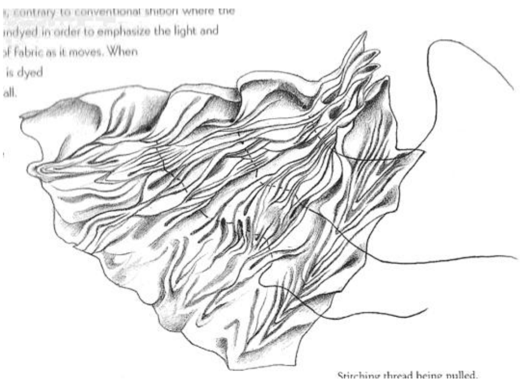
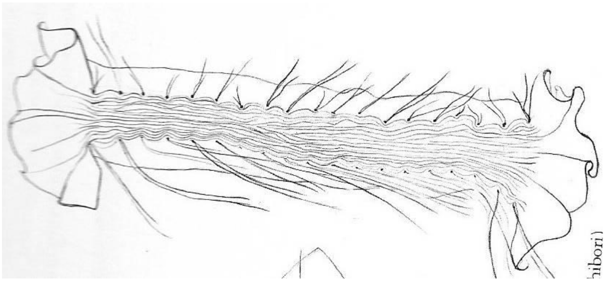


Fig. 2.4.2b



Fib. 2.4.2c Wood-grain shibori

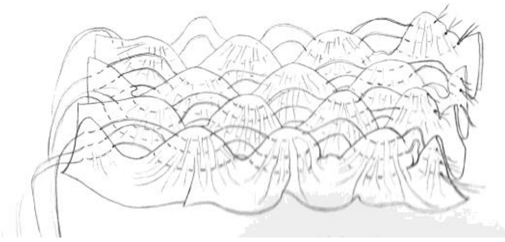


Fig. 2.4.2d Japanese larch shibori

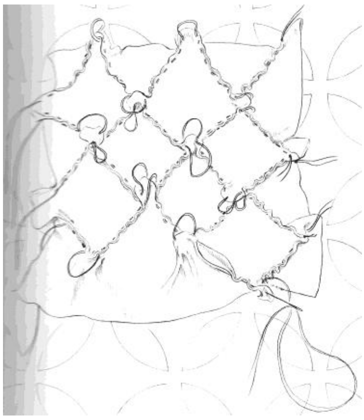


Fig. 2.4.2e Linked circle patterned shibori

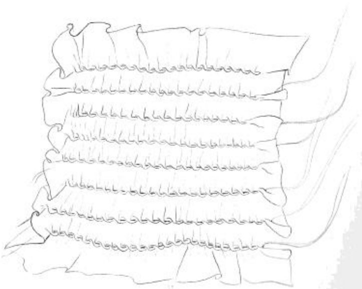


Fig. 2.4.2f Chevron stripes shibori

2.4.3 Folding and Clamping- Board-clamping Shibori

Among the different folding techniques, pleating is an important skill that has been used for more than three hundred years in the history of Japan. Parallel strips of shapes and colors can be set by pleating. It has a wide variation as the sizes, direction and patterns of pleating vary according to designs. Textile designs have developed many ways to alter the design made by pleating. For example, stripes and dyed band (tazuna) shibori is to make striped patterns and plain band of solid color; willow (yanagi) shibori creates warpwise stripes in irregular forms and are randomly spaced. The continuous pleating can be done by hand (te-suji shibori), machine (fukuzo-suji shibori) or stitching (nui yoro) shibori.

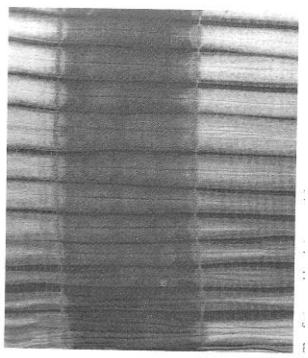


Fig. 2.4.3a

Tazuna shibori

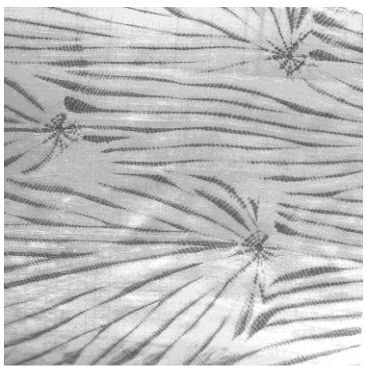


Fig. 2.4.3b

Willow shibori

Fig. 2.4.3c

Te-suji shibori

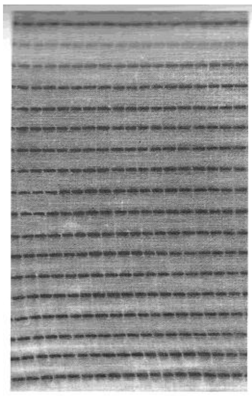


Fig. 2.4.3d

Stitching shibori

The cloth is then secured by binding with thread or clamping. In this study, the folding and clamping techniques for heat-setting are demonstrated in board clamping shibori. Board clamping shibori (itajime) is a folding and pressing technique that can be used in pleating. The dyeing fabric is folded in more than 2 directions to form a neat bundle and clamped between 2 boards or sticks. If the fabric bundle is small enough, clamping by boards is suggested. In my study, paper card board is used. For clamping with sticks, the sticks can be placed on both sides of the cloth bundle. In some cases, the cloth runs through the slit between sticks. The cloth cannot be secured with sticks alone. It has to be bound together with cloth around a cord. (Wada, Rice & Barton, 1983, p. 109-115)

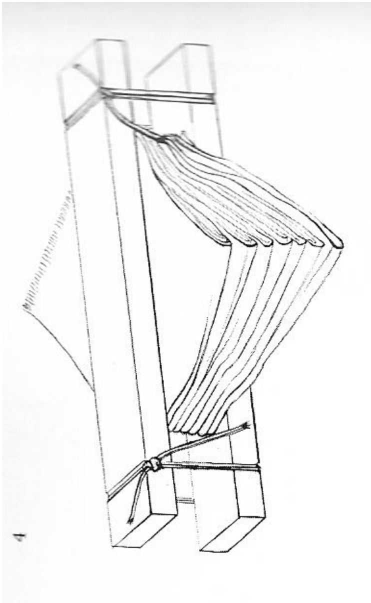


Fig. 2.4.3e Board-clamping shibori

Nevertheless, clamping is generally used as a securing method that does not produce obvious heat-setting effect alone. Yet, it provides suitable pressure to the folded fabric to create permanent striped shapes under high temperature.

2.5 Textiles for heat-setting

During the process of heat-setting, there are some factors that may affect the resulting effect: the materials, the amount of heat and pressure and the duration. In this study, various materials were the variables to be manipulated to compare their effects on heat-setting. Factors other than materials, such as the temperature, pressure and time were kept constant.

The materials used for heat-setting are different in the way of fiber content and fabric structure. In this study, both the fiber content and fabric structure that are commonly used will be considered.

2.5.1 Fiber Content

Theoretically, all pure synthetic fabrics can undergo heat-setting treatment to give a comparatively permanent three-dimensional effect. For example, polyester and nylon are very common ones. However, for natural fibers, contrast to petrochemical fibers, those can be used for heat-setting are very limited. Many of them can only produce semi-permanent heat-setting effects. Silk, cotton and linen are examples of the most frequently used. To retain the texture set on fabric, stiffening process is usually applied on the fabric surface. Thanks to the advanced technology, some “techno-textiles” are developed to suit the aesthetic value in the modern of fashion. These regenerated fibers can be described as half-natural-half-synthetic. Viscose rayon was one of the earliest invented “techno-textiles” which can be used for heat-setting. To find out the contribution of different kinds of fibers on heat-setting effect, silk, polyester and nylon were studied.

2.5.1.1 Silk

Silk is the only natural fiber which exists as a continuous filament. Its amino acid composition arranged in a polypeptide chain which is similar to that of human skin. Silk is recognized as a luxury fiber because it possesses a combination of properties that cannot be imitated by any other fibers. It possesses a naturally distinctive luster, suppleness and draping quality, smooth hand feel, high moisture absorption, and good strength. These favorable properties are the results of the fine denier, unique shape, loose and crimped structure of silk fibers.

