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Textile Dying and Printing

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Abstract

Dyeing Introduction Man has known colour since his creation. Nature has been like Art with an inexhaustible colour palette with beautiful compositions that inspire man to capture colour on cloths that adorn his body. Primitive man coloured the caves and smeared his body with pigments that he discovered. Ancient people extracted dye from roots, stems, leaves, fruits, berries, flowers, nuts, vegetables, minerals, animals and insects. Colour plays a vital role in Human life. Nature's colour changes with changing season.

Keywords: Dyeing; Synthetic dyes; Natural dyes; Animal dyes

Introduction

The colourful wall paintings of Ajanta during the first century AD(CE) and description of natural dyes in Atharvaveda provides evidence for the use of dyes in ancient period. People liked to colour everything they use, especially clothes. So they extracted colour from different natural sources such as plants, animals, insects and minerals and applied it on to fabric. The quest for new colours led to the discovery of synthetic dyes which later on became a full-fledged industry.Dyes are organic compounds with two components namely Chromophore, which imparts colour and Auxochrome that help in substantivity of dyes. They are classified into natural dyes and synthetic dyes [1].

Natural Dyes

Natural dyes are colour substances obtained from natural sources. Natural dyes are used for all types of textile dyeing and printing until the middle of nineteenth century. The use of natural dyes were reduced due to the advent of synthetic dyes, though they were economical and posses excellent fastness properties. However, the growing consumer awareness on the harmful impact of synthetic dyes, concern for environment worldwide and stringent environmental laws lead to the revival of natural dyes.

Advantages of natural dyes

- Natural dyes are extracted from natural sources and hence they are eco-friendly
- Produces soft and soothing colours
- These dyes provide excellent protection from UV rays
- Natural dyes like turmeric have anti-microbial properties and hence protect the fabrics and wearers from microbial attack
- Some natural dyes possess mosquito repellent and flame resistant property
- They can be obtained from the natural sources which are abundant in a particular area. Hence supply of raw materials will be continuous and transport charges will be lower

Disadvantages of natural dyes

- Natural dyes are difficult to store
- Dye extraction is a time consuming process
- Reproducibility of the same colour shade is difficult
- Impurities in natural dyes fades away the colour produced
- Availability of these dyes depends on the seasons
- Natural dyeing process is difficult to standardize

Classification of Natural Dyes

Natural dyes are classified in to three types based on the source of origin namely vegetable dyes, animal dyes and mineral dyes.

Vegetable dyes

The earliest dyes were of vegetable origin, discovered by accidentally staining garments with juices of fruits or plants [2]. Vegetable dyes are obtained from different parts of plants such as leaves, flowers, fruits, pods, bark etc. These vegetable dyes can be applied directly or with different mordants.

Indigo: Indigo (blue dye) is called as the king of all natural dyestuffs. It imparts blue colour. It is extracted from the leaves of the leguminous plant, Indigofera tinctoria. It is suitable for dyeing cotton and wool.

Indian madder: It produces shades of red on textile fabrics. It is used for dyeing cotton and woollen fabrics. It is extracted from roots of Rubia tinctoria.

Turmeric: It produces shades of yellow on fabrics. It is suitable for dyeing cotton, silk and wool. The yellow dye is extracted from the ground root (rhizome) of turmeric plant (Curcuma longa).

Marigold: It is extracted from lemon or orange coloured marigold (Calendula officinalis) flower. It is suitable for dyeing both silk and wool fibres.

Henna: The dye is extracted from the dried leaves of Henna plant, Lawsonia inermis. It produces yellowish orange colour. It is suitable for dyeing wool and silk fibres.

Tea: Leaves of tea plants (Camellia sinensis) or tea powder is used to extract dye. It produces different shades of brown.

Onion: The dye is extracted from the outer most skin or peel of the onion (Allium cepa). The onion skins if properly dried can be used for one year.

