

CHAPTER 5

Natural and Synthetic Dyes

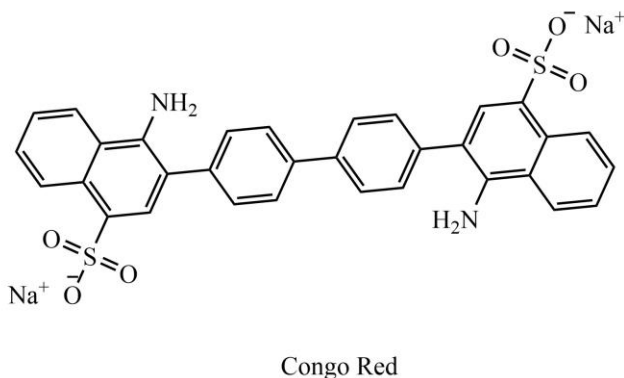
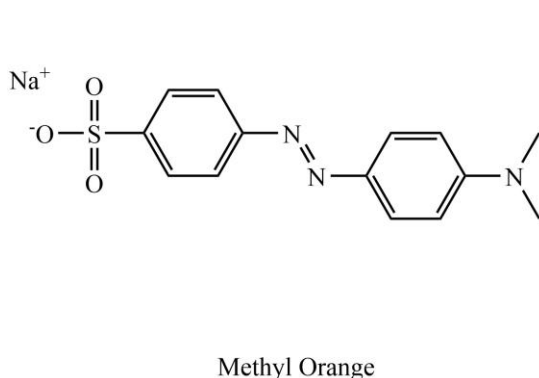
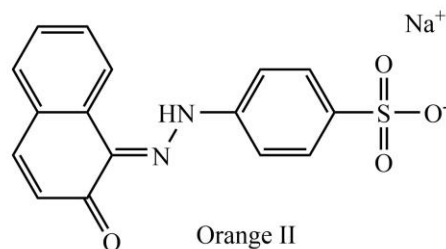
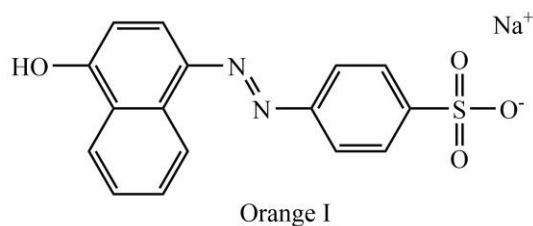
❖ Various Classes of Synthetic Dyes Including Heterocyclic Dyes

A dye may simply be defined as a colored compound that binds chemically or physically to the substrate to which it is applied; and depending upon the type of source, they are classified as synthetic or natural. In this section, we will further classify the synthetic dyes (azo and non-azo types) based upon their method of application.

➤ Acid Dyes

An acid dye may simply be defined as the sodium salt of azo dyes which contains carboxylic or sulphonic acid.

These types of dyes are applied to fiber from their acid solution and are typically employed to color wool, nylon, polyurethane, and silk. Acid dyes have a greater affinity for nylon which is obviously due to the presence of more free amino groups in polycaprolactam. These types of dyes cannot be applied to cotton due to little to no affection. Some of the typical examples of acid dyes are orange-I, orange-II, congo red, and methyl orange.

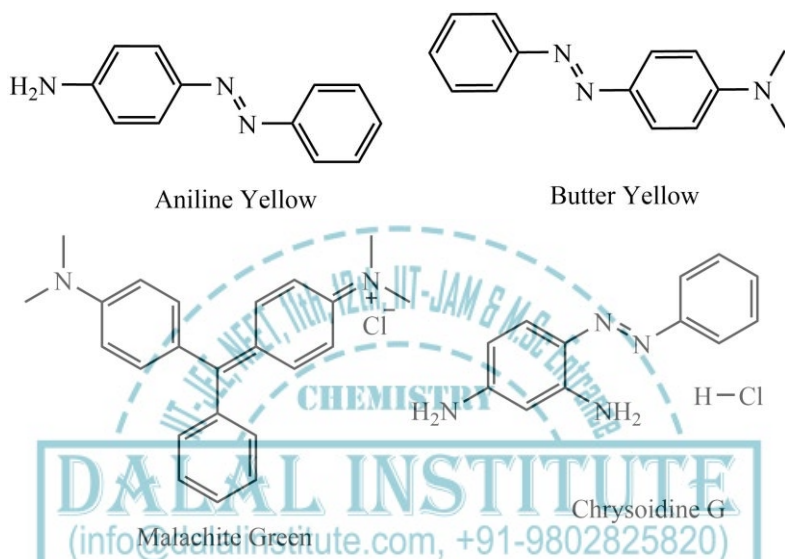


It is also worthy to note that besides dyeing the fabric, some special acid dyes are also used as food colorants, to stain organelles in the medical field.