Untreated silk is stiff because the silk filament is naturally coated by protein. The protein can be destroyed in high temperature but the filament itself would not. Therefore silk fabric in the market is usually degummed to give a luster surface.

Besides its luster, flexibility and luxurious quality, it has a natural tendency to retain the shape made when it is wet. This property of silk is important in maintaining the texture and elasticity of silk. Silk has a great versatility to create a wide range of fabrics such as chiffon and velvet. (Kadolph & Langford, 1998, p. 63)

Boiling or steaming silk fabric can achieve a quite permanent heat-setting effect. The temperature applied should be lower than 140℃. As silk is a dedicate protein natural fiber, it should be treated more gently. For heat-set silk fabric, ironing should be avoided and dry-cleaning is recommended to maintain the three-dimensional texture. (Wada, 2002, P. 146)

2.5.1.2 Polyester

Polyester was invented in 1951 in the U.S. It was then processed in different creative possibilities for artists and designers. Thanks to its excellent resiliency and dimensional stability after heat-setting, it is now considered as the most important synthetic fiber nowadays. The staple form of polyester can be blended with many other fibers to produce desirable fabric properties. This is also a favorable property of polyester fiber.

Polyester is composed by some kinds of molecules that their bonds can be broken under high temperature. Therefore polyester is considered as thermoplastic, which can be reshaped under high temperature. To heat-set polyester fabric, suitable temperature ad pressure should be applied. Theoretically, the temperature should be between its softening point and melting point, which is between 238℃ to 260℃ for twenty to thirty minutes. Yet, ideally, bound polyester fabric should be heated to around 200℃ for 20-30 minutes to form a 3D texture without causing the filament to shrink. (Wada, 2002, P. 146)

As polyester fabric has a good resiliency and high dimensional stability, it is easy-care and machine washable. The staple form of polyester fiber allows the blending with many other fibers to create desirable aesthetic and functional properties which are better than nylon. (Kadolph & Langford, 1998, p. 99-107)

2.5.1.3 Nylon

Nowadays, nylon is the third most popular fiber in the U.S. Nylon was a synthetic fiber developed in the U.S. in 1928. By 1939, Nylon 6.6 was introduced to the public and widely used especially in women's hosiery. Unlike many fibers at that time, nylon is strong in strength and standing with abrasion. It has greater elasticity and can be heat-set to form permanent pleats even undergoing machine washing. There are a large variety of nylon fibers which are manipulated according to different end uses. In this study, nylon is used as a comparison with satin made from other materials such as polyester. (Kadolph & Langford, 1998, p. 99)

2.5.2 Thermal properties of Fibers

The following table shows the comparison between the thermal properties of silk, polyester and nylon. Thermal property describes the heat sensitivity of fibers. It tells the softening and melting temperatures of different fibers and thus determines the temperature for not affecting the structures of fibers. In the process of heat-setting, the temperature applied to fabrics should in-between the softening and melting points so that the fabric can be shaped without being melted. (Kadolph & Langford, 1998, p. 26)

Fibers	**Heat Sensitivity**	**Safe Temperature**	**Glass Transition Temperature (Tg)**
Silk	Does not melt	149℃	/
Polyester	Soften from 238℃, melted from 478℃	163℃-177℃	69℃
Nylon	Soften from 171℃, melted from 419℃	149℃-177℃	57℃

Table 2.5.2 Thermal properties of silk, polyester and nylon

2.5.3 Fabric structure

Besides fiver content, structure of fabric is another element of material that affects the heat-setting effect. In this section, the properties of organza, chiffon and satin were investigated in order to better understand their effects on heat-setting. Also, some other fabric structures such as gabardine and georgette were employed to give a more comprehensive comparison with same fiber content.

2.5.3.1 Organza

Organza is a common kind of plain weave. It is a semitransparent fabric made with filament yarn. The yarns are voluminous which create sheer appearance on fabric. The fabric receives an acid finish on lawn gray goods which contribute to its sheerness and crispness.

In a shibori piece made by Hiroshi Murase, polyester organza was treated with tool-aided spiderweb shibori to become a sculptural, spiky and elastic fabric.

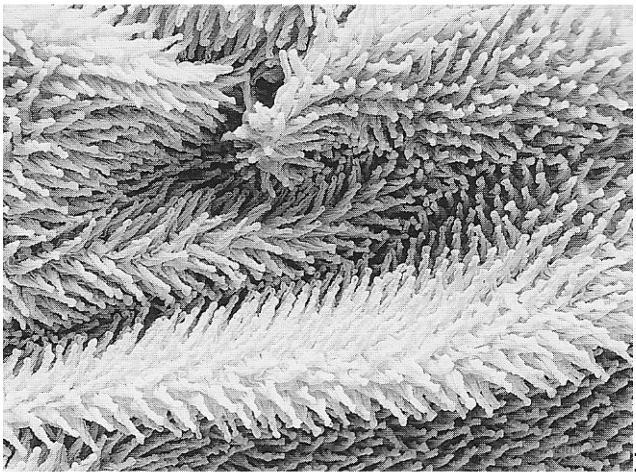


Fig. 2.5.3.1

A finished piece of Hiroshi Murase

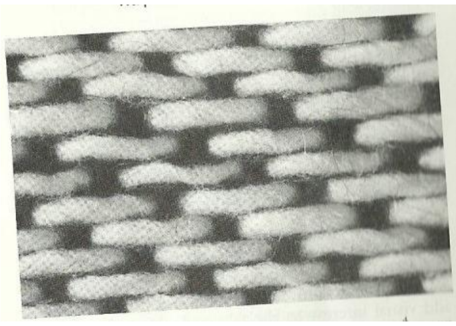
2.5.3.2 Chiffon and georgette

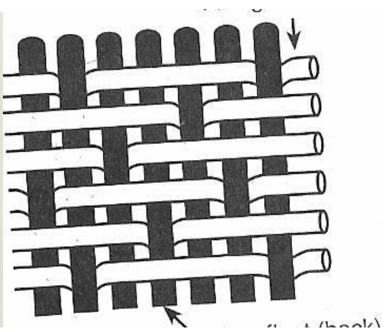
Both chiffon and georgette were used to be made with silk, but nowadays they are mostly made with synthetic filament yarns. They are very light-weighted, high in draping quality. Chiffon is manufactured by making the direction of S or Z crepe twist of warp and weft yarns alternatively. Chiffon is made with a smaller diameter of yarns and harder twist so that it is smoother and more lustrous than georgette. (Kadolph & Langford, 1998, p. 185)

Ultra fine chiffon has a hand feel similar to silk crepe. Silk chiffon is very suitable for pleating. Some silk chiffon wall hanging and scarf of shibori are suggested by Elfride Moller. (Moller, 1999, p. 60)

2.5.3.3 Sateen

Sateen is a basic fabric of satin weave. In weaving, the warp yarn floats over a few weft yarns and interlace with the subsequent weft yarn. Unlike plain weave, sateen has a different appearance on technical face and technical back. The difference between satin and sateen is that satin is made of short staple yarns such as cotton and linen, while sateen is made of filament yarns such as polyester and nylon. (Kadolph & Langford, 1998, p. 197)





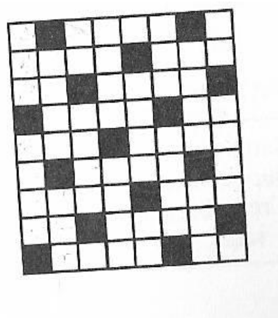


Fig. 2.5.3.3a Fig. 2.5.3.3b

Fabric structure of sateen

Sateen is characterized as one of the most lustrous cloth in the world. It is because of the bright and low twisted fibers and long floats of warp yarns on its surface. The high count of fabric makes it more voluminous, durable and firm.

Sateen of medium or heavy weight can retain heat-setting effects, especially pleats, firmly. It is very thermoplastic that pleats can be set at high synthetic fabric temperature.