Animal dyes

Dyes extracted from certain insects and invertebrates are called as animal dyes. Various shades of red and purple were obtained from animal origin. Cochineal, Tyrian purple and Lac are the commonly used animal dyes.

Cochineal: Cochineal dye is extracted from the dried bodies of the female red bug (Dactylopius coccus). It produces crimson and scarlet colours with mordants aluminium and tin oxide. This dyestuff was mostly used for dyeing wool and silk. These dyes exhibit excellent fastness properties.

Tyrian purple: This dye is extracted from the sea snails found in Mediterranean Sea. The amount of dye produced was very limited and therefore very expensive. Hence, it is called Royal purple.

Lac dye: This dye is extracted from the fluid secreted by the lac insect (Lauifer lacca), which lives on the twigs of the banyan trees and other varieties. It produces crimson and scarlet colours. These dyes possess good fastness to light and washing. Animal dyes are also obtained from murex snail (purple colour) and Octopus/ Cuttle fish (Sepia brown).

Mineral dyes: Dyes extracted from mineral sources are called as mineral dyes. Most widely used mineral dyes are Iron, which produces yellowish brown shades, chrome yellow, prussian blue and manganese brown. The dyes obtained from mineral sources may be poisonous and hence are not being used commercially.

Synthetic dyes: Dyes that are produced chemically are called as synthetic dyes.

Dyeing methods

The art of dyeing dates back to pre-historic times. It is practised from ancient time and it is as old as human civilization. Dyeing is the process of imparting colour to the fibre/yarn or fabric by the application of dyes or pigments [3]. Colour is produced between the dye molecule and the fibre or fabric. The bond between dye molecule and fibre may be strong or weak depending on the dye used. Dyeing enhances the aesthetic look of the fabric. It is one of the surface ornamentation methods.

Stages of dyeing

Dyeing can be done at any stage of textile production process such as at fibre stage, yarn stage, fabric or finished product [4]. Dyeing at Fibre Stage The process of dyeing at fibre stage is called as fibre dyeing. It includes stock dyeing, top dyeing and dope dyeing. Stock Dyeing Fibres are dyed by the process of stock dyeing. In this method, dyeing is carried out in a large enclosed vessel called kiers. Fibres are placed loosely in perforated containers and kept inside the kiers. The dye liquor is circulated through the fibres at high temperature until the desired colour is obtained. Excess dye solution is removed after dyeing process. The dyed fibres are washed and dried.

Advantages

- Produces varied colour effects by blending different coloured fibres
- Large quantities of fibres can be dyed at one time
- Produces uniform colour
- Colour fastness ranges from good to excellent
- Dye easily penetrates the fibres and hence crocking is prevented.

Disadvantages

- Expensive and time consuming
- Fibre wastage if not consumed immediately
- Dyed fibres loses its flexibility and hence not readily spin as undyed fibre
- Cannot withstand rapid changes in fashion

Top Dyeing

Wool that has been combed to remove short fibres is called as top. Top is wound on perforated spools and dye solution is passed through it. Top dyeing method results in even dyeing.

Advantages

- Uniform dye uptake
- Dye penetrates into the fibre therefore good colour fastness Disadvantages
- Flexibility is reduced
- Time consuming Dope dyeing Manmade fibres such as polyester and polypropylene are dyed by this method. In this method, dye is mixed with the spinning solution before the filament is extruded through the spinneret.
- Dyeing is uniform
- Dyed textiles have good to excellent colour fastness to washing and light Disadvantages
- The strength of solution dyed filaments are slightly lesser
- Expensive method

Dyeing at yarn stage

The process of dyeing at yarn stage is called as yarn dyeing. Yarn dyeing is preferred to create interesting checks, stripes and plaids in the fabrics. Yarn dyed fabrics are deeper and richer in colour [5]. Fabric with dyed warp and undyed weft are example for chambrays. This includes techniques like skein dyeing, package dyeing, warp-beam dyeing and space dyeing.