➤ Basic Dyes

A basic dye may simply be defined as the salt of colored bases which contains amino groups as auxochromes.

The amino groups of basic dyes generate water-soluble cations; which in turn, can bind with the anionic sites on the fabric used. These dyes can be used to color modifies nylons and polyesters. Some of the typical examples of basic dyes are aniline yellow, butter yellow, chrysoidine G, and malachite green.

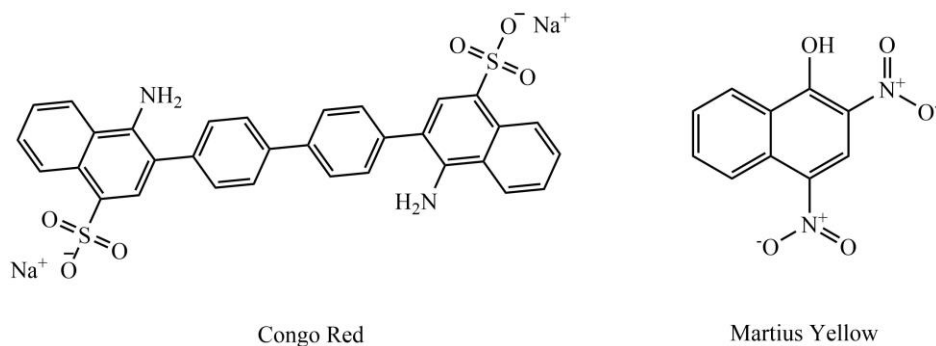


It is also worthy to note that besides dyeing the fabric, some special basic dyes are also used as paper colorants in the paper industry.

➤ Direct Dyes

A direct dye may simply be defined as the dye which can be applied to the fabric directly from its aqueous solution.

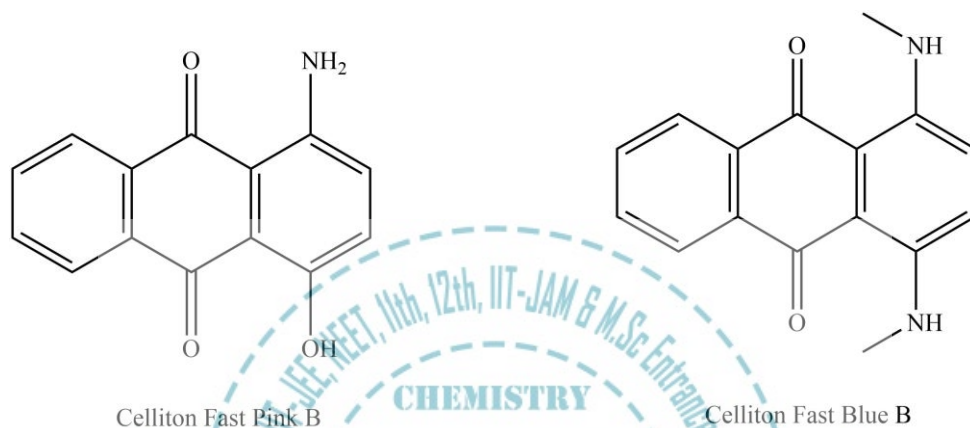
These dyes are water-soluble and appropriate for the fabrics that can bind to the dye molecule via hydrogen bonding. Direct dyes are primarily used to color nylon, silk, rayon, cotton, and wool. Some of the typical examples of direct dyes are martius yellow and congo red.



➤ **Disperse Dyes**

A disperse dye may simply be defined as the dye which can be applied to the fabric in the form of dispersion dye material in a soap solution stabilized by benzoic acid, cresol, or phenol.