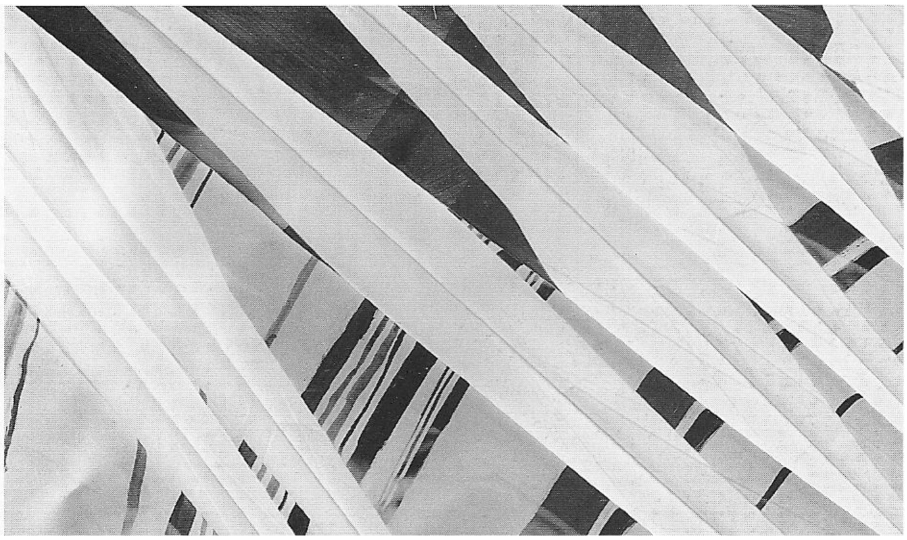


Fig. 2.5.3.3c Pleating and printing on polyester sateen fabric by Ryoko Kohbata.

2.5.3.4 Gabardine

Gabardine is a kind of twill weaved fabric. A direction of single yarn is filled across more than two yarns of the other direction so that one yarn is interlaced. Thus a diagonal line, wale, is formed. Same as satin, all twill fabrics have technical face and technical back.

Gabardine is a warp-faced twill fabric with pronounced wale closely packed and raised. It can be made with combed, carded, single or ply yarns. The number of warp yarns is much more than that of weft yarns.

Twill fabrics are more durable and attractive. Because of its distinctive wale appearance on technical face, it is unlikely to have printings on top. As twill fabrics are usually less sheer, generally they are used in areas which require higher durability. For example, Gabardine is commonly used for the outer layer of jackets.

In this study, polyester gabardine is employed to make a comparison between different fabric structures of polyester. (Kadolph & Langford, 1998, p. 196)

2.6 Examples of heat-setting on textile applications

In the history of shibori development, there were many textiles and fashion designers who were fascinated by the distinctive sculptural characteristics created by heat-setting process of shibori. In this section, six textiles designers who are renowned for their heat-setting technique applications were studied: Ana Lisa Hedstrom, Barbara Rogers, Jean Williams Cacicedo, Jun`ichi Arai, Mascha Mioni and Tsuyoshi Kuno.

These six contemporary textile designers were invited to participate in the textile exhibition “Transformation: Material˙Magic˙Memory” which was hosted by the Institute of Textiles & Clothing, The Hong Kong Polytechnic University. The exhibition featured works of nine internationally recognized textile designers from all around the world. In the exhibition, traditional local culture and art is transformed into contemporary artistic fashion through the hands of the designers. To a large extent, the reason of these six designers being studied in this project was due to their profound contribution to the development of heat-setting technique. Their exquisite art pieces raised my interest in heat-setting and thus set off this study.

2.6.1 Ana Lisa Hedstrom

Born in Indiana, Ana Lisa Hedstrom has devoted into shibori for more than thirty years. After she graduated from Kyoto Art College in Japan in 1967, her works has been exhibited in U.S.A. and Germany. She was awarded with two NEA craftsmen grants and considered as a fellow of the American Craft Council in 2004.

Hedstrom considers fabric as conversation and that shibori creates intricate patterns like a language. She hopes to speak to the viewers through her work.

From Fig. 2.6.1(1a) to Fig. 2.6.1(4b) show her art works exhibited in "Transformation: Material˙ Magic˙ Memory".

Fig. 2.6.1(1a)

Fig. 2.6.1(1b)

"Sunrise" was made with polyester felt. It was finished in 2008 by hand stitching, transfer printing and heat-setting.

Fig 2.6.1(2a) Fig. 2.6.1(2b)

"Leaf Vest" was made with polyester felt from recycled bottles. It was finished in 2008 by stitching, transfer printing and heat-setting.

Fig. 2.6.1(3a) Fig.2.6.1(3b)

"Morning Glory Dress and Coat" was made with polyester organza. It was an art piece of 2009 which finished by transfer printing and heat-set pleating.

Fig.2.6.1(4a) Fig.2.6.1(4b)

"Meadow Vest" was made with polyester felt. This outfit of 2008 was finished by stitch-resist shibori, transfer printing and heat-setting.

There are some other recent art pieces of Hedstrom:

Fig.2.6.1(5a) Fig.2.6.1(5b)

"Horizontal Medley" in 2009 was a hand-dyed pieced silk.

Fig.2.6.1(6)

"The Sea" in 2009 was made with polyester felt and finished by transfer printing.

Fig.2.6.1(7)

"Verdure" in 2008 was made with polyester felt and finished by transfer printing and stitching.

2.6.2 Barbara Rogers

After graduated from Ohio State University, Barbara Rogers studied drawing and painting in California. She retired from the University of Arizona in 2007 and is now an emeritus professor of the University. Some of she works were exhibited in France (2008), USA (2005) and Japan (2005).

Fig. 2.6.2(1a)

Fig. 2.6.2(1b)

The work exhibited in "Transformation: Material˙Magic˙Memory" textile exhibition.

2.6.3 Jean Williams Cacicedo

In 1970, Jean Williams Cacicedo received a BFA from the Pratt Institute in New York. In 1985, she was awarded as the Artist of the Year from the Oakland Museum. In 1977, her fiber art work, "Breaking Barriers" was exhibited at the closing of the American Crafts Museum's national touring exhibition in New York. Cacicedo was a major leader in the Wearable Art Movement in 1970s. Her signature wool art works incorporated with her specially developed treatment and were exhibited worldwide. Cacicedo thinks textile material is an extension of her voice. Along with the long development of fiber art, she can feel a distinct connection provided in it.

Fig. 2.6.3(1a)

Fig. 2.6.3(1b)

Fig. 2.6.3(1c)

“Winter White” of 2009 was exhibited in “Transformation: Material˙Magic˙Memory”. It was made with fulled woven wool and silk. The work was finished by resist paste, dyeing, printing and some appliqué.

Fig. 2.6.3(2a)

Fig. 2.6.3(2b)

“Grey Bird” is made with 600 grams fulled woven wool in 2010. It was finished by resist paste, dyeing and printing.

Fig. 2.6.3(3)

Fig. 2.6.3(4)

Celebration Buffalo Coats in 1985 and 1986 are the earlier works by Jean Williams Cacicedo.

2.6.4 Jun`ichi Arai

Jun`ichi Arai was born in a mill-owning family in 1932 in Japan. He obtained experienced fabric weaving techniques from his family business. It influenced a lot his process of textile designs especially the traditional weaving technique and employing local craftsmen. Arai holds 36 patents for processes including the high-tech yarn to make the “macro-gauze”. He produced fabrics for Comme des Garçons and Issey Miyake in the 70s and 80s. He also developed the old tie-dye technique and worked on heat-setting of synthetic fibers to three-dimensional surface to fabrics.

Fig. 2.6.4(1a)

Fig. 2.6.4(1b)

A work of Arai exhibited in "Transformation: Material˙ Magic˙ Memory" textile exhibition. It was an application of transfer printing and heat-setting on metallic fabric.

Fig. 2.6.4(2a) Fig. 2.6.4(2b)

Weighted 0.7kg, "Golden Cicada" was a work with transfer printing in 1989. It was also exhibited in "Transformation: Material˙ Magic˙ Memory" textile exhibition.

Fig. 2.6.4(3a) Fig. 2.6.4(3b)

Some of Arai`s works were also exhibited in "Innovative Cloths" exhibition of the Institute of Textiles & Clothing, The Hong Kong Polytechnic University in May 2009.

2.6.5 Mascha Mioni

Growing up in Switzerland, Mascha Mioni is a painter whose oil paintings on canvas were exhibited all over Europe. Later in 1986, as she studied dress-making, she started to develop silk paintings and design silk dresses. Her artistic dresses were shown in different places in the world, including Germany, United Kingdom, Italy and United States. Together with six other textile artists, Mioni published a series of three books “Art To Wear” from 1990 to 2005.