Skein dyeing

In this method, the yarns are loosely wound in hanks or skein form. The hanks or skeins are hung on perforated rods and immersed in a dye bath. The dye solution is circulated in and out of the yarn to achieve an even shade. This method is commonly used for dyeing acrylic and wool yarns.

Advantages

- Loose arrangement of yarn permits excellent dye penetration
- Yarns retain softer feel Disadvantage
- Most expensive yarn dyeing method

Package Dyeing

Yarns are wound on cones, spools or similar units. These yarn packages are arranged on perforated rods in a rack and immersed in a tank. The dye solution is forced outside from the rods and forced back to the centre under pressure through the packages so that, the dye penetrates the entire yarn.

Advantages

- Dyeing capacity is higher (550 kg) when compared to skein dyeing (200 kg)
- Material to liquor ratio is less · Uniform dyeing Disadvantages
- Package dyed yarns do not retain softness and loftiness feel

Not suitable for high twist yarns which will not allow dye to penetrate Warp-Beam Dyeing This method is similar to package dyeing. In warp-beam dyeing, the yarn is wound onto a perforated warp beam and placed in a tank containing dye solution. Dyeing is

carried out under pressure for deeper and uniform penetration of dye [6]. This method is used for the manufacturing of denims, in which warp yarns are dyed with indigo and weft yarns are left undyed. Advantage Economical than other yarn dyeing methods Disadvantage May not produce high fashion fabric since warp yarn will be dyed in specific colour Space Dyeing In this method yarn is not completely dyed, but it is dyed at intervals. Space dyeing is done by two methods namely, Knit-de-knit meth.

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Synthetic dyes: Dyes that are produced chemically are called as synthetic dyes.

Printing

The art of printing fabric was known as early as 300 BC (BCE) Printing is the art of colouring the surface of any item. Tattooing of body is one of the most common printing of olden days. The impression of object dipped in dyes on fabric is the basic technique of printing. Textile printing is defined as the 'localized dyeing' or restricted form of dyeing a particular area of cloth or design. Dyes or pigments are applied to produce attractive patterns or designs with one or more colours. Printing is quicker and cheaper method of colouring fabrics. Generally a pigment or paste is needed to print textiles. Printing is carried by different methods namely block, screen, stencil

etc. Printing Paste in printing, dyes or pigments are applied in the gel form to prevent the flowing of print design during printing and subsequent drying. Dyes are thickened by mixing it with gums or starches. This thickened dye solution is called as print paste. Print paste is composed of dyestuff, thickener, hygroscopic agents and auxiliary chemicals. Thickeners are added to improve the viscosity and better penetration of the dyestuff into the fabric. The thickener used for print paste preparation may be natural like starch, gum Arabic or synthetic polymers like polyvinyl alcohol and polyacrylamide. Hygroscopic agents used for print paste preparation are water soluble substances like urea and glycerine. They help the dye to enter into the fibre structure for fixation. Auxilliary chemicals such as solvents improve dye solubility and colour yield. Additional chemicals may be added depending on the fibres and dyes. For example, citric acid may be added for acid dyes or alkali added for reactive dyes. Thickness and freshness of the printing paste are two important aspects to be considered for the quality and durability of printing.

Dyeing

- The process of imparting colour to the fabric is called dyeing.
- It is performed on fabric, yarn or fibre in wet condition.
- Half bleaching is enough for fabric preparation.
- Dyeing can be done on fibre, yarn and fabric.
- Colour is applied in the form of solution.
- For dyeing there is no design.
- Dyes are applied on both the sides of the fabric.
- Only one colour is generally used for dyeing
- In dyeing process, colour penetrates through the fibre or fabric.
- A particular temperature is maintained in the dyeing process.
- Thickener is not used.
- The density of dye solution is low.
- Generally after dyeing, steaming, and curing are not required.
- Dyed fabrics are soft to touch.
- Water consumption is high.
- Huge time is required for dye application.
- Liquor ratio is high.