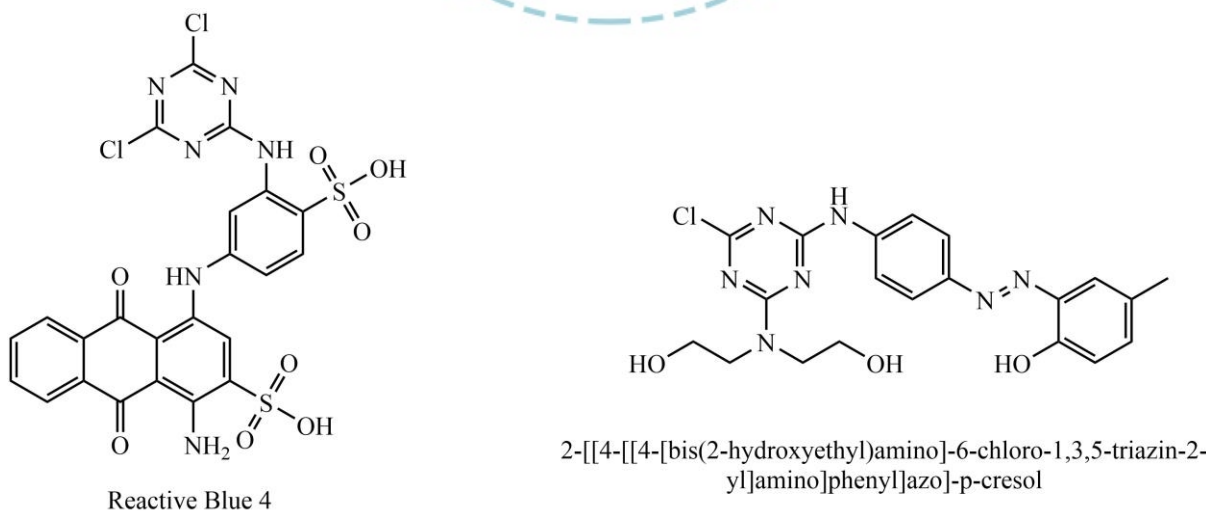
These dyes are water-insoluble (correspond to the anthraquinone class) and are appropriate for the synthetic polyamide fibers. Some of the typical examples of disperse dyes are celliton fast pink B and celliton fast blue B.



➤ **Reactive Dyes**

A reactive dye may simply be defined as the dye that has reactive groups capable of binding with the amino or hydroxyl groups of the fiber.

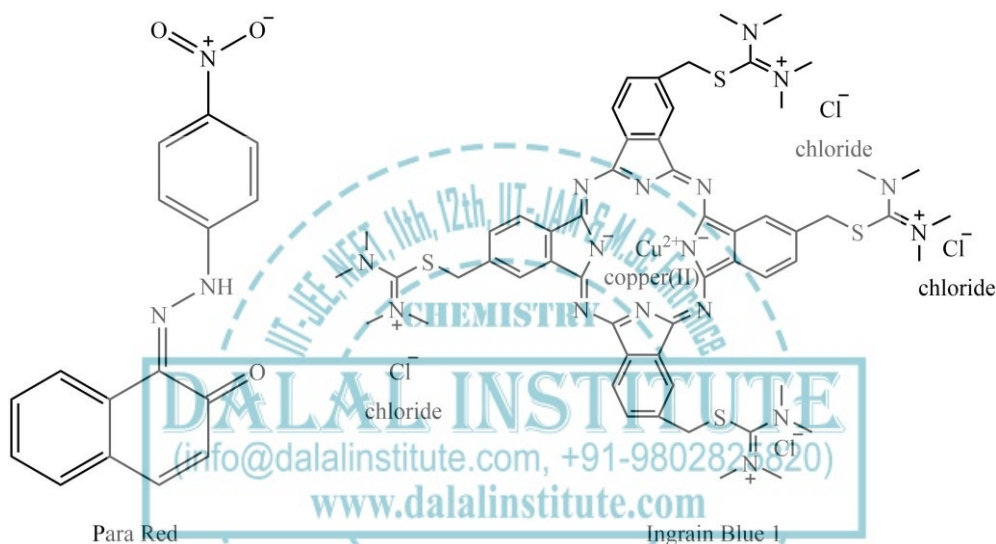
These dyes bind very strongly with the fiber which can be attributed to the chemical nature of the bonding interaction. These dyes are primarily used to color wool, silk, and cotton. Some of the typical examples of disperse dyes are reactive blue 4 and 2-[[4-[[4-[bis(2-hydroxyethyl)amino]-6-chloro-1,3,5-triazin-2-yl]amino]phenyl]azo]-p-cresol.