Fig. 2.6.5(1a) to Fig. 2.6.5(3c) show the dresses by Mioni in the exhibition “Transformation: Material˙ Magic˙ Memory”. From Fig 2.6.5(4) to Fig. 2.6.5(7c) are some other works of Mioni.

Fig. 2.6.5(1a) Fig. 2.6.5(1b)

"Remember Arimatsu I" in 2006. The cotton fabric undergoes resist dyeing to create the sculptural form.

Fig. 2.6.5(2a) Fig. 2.6.5(2b)

"Remember Arimatsu II" in 2006 is a silk dress made with snake cotton. Resist dyeing was applied to create the folded and creased effects.

Fig. 2.6.5(3a)

Fig. 2.6.5(3b)

Fig. 2.6.5(3c)

“Woman and Snake” in 2010 is made with silk and 120 champagne bottle cap wires. Resist dyeing, folding and creasing were applied.

Fig. 2.6.5(4)

Fig. 2.6.5(5)

Fig. 2.6.5(6)

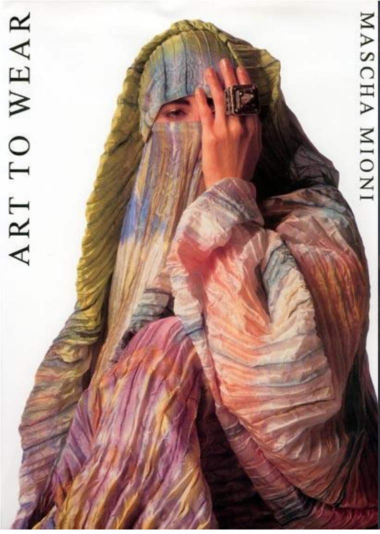


Fig. 2.6.5(7a) **Fig. 2.6.5(7b)** **Fig. 2.6.5(7c)**

Art To Wear 1 **Art To Wear 2** **Art To Wear 3**

2.6.6 Tsuyoshi Kuno

Tsuyoshi Kuno is a textile artist who modernized shibori with high-pressure and high-temperature industrial chambers. His studio reached high production of shibori fabrics in early 1990s. Kuno is famous for applying shibori on unusual fabrics. As a young textile designer, Kuno often cooperates with different fashion designers and also designs costumes and home textiles.

Fig. 2.6.6(1a) Fig. 2.6.6(1b)

A shibori kimono of Kuno shown in "Transformation: Material˙ Magic˙ Memory". It was created in Tsuyoshi Kuno Studio.

Fig. 2.6.6a

It was made with leno weave fabric of 56% wool, 31% mohair and 13% nylon. Resisted with hand-spiderweb shibori and fulled by washing, it was created in 2000.

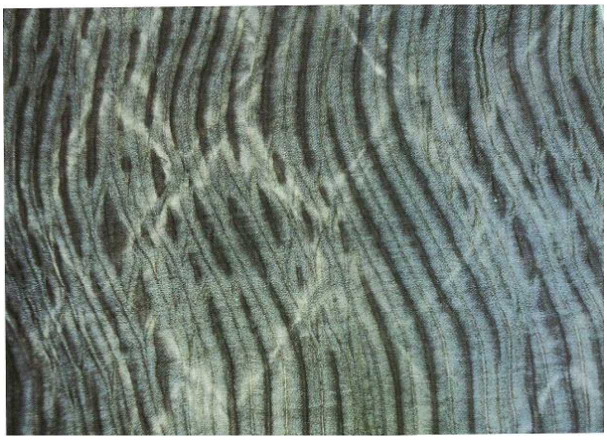


Fig. 2.6.6b

It was made with light-weighted challis woven fabric. The fiber content is: 65% wool and 35% polyester. It was made in1999 by tie-dyeing in acid dyes and pole-wrapping shibori. (Wada, 2002, p. 56)

2.7 Summary

In this chapter, the background of shibori, a very ancient textile dyeing technique, was understood. Though Shibori has a long history, it became popular in the fashion industry since 1960s. The heat-setting effects created by shibori triggered many textile designers` interests. After understanding various kinds of shibori, the spider-web shibori, wood-grain shibori and board-clamping shibori were chosen for experiments. The reason was that these three kinds of shibori consist of techniques found in most types of shibori. Thus they created heat-setting effects that can be found on most shibori textiles. They were considered as "representatives" of heat-setting methods in the experiments. Spider-web shibori consists of twisting and binding techniques. Wood-grain shibori includes gathering and knotting techniques. Board-clamping shibori combines folding and clamping techniques.

In the section 2.5 of this chapter, the study of textiles of shibori was divided into fiber content and fabric structure investigations. Fiber content and fabric structures were two major components that affect the physical properties of a fabric and thus affect the heat-setting effects of a shibori. Therefore, the thermal properties of silk, polyester and nylon were compared so that their reaction under high temperature can be predicted. Besides, the general features of organza, chiffon, georgette, sateen and gabardine were identified to help to understand the heat-setting effects on these fabrics.

Nevertheless, the last section of this chapter illustrated the contemporary shibori designs from six textile designers. They were some examples of how the heat-setting effects of shibori can be applied to create excellent and striking fashion and textiles.

Chapter 3

Methodology

3.1 Introduction

It is crucial to know the factors in a carefully-conducted experiment which significantly affect the accuracy of results. As mentioned in the previous observations, there are a few factors which affect the heat-setting effects of shibori:

- The fiber content of fabric;
- The fabric structure of materials;
- The duration of heat-setting process;
- The temperature throughout the heat-setting process; and
- The amount of pressure applied (if any) onto the fabric.

The fiber content and fabric structure of fabric samples acted as variables or invariables accordingly in different comparison. The factors of duration, temperature and amount of pressure were controlled appropriately as confounding factors in various contexts of experiment. The experiments conducted in this study were based on the hypothesis that different sculptural effects on fabrics can be obtained by applying shibori on different kinds of fabrics. Therefore, one of the objectives of the experiments was to find out the heat-setting effects on different types of fabric. After that, by comparing the results obtained, suitable types of fabric can be recommended for different desirable heat-setting effects.

Before the experiment was conducted, some information had been collected in advance:

- The techniques used in each type of shibori;
- The typical resulting three-dimensional effects of shibori;
- The Thermal properties of fiber contents under tested;
- The physical properties of fabric structures under tested;
- The environmental conditions for shibori to be effective on each fabric sample; and
- The ways that shibori is applied in contemporary fashion world.

Still, there was some other information not yet known until the experiment carried out:

- Under the same condition, the influence of different fiber content on heat-setting effects of fabric samples with same fabric structure;
- The influence of different fabric structures on heat-setting effects of fabric samples with same fiber content; and
- The most suitable type of fabric for each kind of shibori.

Therefore, the aim of the laboratory experiment was to find out the above three aspects of information.

3.2 Laboratory Experiment

3.2.1 Methods

There were three types of shibori conducted in this study: spiderweb shibori, wood-grain shibori and board clamping shibori. Each shibori represented a combination of two or more heat-setting techniques that are commonly used in the contemporary shibori performance.

The spiderweb shibori in this study was a combination of twisting and binding techniques. In a traditional spiderweb shibori, tips of cloth are held taut, either by hand or by a simple hook tool. The tips are then bound by thread to secure the shape. After heat-setting the bound cloth, it would become a sculptural, spiky and elastic fabric. If the bound fabric is tie-dyed, a special dyed pattern would be resulted. The parts of cloth resisted by the binding thread would be alike spiderweb. This is why this kind of twisting and binding method is called spiderweb shibori. The three-dimensional effect would be much similar to the works of Masha Mioni and Tsuyoshi Kuno. (See Fig. 2.6.5(3a), Fig. 2.6.5(3b), Fig. 2.6.5(3c), Fig. 2.6.6(1a), and Fig. 2.6.6(1b)). In order to imitate the spiky appearance of spiderweb shibori, in this study, tips of cloth are twisted and held taut by hand and then bound tightly by white thread of five turns clockwise. Obvious heat-setting spiky effect on cloth was achieved.