Printing

- Pigments or dyes applied locally or discontinuously to produce different designs on the fabric is known as printing.
- It is performed on fabric in dry condition.
- Full-bleaching with optical whitener is essential.
- Printing is done on fabrics only.
- Colour is applied in form of thick paste.
- For printing there is a specific design.
- Dyes are applied on single side of the fabric.
- One or more colours are used in printing process.
- Colour is applied only on the surface.
- Carried out at room temperature.
- Thickener must be used.
- The density of dye solution is high.
- After printing, steaming and curing is must for fixing the dye to the fabric.
- Printed fabrics are harsh to touch.
- Water consumption is low.
- Less time is required for printing process.
- Liquor ratio is less.

Styles of printing

Fabrics can be printed in three different styles namely direct, discharge and resist styles.

Direct style of printing

The most common style of printing textile fabric is direct printing. In this method the dye is directly applied onto the fabric. Dyes are used in paste form. It is the simplest and oldest style of printing. It can be done on a white fabric or coloured fabric. The dye is imprinted on the fabric in paste form and any desired pattern may be produced. Dark colour prints in lighter background is the characteristic feature of direct style printing. In this style of printing, the printing paste is transferred to the selected areas of the fabric and the pigments adhere to the fabric surface. Direct style of printing is used in block printing, screen printing or roller printing methods.

Discharge style of printing

In this method, the fabric is printed on a dyed fabric. The printing paste used in this method contains a discharging agent, which will bleach or destroy the colour from the dyed fabric in the printed areas. The resulting white area is brighten the overall design. Sometimes the base colour is removed and another colour is printed in its place. The discharging agent is an oxidizing or reducing agent capable of discharging colours by oxidation and reduction. Potassium chlorate or sodium chlorate (oxidizing agents) and stannous chloride (reducing agent) are commonly used discharging agents. The effects produced are very striking as the white area obtained brightens the overall design. This style of printing enabled intricate and fine designs to be printed on the fabric. If the fabric is not thoroughly washed after printing, the strength of the fabric may be affected due to the use of discharging agents. The advantages of discharge style of printing produces light, bright colour on a dark background, printing is sharp and fine and easier to work. However the major disadvantages of this method is the cost involved.

The resist style

In this method, the bleached fabric is first printed with a substance like wax, rice paste, china clay or chemicals such as acids, alkalis and salts that resist dye penetration and fixation. The printed fabric is then dipped in cold dye bath, so that the resisting agent remains unaffected and only the areas free of the resist agent are coloured. After dyeing process, the resist paste is removed, leaving white or light coloured patterns on a dark background. Batik, tie and dye are examples of resist printing. The durability of the fabric is not affected by the resist method.

Methods of Printing

Block printing

Block printing is the ancient method of printing designs on the textile material by hand. It is the simplest of the printing methods. In this method, the desired design is carved on a wooden or metal block. The fabric is pinned on a table which is firm, strong and withstands the pressure of printing. The top is made of metal with a resilient surface made of artificial leather. The wooden block is stamped in the print paste or applied on the surface of the block. The block is stamped firmly on the selected part of the fabric. This process is repeated to

print the required length of fabric. Multi coloured designs require separate blocks for each colour. Block printing is done mainly in decorative pieces or in expensive linens for upholstery purposes. Advantages simplest method of printing handmade art no special printing equipment required disadvantages · tedious and time consuming process expensive irregular colour shade overall production is low carving of blocks is difficult and laborious.