➤ Ingrain Dyes

An ingrain dye may simply be defined as the dye that is produced within the fiber from chemical precursors and binds itself by an irreversible chemical change in such a way that fastness is improved upon the dyeing.

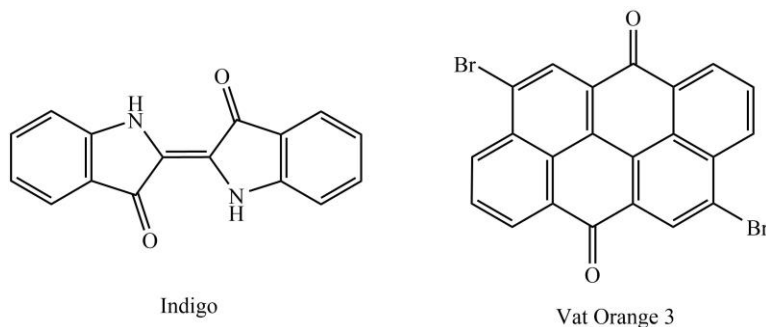
These dyes are created by the coupling of the diazonium salt with naphthols, phenols, aminophenols, or arylamines on the fiber's surface. Ingrain dyes are not considered as fast because the dye molecules bind to the fiber via adsorption. These dyes are primarily used to color nylon, silk, polyester, leather, polypropylene, polyacrylonitriles, polyurethanes, and cellulose. Examples of ingrain dyes are para red and Ingrain blue 1.



➤ Vat Dyes

A vat dye may simply be defined as the dye that is applied in its reduced form to the fabric in a bucket or vat with a reducing agent like sodium hydrosulfite's alkaline solution.

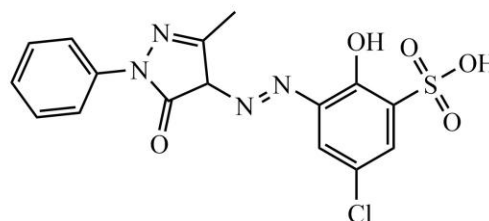
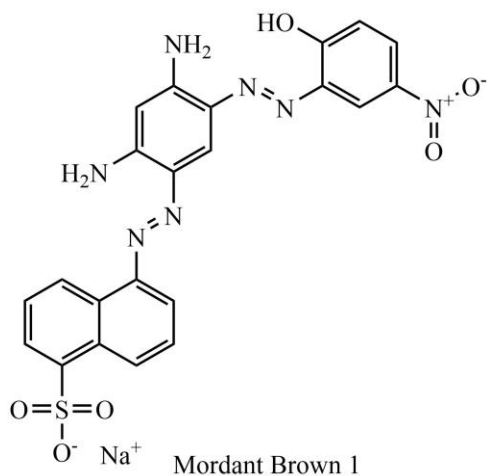
These dyes are water-insoluble and cannot be applied directly to the fiber. However, their reduced form (generally colorless) becomes soluble in water and does have an affinity for cellulose fiber. Owing to this special feature, vat dyes are primarily used to color cotton cloths. Some of the typical examples of vat dyes are indigo (also a naturally occurring dye) and vat orange 3.



➤ **Mordant Dyes**

A mordant dye may simply be defined as the dye that is applied to the fabric via some mordant acting as a binding agent between the fiber and dye.

Tannic acid and metal ions are used as mordant basic and acid dyes, respectively. The fabric is first soaked in the mordant provider and then the dye is applied. These dyes are primarily used to color wool. Two of the typical examples of mordant dyes are mordant brown 1 and mordant red 19.



Mordant Red 19

It is also worthy to note that mordants not only increase the fastness of the dye but can also change the color of both the dye-plus-mordant solution and influence the shade of the overall product.

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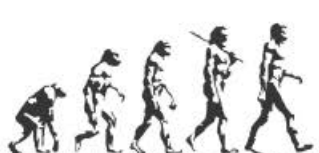
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Volume I

MANDEEP DALAL



First Edition

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