Wood-grain shibori was used demonstrated gathering and knotting techniques in this study. The traditional wood grain shibori was done by stitching technique. Parallel lines of evenly-spaced running stitches go along the weft of fabric. The stitched thread is then drawn to create crease through gathering. The gathers are held by securing the ends of thread with knots. After dyeing the fabric, the crease of gathers and the parts resisted by threads look similar to wood-grain. So this type of shibori was called wood-grain shibori. Wood-grain shibori was modified by Hiroshi Murase by having zigzagged running stitches on cloth, making the gathers of fabric similar to waterfall.

Fig. 3.2.1a

A Finished textile design of Hiroshi Murase

In this study, the creases of wood-grain shibori were imitated by making two or more lines running stitches along the direction of the relatively longer side of each sampling fabric. The stitches were evenly-spaced at 1 cm interval. The ends of running stitch were secured by two knots at each end. After heat-setting, the permanent effects of gathering on different sampling fabric were compared.


Fig. 3.2.1b

Tools used in preparing fabric samples

The third method exercised in the study was the board clamping shibori. It represents the folding and clamping techniques. “Itajime” of Japan means board-resisting. A folded bundle of fabric is sandwiched between two flat pieces of boards of the same size. The board can be made of wood of any materials as long as they would not be affected by the high temperature of heat-setting process. The sandwiched bundle of fabric is compressed and secured by binding cord or clamps before heat-setting.

In this study, the sampling fabrics were pleated for shibori. Paper card boards sized 1.5cm x 5.5cm x 0.1cm were used to sandwich the pleated samples. Since the temperature of experiments in this study was between 100℃-200℃, paper card boards which can stand under 200℃ were used. However, if any board-clamping shibori experiments beyond this study are to be conducted under temperature higher than 200℃, wooden or metal boards are suggested.

The pleated and sandwiched samples were then compressed and secured by metal clamps of 3.8cm width. Each metal clamp was clamped at the center of the sandwich of boards and fabric so as to control any confounding factors and minimize the inaccuracy of results.

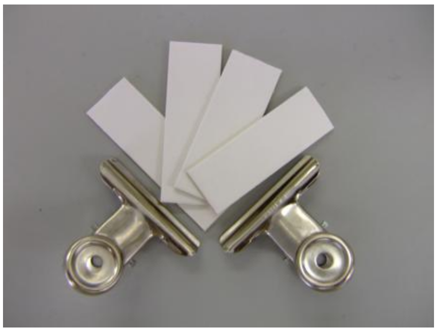


Fig. 3.2.1c

The boards and clamps used.

Fig. 3.2.1d
The clamp is situated at the center of fabric bundle.

Fig. 3.2.1e
The fabric is sandwiched in-between card boards.

3.2.2 Sample Preparation

Different types of fabrics were collected from fabric suppliers. As the fiber content of samples was important in this study, only those fabrics with clearly stated fiber contents were chosen for this study.

After analyzing and classifying the fiber contents and fabric structures of the samples collected, there were a total of fourteen different types of fabric samples used in this study. Their fiber contents and fabric structures are listed below:

		Fabric Structure						
		Chiffon	Plain weaved	Organza	Sateen	Gabardine	Georgette	**Total**
Fiber Content	100%Polyester	✓	✓	✓	✓	✓		**5**
	100% Silk	✓	✓	✓			✓	**4**
	100%Nylon	✓			✓			**2**
	100%Rayon		✓					**1**
	52%polyester 35%silk 13%spandex	✓						**1**
	50%Polyester 50%Nylon	✓						**1**
	Total	**5**	**3**	**2**	**2**	**1**	**1**	

Table 3.2.2 Fiber contents and fabric structures of fabric samples

Every type of fabric went through the same three kinds of shibori so as to single out difference in heat-setting effects caused by the difference in fabrics. For example, three samples of 100% polyester Chiffon were prepared for spiderweb, wood-grain and board clamping shibori respectively; and another three samples of 100% Polyester Organza were prepared also for spiderweb, wood-grain and board clamping shibori respectively. By doing so, there were a total of forty-two number of fabric samples prepared.

There were some reasons for choosing the above fabric samples. Fabric structures such as chiffon, organza and sateen are very common materials for textile artists to work with shibori. Thus it is important to compare the difference in heat-setting effects caused by the difference of fiber content in these fabrics.

100% Polyester and 100% silk were the major kinds of fiber content in this study. It was because both polyester and silk are the most frequently used types of fiber for contemporary shibori works. Pure polyester and silk content provided a concise indication of how polyester and silk affect the resulting heat-setting effects. Also, the results obtained from the experiments can be generated to other fabrics of blended fiber contents beyond this study. Thus, their heat-setting effects can be more foreseeable.

Other samples, 100% Nylon and 100% Rayon fabrics, were used as a comparison with the 100% polyester and silk of the same fabric structure. They acted as an indicator to show the typical features of heat-setting effects on polyester and silk fabrics. Nevertheless, the two fabric samples with blended fiber contents, 52%polyester- 35%silk- 13%spandex chiffon and 50%Polyester-50%Nylon chiffon, were examples to show the difference in proportion of fibers affect the consequence heat-setting effects.

3.2.3 Conditioning

Confounding factors are those conditions which correlate with the variables and invariables in experiments. The duration and temperature in each experiment were the confounding factors that under control in each experiment to minimize errors. As these conditions are set differently according to the fiber content of samples in different experiments, each time the conditions are controlled in different settings.

Fabric samples were heated in a universal oven of Memmert, the expert of thermostats in Western Germany. The oven was allowed to preheat before the experiment and the oven has a thermostat system to prevent over-heat temperature. Generally, for shibori with fabrics made of 100% silk, the temperature and the duration required is less than that of 100% polyester. In both the spiderweb and wood-grain shibori, the bound fabric samples were heated at 100℃ for 15 minutes in the oven. In board clamping shibori, however, the fabric samples were heated at 100 ℃ for 20 minutes. Since the fabric samples were clamped in-between card boards, a longer time is needed to allow the fabric to be heat-set under high temperature.

Fig. 3.2.3a
An oven of Memmert

Fig. 3.2.3b
Preheat at 100℃

Fig. 3.2.3c
Samples in the oven

The 100% polyester samples for spiderweb and wood-grain shibori were heated at 200℃ for 20 minutes. Those for board-clamping shibori were heated at 200℃ for 30 minutes.

In order to single out the effects caused by difference of blended fibers, the temperature and time duration were kept constant all the blended fiber fabrics under the same kind of shibori. The fabric samples with blended fiber contents were heated to 200℃ for twenty minutes in spiderweb and wood-grain shibori while heated to 200℃ for thirty minutes.

3.2.4 Experiment procedures

There were three experiments conducted in this study: the spiderweb shibori, wood-grain shibori and board-clamping shibori. Each type of fabric samples went through the same three shibori. As the temperature required for silk fabrics was the lowest, they were conducted in the first phrase of experiment. The procedures were as follows:

1. All the fabrics samples were tied, stitched or sandwiched as preparation before experiments.

2. The oven was preheated to 100℃.

3. Silk chiffon, plain-weaved, organza and georgette for spiderweb and wood-grain shibori were placed on the metal plate and heated in the oven at 100℃ for fifteen minutes.

4. After the spiderweb and wood-grain shibori with silk fabrics were done, the board-clamping shibori was to be conducted. Another set of silk chiffon, plain-weaved, organza and georgette were placed on the metal plate and heated in the oven at 100℃ for twenty minutes.

5. When heat-setting of all the silk fabrics samples were completed, the oven was further preheated to 200℃ for preparing the heat-setting of polyester fabric samples.

6. Polyester chiffon, plain-weaved, organza, satin and gabardine for spiderweb and wood-grain shibori were placed on the metal plate and heated in the oven at 200℃ for twenty minutes.

7. After the spiderweb and wood-grain shibori with polyester

fabrics were done, the board-clamping shibori was to be conducted. Another set of polyester chiffon, plain-weaved, organza, sateen and gabardine were placed on the metal plate and heated in the oven at 200℃ for thirty minutes.

8. When heat-setting of all the polyester fabrics samples were completed, the temperature of the oven was kept at 200℃.

9. Nylon chiffon and sateen; rayon chiffon and plain-weaved; polyester and silk chiffon; and polyester and nylon chiffon were placed on the metal plate. They were prepared for spiderweb and wood-grain shibori. They were then heated in the oven for 200 ℃ for twenty minutes.