Roller printing

It is a machine printing method, in which designs are printed on textile fabric by engraved rollers. This method of printing produces over 4000 yards of printed fabric per hour. The cylinder is made up of cast iron which acts as a printing table. The cylinder is covered with many layers of special fabric which has linen in warp and wool in weft for providing resiliency. It is covered with a layer of woollen blanket which provides the perfect surface for printing. The woollen blanket is covered with unbleached cotton cloth which will absorb excess dye. The last layer is the fabric which is to be printed. The design is transferred onto the cloth by engraved copper rollers. The design roller is arranged in such a way that the paste is applied on the roller and then transferred to the cloth. Number of engraved rollers rotate in contact with larger cylinder in rotation. The cloth is printed at the rate of 1000 to 4000 yards per hour. There are series of rollers each imprinting a different colour on the fabric. The sizes of the engraved cylinders depend on the pattern to be printed. There are different ways of engraving the roller such as hand engraving, machine or mill engraving and photographic engraving. The design roller rotates against the cloth and the design is imprinted. The fabric moves on to the second roller where the second colour is printed. The doctor blade placed in contact with design roller scrapes the excess dye from the surface of the design roller. The printed cloth is dried and then steamed to set the dye advantages superior to other methods for the production of fine and precise designs production is faster and accurate all colours required to print can be achieved in one process itself versatile in colours, pattern and scale disadvantages required skilled labour laborious process production cost is more for printing in small quantities creation of engraved rollers is expensive time consuming process if rollers are not aligned properly, it results in one or more colours falling out of position.

Stencil printing

In stencil printing, the design is first traced on the cardboard, wood, metal or plastic sheets with marker pens or pencils. Using scissors, knife or sharp blade the design is cut out. The uncut portion represents the part that is to be left uncoloured. When cutting the stencil care must be taken that small patterns must be cut through first. If large patterns are cut over or keeping small pattern inside then the smaller designs would be cut away with it. The stencil is placed on the fabric to be printed and the printing paste is applied with stencil brush through its interstices. When printing is repeated, care must be taken that the stencil on face side does not take up dye. Other colours can be applied on the design when the first colour dries. This method is suitable for both fine delicate design and large space design. Low budget investment · Exclusive designs and intricacy Unevenness on printing table leads to uneven printing

Screen printing

In this printing method, fabric is spread on large table and design screen is placed on the fabric. The screen consists of wooden frame covered with nylon or silk cloth and the technique is called as silk screen printing. Lacquer is applied on the screen to make the areas except design opaque so that printing paste is transferred through the design only. Based on the number of colours, many numbers of screens are prepared to complete the design. The printed portion should be allowed to dry before screen Printing In this printing method, fabric is spread on large table and design screen is placed on the fabric. The screen consists of wooden frame covered with nylon or silk cloth and the technique is called as silk screen printing. Lacquer is applied on the screen to make the areas except design opaque so that printing paste is transferred through the design only. Based on the number of colours, many numbers of screens are prepared to complete the design. The printed portion should be allowed to dry before placing the second screen. When screens are placed properly, they will produce a complete design. Whole width of fabric is printed at once and so the process is faster than block printing screens can be preserved for future use preparation of screen is a time consuming process preservation of screen needs extra care a small damage in the screen will spoil the entire printing The design is created by painting or making non-design portions of the screen opaque, thus preventing the print paste from passing through. The areas where the print paste passes through will create a printed pattern. The screen is placed in contact with the fabric to be printed and the print paste is forced through the screen by a squeegee. The squeegee is used to spread the dye evenly through the screen. It is moved across the screen, forcing the print paste through the mesh openings. It helps in making a clean image on the printed surface. A screen is prepared for each colour of the design. There are two types of screen printing namely Flat screen printing and Rotary screen printing.

Flat screen printing or hand screen

Printing It is done by hand. The design is copied onto a series of very fine, flat screens, one for each colour to be printed. Lacquer or other impermeable substance is applied to all parts of the screen that are not part of its design. Each screen is fitted onto a wooden or metal frame. The fabric to be printed is spread onto a long table. A screen is set over the fabric and the printing paste is poured on the screen and forced through its unblocked areas onto the fabric with a squeegee. The screen is then moved to the next section of the fabric and the operation is repeated until the entire fabric is printed. This process is repeated for each colour of the design. Hand screen printing is time-consuming and limited to short length of fabrics.

