



TRINITY COLLEGE FOR WOMEN NAMAKKAL

DEPARTMENT OF COSTUME DESIGN & FASHION

**DYEING AND PRINTING
ODD SEMESTER**

Presented by

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INTRODUCTION

- A dye is a colored substance that chemically bonds to the substrate to which it is being applied.
- A dyeing process is the interaction between a dye and a fiber, as well as the movement of dye into the internal part of the fiber.
- This distinguishes dyes from pigments which do not chemically bind to the material they color.
- Dye is generally applied in an aqueous solution, and may require a mordant to improve the fastness of the dye on the fiber.
- Generally, a dyeing process involves
 - Adsorption (transfer of dyes from the aqueous solution onto the fiber surface)
 - Diffusion (dyes diffused into the fiber)



CLASSIFICATION OF DYEING:

- 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**.



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.
- **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. 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
- INDIAN MADDER
- TURMERIC
- MARIGOLD
- HENNA
- TEA
- ONION



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
- Lac



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.

| | | |
|-----------------|--|--|
| Iron |  |  |
| Prussian blue |  |  |
| Chrome yellow |  |  |
| Manganese brown |  |  |

Synthetic Dyes

- Dyes that are produced chemically are called as synthetic dyes. These are classified based on the chemical composition of the dye.



Direct Dyes

- When a dye colours the fabric directly without the help of any fixing agent, the dye is said to be a direct dye.
- Direct dyes are water soluble.
- They are easy to produce, simple to apply and cheap in cost of production and application.
- Direct dyes are anionic in nature and have greater affinity for cellulosic fibres.
- They are used to dye cellulose fibres without a mordant in bright shades and they produce a wide range of colours.
- A levelling agent such as sodium carbonate is added for even dyeing.
- At the end of dyeing, exhaustion agent such as salt (NaCl) is added which helps the dye to leave the liquor and get attached to the fibre.
- Some direct dyes are used to dye wool, silk and nylon.
- Direct dyes can be applied to wide variety of textile materials such as apparel, upholstery fabrics, draperies, linings and automotive fabrics. Most direct dyes have good fastness to light but poor wash fastness.



Reactive Dyes

- Dyes that react with the fibres and form covalent bonds are called as reactive dyes.
- They become an integral part of the fibre.
- They are water soluble and are used to dye cellulose, protein and polyamide fibres.
- They produce full range of bright shade across the spectrum.
- They exhibit excellent wash fastness and good light fastness properties.
- Dyeing of fibre with reactive dyes involves 3 steps, namely exhaustion of dye (NaCl or Glauber's salt), fixation of dye (sodium carbonate or sodium hydroxide) and washing off.



Basic Dyes

- Basic dyes have cationic or basic groups (positively charged) and hence they are also known as cationic dyes.
- Basic dyes react with the acidic groups present in the fibres and form electrovalent bonds.
- Basic dyes are soluble in alcohol but not easily soluble in water.
- Basic dyes exhibit brilliant shades of colour which is not shown by other dye classes.
- Basic dyes are suitable for dyeing wool, silk and acrylic, but they have no affinity towards cellulosic fabrics.
- Basic dyes are used along with a mordant for fibres such as cotton, linen, acetate, nylon and polyester.
- Basic dyes show moderate light and wash fastness.
- For dye preparation, the dyestuff is mixed with equal amount of acetic acid followed by warm water under constant stirring.



Acid Dyes

- Water soluble dyes that require acid (sulphuric, acetic, formic acid etc.,) in dye bath to dye silk or wool are called as acid dyes.
- These acid dyes are mostly sodium salts of organic acids.
- When dissolved in water, acid dyes produce negative ions (anions or acidic groups) which react with positive ions of protein fibres and get attached to the fibre through electrovalent bonds.
- Acid dyes are similar to direct dyes however they cannot be applied to cellulosic fibre due to slight variations in structure.
- Acid dyes have greater affinity for protein and polyamide fibres.
- They possess very good fastness to washing and good fastness to light.
- A large colour range is available with acid dyes.
- They are inexpensive.



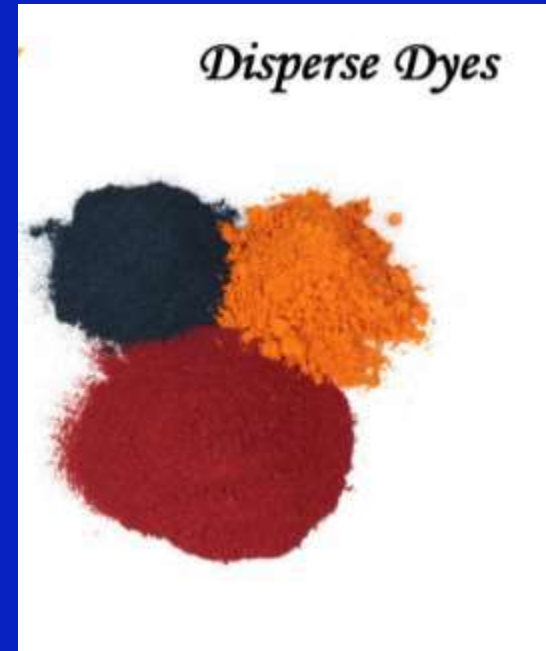
Mordant or Chrome Dyes

- Natural dyes and some synthetic dyes do not have affinity towards fibres.
- With the help of some chemicals, they can be used to dye fibres.
- These chemicals are called mordants or mordant dyes.
- Mordant dyes have affinity for both fibre and dye and form a linkage between the dye molecule and the fibre.



Disperse Dyes

- Disperse dyes are insoluble in water.
- Their solubility is increased by increasing temperature and by adding dispersing agents.
- They are suitable for dyeing hydrophobic fibres like nylon, polyester, acrylic and other synthetic fibres.
- Disperse dyes are non -ionic or neutral in nature.
- They have an excellent fastness to washing and sunlight exposure.



Vat Dyes

- These dyes were initially fermented in a large wooden vessel known as vats and hence the name “vat dyes”.
- They are insoluble in water but soluble in alkali.
- Vat dyes are accepted into the fibre in a reduced or vatted form.
- When it is re-oxidized, it is then fixed to the fibre firmly.
- The dyes are treated with a reducing agent that converts them into leuco compounds, which is soluble in alkalis.
- The process of making the dyes soluble is known as Vatting.
- The leuco compounds are either colourless or exhibit a colour that is different from the colour of final product, which is achieved after oxidation.
- Once the dye is attached to the fibre, it gets oxidised and changed into an insoluble colour product that gets trapped inside the fibre.
- Indigo, an example of vat dyes has been used in India for long periods.



Sulphur Dyes

- Presence of sulphur is the characteristic feature of sulphur dyes.
- Like vat dyes, sulphur dyes are water insoluble and made soluble by the addition of reducing agents and alkali as solubiliser.
- They are converted into soluble leuco compounds by using sodium sulphide or sodium hydrosulphite as reducing agent.
- The leuco compounds have high affinity for cellulosic fibres.
- After dyeing the fabric, the dye is converted into insoluble form by the addition of potassium dichromate and acetic acid.
- Sulphur dyes do not produce brighter shades.
- They are cheap and produce colours like navy blue, black, khaki and olive green.
- They are used for black more than any other colours.
- They have excellent wash fastness property.
- The fabric loses its softness after dyeing with sulphur dyes.



The background is a solid blue color. In the top-right and bottom-left corners, there is a decorative grid pattern that curves inward, creating a sense of depth and perspective.

THANK YOU