10. After the spiderweb and wood-grain shibori with blended fibers fabrics were done, the board-clamping shibori was to be conducted. Another set of nylon chiffon and sateen; rayon chiffon and plain-weaved; polyester and silk chiffon; and polyester and nylon chiffon were placed on the metal plate. They were then

heated in the oven at 200℃ for thirty minutes.

11. After all the heat-setting procedures were completed; all the fabric samples were removed from binding thread, stitching thread and clamps. The heat-setting effects can thus be compared.

CHAPTER 4

Analysis of Results

4.1 Introduction

After the experiments were conducted, the results were analyzed in three aspects. Firstly, the influence of fabric structure on heat-setting effects. Secondly, the influence of fiber content on heat-setting effects.

Fiber Content	Fabric Structure: Chiffon	Plain weaved	Organza	Sateen	Gabardine	Georgette	**Section**
100%Polyester	✓	✓	✓	✓	✓		**3.3.1a**
100% Silk	✓	✓	✓			✓	**3.3.1b**
100%Nylon	✓			✓			
100%Rayon		✓					
52%polyester 35%silk 13%spandex	✓						
50%Polyester 50%Nylon	✓						
Section	**3.3.2a**	**3.3.2b**	**3.3.2c**	**3.3.2d**			

Table 4 Results of experiments in different sections

4.2 Influence of Fabric Structure on Heat-setting Effects

The influence of fabric structure on heat-setting effects can be observed by comparing different fabric structures with the same fiber content.

4.2.1 Fabrics with 100% Polyester fiber content

In this study, there were five types fabric samples made with 100% polyester: chiffon, plain-weaved, organza, sateen and gabardine. Fig.3.1 to Fig.3.14 show the fabrics before and after heat-setting process. The first pair of pictures were the spiderweb shibori, the second pair was the wood-grain shibori while the third was the board-clamping shibori.

Polyester Chiffon:

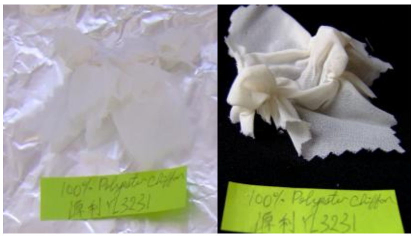


Fig. 4.1

Fig. 4.2

Fig. 4.3

Plain-weaved polyester:

Fig. 4.4

Fig. 4.5

Fig. 4.6

Polyester Organza:

Fig. 4.7

Fig. 4.8

Fig. 4.9

Polyester Sateen:

Fig. 4.10

Fig. 4.11

Fig. 4.12

Polyester Gabardine:

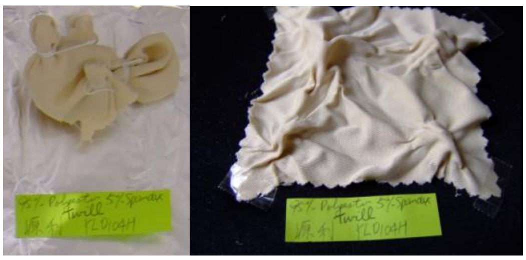


Fig.4.13

Fig. 4.14

Fig. 4.15

From the above pictures of comparison, all fabrics were successfully heat-set through suitable temperature and time duration. In this section, the fabric structure chiffon, plain-weaved, organza, sateen and gabardine were compared when the fiber content was constantly controlled.

The three dimensional effect of polyester chiffon was relatively soft and vague. Patterns created by heat-setting were not clear. The effect on plain-weaved polyester fabric was unexpectedly good. The sculptural effect was more obvious than that of chiffon. Though the fabric itself was not as stiff as organza, there were striking three dimensional effects. For the polyester organza samples, since the fabric itself was very crispy, the three dimensional effect was very obvious. Yet, the temperature and time duration for polyester organza should be less than that for other polyester fabrics. Yellowing occurred on the polyester organza samples when they were treated at 200 ℃ for twenty to thirty minutes. Polyester sateen was drapery as chiffon but it had a heavier weight. Thus its three dimensional effect was more obvious than that of chiffon especially for board clamping shibori. Polyester gabardine was a twill fabric which was relatively heavy-weighted. Though the sculptural shape was formed, the effect was not as obvious as that of plain-weaved polyester or organza.

The heat-setting effects of different polyester fabrics had different characteristics. It was hard to say which fabric structure was the best, since each of them may suitable for different textile designs and utilization. It was case-dependable. Nevertheless, in the following table, the level of explicitness of these fabrics was ranked below. “1” represented the most explicit result.

100% Polyester				
Chiffon	Plain-weaved	Organza	Sateen	Gabardine
5	2	1	3	4

Table 4.2.1 level of explicitness of polyester fabrics

4.2.2 Fabrics with 100% silk fiber content

A total of 4 types of silk fabric samples were tested for the three kinds of shibori. Silk chiffon, plain-weaved, organza and georgette. Fig. 3.15 to Fig. 3.26 show the results of the experiments. They were pictures of spiderweb shibori, wood-grain shibori and board-clamping shibori accordingly.

Silk Chiffon:

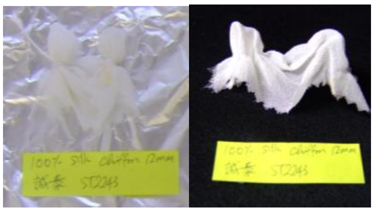


Fig. 4.16 Fig. 4.17 Fig. 4.18

Plain-weaved silk:

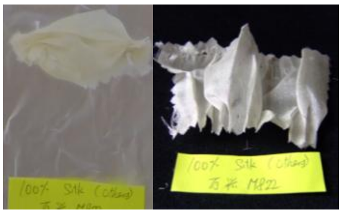




Fig. 4.19 Fig. 4.20 Fig.4.21

Silk organza:

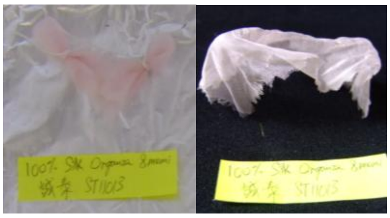
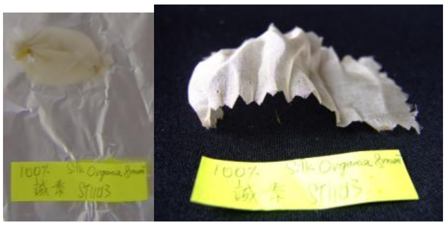
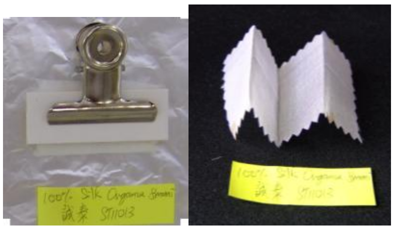




Fig. 4.22 Fig. 4.23 Fig. 4.24

Silk georgette:



Fig. 4.25 Fig. 4.26 Fig. 4.27

As shown from the above pictures, the heat-setting effects on all the fabrics samples were created effectively. It showed that the temperature and time duration used in this study for silk fabrics were basically appropriate.

The three dimensional effect of silk chiffon was very gentle and obscure. Though the sculptural effect was set, there was no clear shape of patterns. For the heat-setting effects on plain-weaved silk fabrics, they were surprising unique. The texture of the plain-weaved silk fabrics were not as soft as chiffon and georgette and were less hard than organza. The heat-setting silhouette was quite obvious and the natural silk lustrous provided a luxury and unique appearance that none of the other fabrics had. For the silk organza samples, as the fabric itself was very brittle, the heat-setting effect was very clear as expected. Unlike the experiments on polyester organza, there was no apparent yellowing occurred on silk organza. It meant silk organza is suitable to be heated at 100℃ for fifteen to twenty minutes. Lastly, the effects on silk georgette were very much similar to that of silk chiffon. Yet, because of the thicker yarns and lighter twists of georgette, it has a more rough hand feel than chiffon. The table below showed which silk fabric has the most obvious heat-setting effect.

100% silk			
Chiffon	Plain-weaved	Organza	Georgette
4	2	1	3

Table 4.2.2 level of explicitness of silk fabrics

4.3 Influence of Fiber Content on Heat-setting Effects

The influence of fiber content on heat-setting effects can be observed by comparing different fiber contents with the same fabric structure. In this study, four structures were used as a context for comparison: chiffon, plain-weaved, organza and sateen.