Automatic flat screen printing

In this method, the process is automated and therefore faster. Here the fabric moves on a wide rubberized belt. The screens are placed above the belt. As the fabric moves, the screens are automatically lowered to the cloth and the appropriate colour is applied with automatically regulated squeegees. The cloth is dried in an oven. Advantages prints upto twenty colours in one run high production rate produce brighter and cleaner shades produces designs consisting of squares, circles and ovals Disadvantage was an high cost

Rotary screen printing

This method of printing is done using machine. The fabric to be printed is moved on a wide rubber belt under the rotary screen cylinders. It is the fastest method of screen printing, with a production of more than 3500 yards per hour. A squeegee in each rotary screen forces the paste through the screen onto the fabric. The cloth is then

passed into a drying oven to set the colour and washed. Faster method of printing. Rotary metal screens are light weight in contrast to there heavy copper rollers and hence they cost less. Operates continuously Production output is higher

Transfer printing

Transfer printing means shifting of a design from one surface to another. In this method, designs made of pigments in paraffin or thermoplastic base can be transferred by heat and pressure to the fabric surface. The fabrics printed by this method become stiff and they are not fast to washing and light. A more effective and easier method of transferring the design intact from paper to fabric is by vaporizing the pigments in the design. Vaporizing can be done by dry heat transfer and wet heat transfer. Disperse dyes are the only dyes which can be sublimated and used for heat transfer printing. Hence transfer printing is suitable for fabrics which have affinity to disperse dyes. Polyester, nylon and acrylics can be printed by this method. The fabric to be printed is passed through a heat transfer printing machine which brings paper and fabric together and passes them through the machine at about 204°C. Under high temperature, the dye on the printed paper sublimates and is transferred onto the fabric. Production cost is low because there is no requirement of post printing treatments. There is no was after Treatment Processes of Printed Fabrics After printing, the fabrics are dried to retain the printed design. It is an essential step to avoid staining of unprinted areas. It prevents bleeding of print paste from the design areas. Drying is followed by steaming which transfer the pigment from print paste to the fabric.

Steaming

In ageing or steaming process, the dyes and chemicals present superficially on the surface of the fabric is transferred into the fabric. The dried printed fabric has pigments or dyes, thickeners such as starch, gum etc. and printing auxiliaries on its surface. Steaming enhances the absorption of dyes or pigments on the fabric. In steaming or ageing, the dried printed fabric is exposed to steam at atmospheric or higher pressure for different time intervals. Steaming can be carried out continuously or batch-wise. When the printed fabric enters the steam chamber, steam condenses to form water molecules which are absorbed by the thickener present in the printed fabric. The water absorbed by the thickener dissolves the dyes or pigments and hence increases the rate of absorption of pigment from thickeners to the fabric. As soon as steaming is done the fabric has to be dried.

Washing off

The printed fabric after undergoing steaming process contains exhausted thickeners and some printing auxiliaries. If the thickeners used are temporary thickeners, they are removed by washing. Washing is done using cold water. Fabrics are washed with neutral soaps to avoid bleed in water. Rinsing removes the print paste chemicals and unfixed dye molecules. For vat dyed printed fabric, oxidation is carried out first followed by soaping. Defines the print or desig prevents loss of colour avoids spreading of colour beyond the design boundary. Expensive process because it requires steam and floor space · Chances of spoiling the printed fabric due to power cuts etc.