4.3.1 Chiffon Fabrics with Different Fiber Contents

Chiffon is very light-weighted and drapery. The small diameter and high twist of yarns make chiffon smooth and lustrous. However, chiffon made with different fibers has slightly different characteristics.

100% Polyester Chiffon:

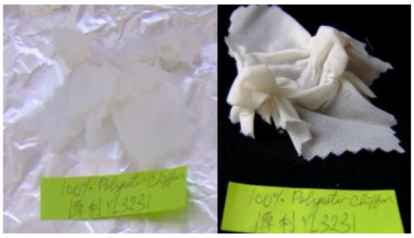


Fig. 4.1 Fig. 4.2 Fig. 4.3

100% Silk Chiffon:

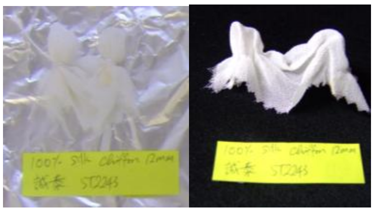


Fig. 4.16 Fig. 4.17 Fig. 4.18

100% Nylon Chiffon:

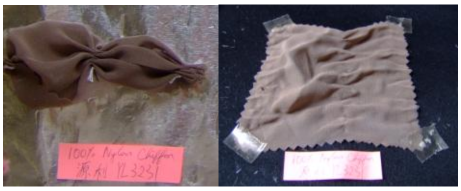


Fig. 4.28 Fig. 4.29 Fig. 4.30

Since the temperature for heat-setting silk fabric is relatively low, it was easier to heat-set silk fabrics. However, the effects on silk chiffon were generally less effective than that of synthetic chiffon. Apparently, heat-setting on synthetic chiffon were more pressed down than on silk as the effects remained more intense when released from binding.

52% Polyester 35% Silk 13% Spandex Chiffon:

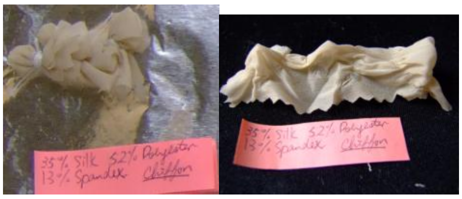


Fig. 4.31 Fig. 4.32 Fig. 4.33

50% Polyester, 50% Nylon Chiffon:

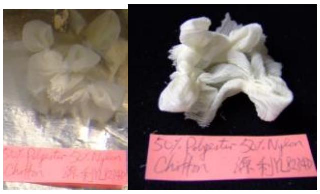


Fig. 4.34 Fig. 4.35 Fig. 4.36

4.3.2 Plain-weaved Fabrics with Different Fiber Contents

Both plain-weaved polyester and silk fabrics performed unexpected well in all three kinds of shibori. Plain-weaved polyester is smooth but not soft. It has a plastic-like hand feel. The sculptural effect is more secured. Plain-weaved silk fabric has a natural luster on its surface. It is smooth, soft and drapery. The heat-setting contributed to permanent three dimensional creases on silk rather than sculptural effects. Rayon fabric with heat-setting effect was similar to the heat-setting effect on polyester gabardine. Rayon fabric was more heavy-weighted and stiff, so the three-dimensional effect was quite obvious too.

100% Plain-weaved Polyester:

Fig. 4.4

Fig. 4.5

Fig. 4.6

100% Plain-weaved Silk:

Fig. 4.19

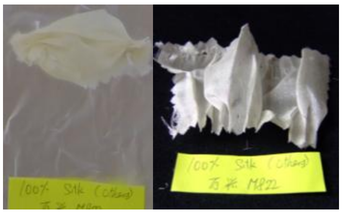


Fig. 4.20

Fig. 4.21

100% Plain-weaved Rayon:

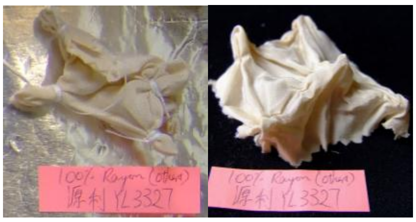


Fig. 4.37

Fig. 4.38

Fig. 4.39

4.3.3 Organza Fabrics with Different Fiber Contents

To a large extent, the stiff and crispy properties of organza contributed to the excellent heat-setting effect of fabrics. With no doubt, heat-setting organza fabrics would create obvious three-dimensional effects. Yet, as shown from the pictures below, polyester organza could show more delicate patterns of shibori than silk organza. Intense creases and three-dimensional effect could be seen clearly on polyester organza. Silk organza is smoother than polyester one but it created a rather rough pattern of shibori.

Polyester Organza:

Fig. 4.7

Fig. 4.8

Fig. 4.9

Silk Organza:

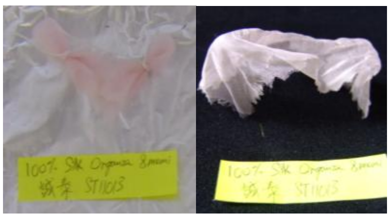


Fig. 4.22

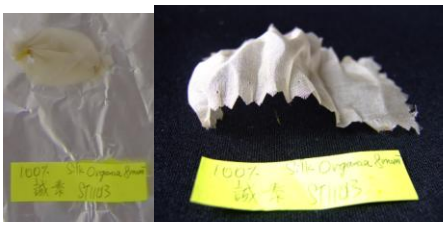


Fig. 4.23

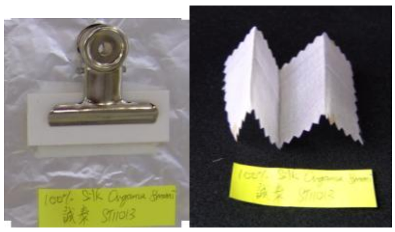


Fig. 4.24

4.3.4 Sateen Fabrics with Different Fiber Contents

Synthetic sateen fabrics have slippery and shiny surface, but they could still create heat-setting effects by shibori. Polyester sateen could be used for spiderweb shibori and board-clamping shibori, as the permanent creases of "spiderweb" and pleats of folding could be easily formed. Still, its performance on wood-grain shibori was not very satisfied. Due to the slippery surface of polyester sateen, the intense gathers of stitching could not be formed clearly.

For nylon sateen, its properties were quite different from that of polyester sateen. It was less slippery and shiny than polyester sateen. It was more stiff and heavy-weighted. As a result, the more striking heat-setting effects were formed. In wood-grain shibori of nylon sateen, the creases of stitched gathered were formed so hardly that it looked like the effect of board-clamping shibori.

Polyester Sateen:

Fig. 4.10

Fig. 4.11

Fig. 4.12

100% Nylon Sateen

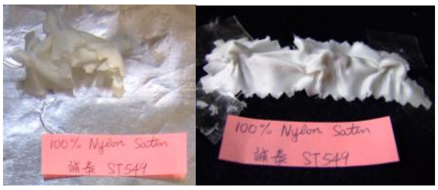


Fig. 4.40

Fig. 4.41

Fig. 4.42

4.4 Summary - Fabric for Each Kind of Shibori

Different kinds of fabric could produce totally different heat-setting effects. Different effects had both strong and weak characteristics. It was hard to conclude which fabric performed the best in each kind of shibori. When creating wavy and swinging designs, chiffon or plain-weaved silk fabric may be a good choice for heat-setting. To match with translucent and bulky designs, organza maybe suitable for heat-setting. Sateen or gabardine may be suitable for heavy and solemn designs. It all depends on which fabric is suitable for the individual textile design.

CHAPTER 5

Recommendations and Fashion Collection

5.1 Recommendations of heat-setting methods for textile applications

Summarizing the experiment results in the previous chapter, Chapter 4, it was found that among the materials of fabrics, polyester was generally a more explicit material in expressing the heat-setting effects. Also, with all the fabric structures tested, organza was generally the most explicit media to express the sculptural effects of shibori. Therefore, scientifically, polyester organza seemed the most suitable fabric for heat-setting.

However, when heat-setting technique is applied to daily garment, polyester organza may not be the best choice. Since polyester has a stiff, crispy and rough surface, it does not have a good hand feel and is not contour to body shape. If a garment is made with polyester organza, it would be bulky and uncomfortable.

Therefore, in real life, it is more common to use polyester chiffon or plain-weaved silk fabrics to produce garments. Polyester chiffon and plain-weaved silk fabrics are much softer, lighter and smoother, making the wearer feel comfortable and fit to body. Yet, the heat-setting effects on polyester chiffon or plain-weaved silk may not be as obvious and permanent as that on polyester organza.

5.2 Fashion Collection

For that reason, in this chapter, a fashion collection of three outfits were made with polyester organza would be shown. Since a fashion collection emphasize on aesthetical value more than practicality, polyester organza was used to maximize the beauty of heat-setting patterns and three-dimensional effects of shibori.

In the fashion collection, golden 100% polyester organza and pure white satin fabric, as a complementary fabric, were used. The technique used in this collection was pleating which was generated from the board-clamping shibori in the previous experiments. Pleating is a technique that can be applied not only in board-clamping shibori but also in other shibori such as pole-wrapping shibori (arashi).

The polyester organza fabric was cut into circular rings and pleated in a special way so that the pleats looked like standing out of the outfits. To make the pleats permanent, the rings of polyester organza were pleated and pressed under a temperature no higher than 200℃ for more than 30 minutes.

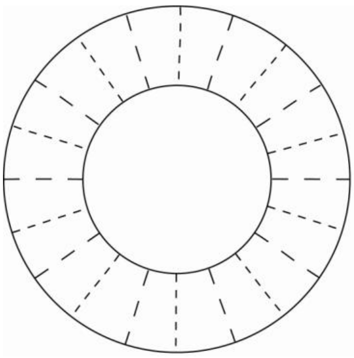


Fig. 5.1

Paper pattern- circular rings of polyester organza

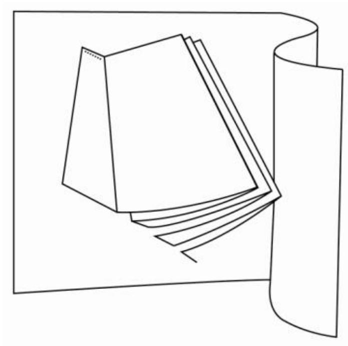


Fig. 5.2

The way the organza being pleated and stitched onto the outfit

Fig. 5.3

A collection of golden polyester organza and white satin

In the collection, the golden polyester organza went through the pleating technique and permanent heat-set pleats were created. The pleats were placed on different parts of the outfits to produce different aesthetic effects. Since polyester organza is translucent, stiff and rough, it helped to create untypical silhouette for outfit. It gave a light-weighted and lively feeling to the outfits.

Fig. 5.4 The first outfit

For this outfit, the golden polyester organza was used to make the lower part of the cocktail dress. Zipper was used as opening at center back of the dress.

There were totally five layers of pleats. On each layer, the pleats were of six inches in length ad each pleat was about two to two and a half inches wide at the edge. Since polyester organza was stiff and the pleats were permanent, the layers pleats were forced towards different direction casually, giving the dress a diversified mood.

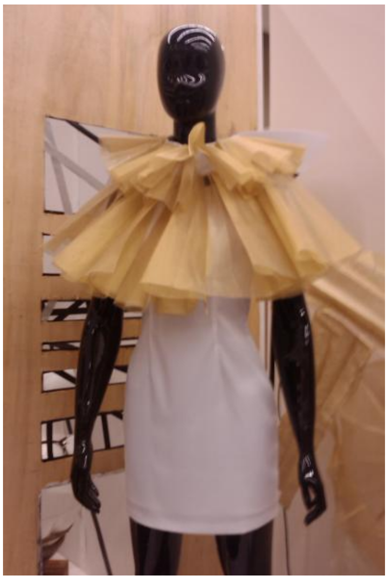


Fig. 5.5 The second outfit

On this outfit, two layers of pleated golden polyester organza were used to make a cape over shoulder. The first layer was composed by pleats of six inches lengthwise and three inches width at the edge. The second layer consisted of pleats in thirteen inches in length and three inches width at the edge. The opening was at center front with spring press buttons.

Again, the golden polyester organza was so rigid that the pleats were forced towards different directions, providing the cape a vivid character.

Fig. 5.6 The third outfit

This outfit consists of two items: a blazer and a pair of suit trousers. On this outfit, there were two parts of the blazer made of polyester organza: the lapel and the hem of the blazer. The exaggerated lapel was an accent of the blazer to show the rigidity and strength of polyester organza. Since polyester organza was very stiff, the silhouette of the blazer was clearly established. The width of the lapel was fourteen inches at center back, and was narrowed down along the collar. Each pleat on the lapel was three inches width. For the pleats at the hem of blazer, each pleat was six inches long and 3 inches wide at the edge.

5.3 Suggestions of Improvement

Though the results of shibori experiments were obtained quite successfully, there were number of ways that can improve the quality of the experiments in future.

Due to the limitation of resources, the fabric samples of the experiments were in small scale. Samples in small scale were for the ease of manipulation in experiments because they were easy to handle. However, heat-setting effects on small fabric made it harder to foresee the result if it is generated to large scale of fabrics.

All the preparation of samples before the experiments was done manually. Manual binding, wrapping or clamping allowed natural variation of heat-setting effects on samples. Yet, if identical heat-setting effects are done on larger fabrics, preparation by machines will be preferred.

Moreover, in the experiments, polyester, silk, nylon and a few kinds of blended fiber contents were studied. More kinds of fiber content can be studied to make the result more comprehensive. Fabrics structures such as organza, chiffon, plain-weaved and sateen were included in the experiments, but more types of fabric structures can be included in future if time and resource are allowed.

For the fashion collection, more variations can be tried to achieve different effects on garments. For example, apart from pleating, other kinds of shibori such as spider-web and wood-grain shibori can be tested on more parts of garments to see the three-dimensional effects from various aspects.

5.4 Conclusion

Nowadays, the works of shibori can be found in many parts of the world. Shibori in different places may be slightly difference due to the cultural influence, but it was believed that shibori was originated from Japan. Shibori is one of the oldest dyeing techniques in the history of Japan, but started to arouse the interests of fashion and textiles designers only since 1960s.

Shibori is a textile treatment consists of both dyeing and heat-setting technique. In the past, designers mainly focus on the dyeing methods and dyed patterns of shibori. Many dyeing methods of shibori were well-developed. There were a lot of systematic records of how different dyed patterns can be achieved through methods of shibori.

In recent years, the direction of the development of shibori has changed. Designers not only focus on the dyeing methods and dyed pattern of shibori, but also, more importantly, the permanent three-dimensional effects of shibori. Designers were no longer satisfied by the diversification of two-dimensional dyed patterns. They started to develop three-dimensional heat-set effects. Sculptural fabrics became an innovative and exciting criterion to explore. Designers, from Issey Miyake to those new ones introduced earlier in chapter three, they all

famous for their devotion to fashion and textile art pieces of shibori. Obviously, one of the biggest attractions of their works was the three-dimensional effect of shibori. Therefore, it is foreseeable that the development of heat-setting effects of shibori will continue to be a focus in fashion industry.

APPENDIX

More pictures showing the details of heat-set fabrics

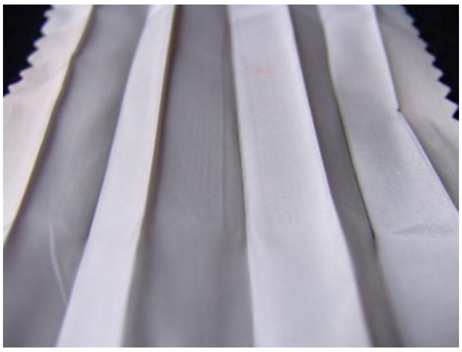
100% polyester chiffon in spiderweb shibori

100% polyester chiffon in wood-grain shibori

100% polyester gabardine in wood-grain shibori

100% polyester gabardine in board-clamping shibori

100% polyester organza in spiderweb shibori



100% plain-weaved polyester in board-clamping shibori

100% plain-weaved polyester in spiderweb shibori

100% polyester sateen in board-clamping shibori

100% polyester sateen in spiderweb shibori

100% polyester sateen in wood-grain shibori

100% Nylon chiffon in spiderweb shibori

100% Nylon sateen in spiderweb shibori

100% Nylon sateen in wood-grain shibori

50% polyester, 50% Nylon chiffon in spiderweb shibori

52% polyester, 35% silk, 13% spandex chiffon in spiderweb shibori

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