Literature Review

The importance of clothing and fashion were changed significantly by the Great War. The flowing lines and tight skirts of the Edwardian era slowly vanished making way for clothes that were more practical to wear Women's fashion from 1914 onwards. The outbreak of war changed the roles of women in society leading to the need for a different kind of fashion. As their men left to fight on the front, women took over their jobs in the munitions factories, offices and farms as well as taking on work as nurses and drivers. Many of them even joined the militia. Fashion itself took on a more structured military look with jobs often requiring a uniform or trousers. Dresses were simplified and skirts shortened to make them more practical to wear. Around this time in France, designer Coco Chanel was influenced by this trend towards looser fitted clothes. This was also the period in which she introduced the colour black as a timeless classic. Her designs, often inspired by men's clothes, were simple and comfortable to wear, which made them very popular during the First World War. Men's clothes adapted to the environment of war. Constant improvements were made for the practicality of life in the trenches. The variety of World War I uniforms highlight how many different nations were involved in the war effort. French troops, for example, were dressed in blue coats and red trousers at first (they changed to blue trousers at a later point), whilst British soldiers wore khaki coloured trousers and shorter jackets. During WWI clothing styles changed greatly. Designs became simpler and the boundaries between gender based fashion started to blur. During the 1920s the length of a skirt's hem became, for the first time, a serious fashion question. While the clothes of 1920-1921 were still calf length, and (around 1923) even ankle length for a short time, after 1924 women favored skirts that hardly covered the knee. In 1922-1923, fashion was influenced by the discovery of the grave of the Egyptian pharaoh Tutankhamen. Anyone who could afford it, bought a djellaba for a house dress or had their evening dresses decorated with Egyptian ornaments. Otherwise, loose-hanging dresses were characteristic for the time. Mostly they had drop waists and sometimes a pleated hem or godet folds which provided freedom of movement. Daytime clothes had high closings, dressed up with baby-doll or men's collars. Evening clothes and elaborate society toilettes corresponded in cut to daytime clothes. Evening clothes, however, featured generous front and back décolletage, the front décolletage underlayed with a flesh-colored slip. It was not modern to show one's bosom, and breasts were pressed flat with fabric bands. The simple cut of the evening dress was compensated for by expensive fabrics of lace, gold or silver lamé, loose hanging pearl necklaces, the use of monkey-fur fringe, and extensive embroidery. In 1927, the tendency to lengthen the evening gown's hem set in and the waist returned to its natural place. By 1928 the evening gown was already calf length, while the daytime dress remained knee length until about 1930. In haute couture, Gabrielle Chanel made her reputation with dresses, jersey suits, and knit jumpers. In 1926 she announced the "little black dress," a black evening dress impressive for its simple elegance. Like Chanel, Jean Patou favored clear lines and extremely simple elegance, beginning with his own collection for the United States. Jeanne Lanvin, in contrast, presented a decidedly feminine, romantic line. Her robes de style (based on historical styles), with their wide paniers, became world famous. Lanvin was also known for her mother-child creations. Short skirts brought the legs, and thereby rayon stockings, into the picture. Bobs and page-boy haircuts were as typical of the time as were simple, form-fitting toques and cloche hats. Sports became a fashion trend: tennis in a short skirt without stockings, skiing in a Norwegian suit with long knickers, swimming in a one-piece bathing suit without whale-bone reinforcements. The 1920s metropolitan fashion spectrum included the garçonne (female boy) in a pants suit with man's hat and even an Eton crop. In the evenings, the gamin style

featured a smoking (tuxedo jacket), or complete smoking suit, and a monocle. And the garçonne also appropriated men's pajamas for household and nighttime wear.

Conclusion

The Exposition International des Arts Décoratifs et Industrials Moderne, held in Paris in 1925, was an epoch making event which later gave the name Art Deco to the period. Among the seventy-two fashion designers, Sonia Delauney created the biggest sensation with her suits and coats in patterns of "simultaneous color contrast." After 1924, men's suits had a slightly tapered waist, and the trousers widened slightly. Dandys were recognizable by their extremely broad trousers, known as "Oxford bags," and by their exaggeratedly pointed winkle pickers or shimmy shoes. For golf, hiking, or hunting, men wore Norfolk jackets and plus fours.

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