**Synthetic Dyes:**

Synthetic dyes are man- made dyes that come from chemical resources, rather than of natural origin.

**History of synthetic Dyes:**

* The first synthetic dye, picric acid, was prepared in 1771 by British chemist Peter Woulfe from the extraction of the natural plant pigment, indigo, treated with nitric acid. Initially used for silk in 1849.
* The first human- made (synthetic) organic dye; mauveine (Mauveine, also known as aniline purple and Perkin’s mauve) was discovered serendipitously by William Henry Perkin in 1856. It was the first mass-produced dye, that was commercially available and the idea was born a color could be made in the factory.
* Many thousands of synthetic dyes have since been prepared. There are over 10,000 dyes.

**Fast Dyes:**

The term a “fast dyes”, implies that the color of dye material will not fade when exposed to light and atmospheric conditions, to another that it is not impoverished by washing with soap and water.

**Fugitive Dyes:**

Fugitive dyes loses it coloring during proper up usage. Some fugitive dyes fade away completely, while others change color, for example, a bright blue fugitive dye might fade to a light tan. Black is also fugitive dye.

**Types of Synthetic Dyes:**

There are many types of synthetic dye due to their chemical reaction:

**Basic Dyes:**

This type of dye is just fair when it comes to fastness to light and to washing, however this type can create a brilliant color. It is mainly used on natural and acrylic fibers; it is also sometimes used for wool and silk. This dye is also used to color paper. **Acetic acid** is usually added to the dye bath to help in the quick penetration of the dye onto the fiber.

**Acid Dyes:**

Acid dyes are used for dyeing silk, wool, nylon, paper, synthetic fibers, leather and the acid used in the dye-bath is often vinegar (acetic acid) or citric acid. Acid dyes are highly water soluble, and have better light fastness. They have ionic interactions. The colors are beautiful, pure, and transparent.

**Direct Dyes:**

Direct dyes or substantive dyeing are perhaps the most widely used and most economical of all classes. Some of the pastels and light shades possess good wash and light fastness but medium and heavy colors, particularly the latter, are not recommended. Direct dyes are commonly used on cotton fibers. The color of direct dyes on cotton fibers is not bright in respect to other dyes. The wash fastness of these is not very good. The only advantage of these dyes is that the light fastness is little better. Light fastness means the resistant capacity against fading in light. But, this is also in few cases only. One more benefit of using direct dyes is that these can be used in the same dye bath with the acid dyes. Many direct dyes are bland and dull in color. Direct dyes provide duller color than the color provided by the fiber reactive dyes. The main reason why direct dyes are used is because of cost. Although the widely available all- purpose dyes which contain a mixture of direct and acid dyes are very expensive, per pound of fabric to be dyed, direct dyes sold alone and purchased in bulk are among the cheapest of all dyes. Direct dyes are used on cotton, paper, leather, wool, silk and nylon.

**Chrome or Mordant Dyes:**

Mordant dyes require a mordant, which improves the fastness of the dye against water, light and perspiration. Most natural dyes are mordant dyes. The most important mordant dyes are the synthetic mordant dyes, or chrome dyes, used for wool, and are especially useful for black and navy shades. Chrome is a modern mordant. It is excellent for wool and is easy to use and very effective in its action. Its great advantage is that it leaves the wool soft to the touch, whereas the other mordant are apt to harden the wool. The disadvantage is that chrome is considered an environmentally toxic mordant and must be disposed of properly. For this reason, many natural dyers choose not to use chrome. The mordant, potassium dichromate, is applied as an after-treatment. It can be hazardous to health and extreme care must be taken in using them. Modern mordant are dichromate and chromium complex that’s why called chrome dye.

**Disperse or Acetate Dyes:**

Their main use is to dye synthetic i.e. polyester but they can also be used to dye nylon, cellulose triacetate, and acrylic fibers. Their fastness properties vary with the dye, color and fiber on which they are used; on acrylics their fastness properties are generally inferior to basic dyes or acid dyes. Disperse dyes are applied by procedure similar to direct dyes but with different controls depending on the fiber to which they are applied.

**Reactive or Fiber- Reactive Dyes:**

A dye which attaches to the fiber by forming a covalent bond also called fiber reactive dye. These dyes are known for their bright colors, very good to excellent light fastness and wash fastness. It may be more expensive than other dye families suitable for same fibers, especially when very dark or dull colors are considered. Reactive dyes of the same family can generally be mixed to produce a very wide range of colors. Apart from cost, the biggest commercial drawbacks to reactive dyes are that they require large amounts of electrolyte (salt) in most processes, extensive rinsing and hot washing after dyeing to remove unfixed and hydrolyzed dye. It is by far the best choice for dyeing cotton and other cellulose fibers. No wonder you can safely wash a garment that has been dyed in bright fiber reactive colors with white clothing, a hundred times, without endangering the whites in the least-even if it is all different bright colors, or even solid black

**Sulphur Dyes:**

Sulfur dyes are relatively inexpensive. They are insoluble in water. They are applied to the fiber in a reduced state and oxidized within the fiber to an insoluble dye again. Shades in sulfur dyes are dull; therefore these dyes are used chiefly for black. The possess low cost, good wash fastness and light fastness and are satisfactory for dry crocking. They should be classed as poor for wet crocking and chlorine fastness. Sulfur dyes find limited use with polyamide fibers, silk, leather, paper and wood.

**Vat Dyes:**

Vat dyes are colored organic compounds that do not dissolve in water. They need vetting for application and oxidation for final color development. Vat dyes can be reduced chemically to form colorless, water-soluble derivate. Upon exposure to air the colorless form of a vat dye is oxidized back to the colored form. Vat dyes are introduced to the fabric in their colorless reduced form then “developed” by exposing the fabric with the ingrained dye to air. The most famous vat dye is indigo, which is used to dye blue jeans. Vat dyes have excellent wash and light fastness. Vat dye is also applicable for cellulosic fibers. It can produced wide range of color especially for blue and green color. It is expensive dye compared to other dyes. It applied in all alkaline condition and for high quality items.

**Parameters in Choosing Synthetic Dyes:**

The following parameters can serve as a guideline for synthetic dyes:

Boiling

Perspiration

Fading

Machine wash ability

Dry cleaning

Hot pressing

Steam pressing

Salt water

Gas fume fading (from oil heaters)

Fastness assessments

**Applications of the Synthetic Dyes apart from Textile Industry:**

Earlier, synthetic dyes are used in textile industries only but now a day these dyes serve many industries such as: Medicine, chemistry, plastics, paints, printing ink, rubber, cosmetics etc. Almost all the colors that you see today are synthetic dyes. Synthetic dyes are used everywhere in everything from clothes to paper, from food to wood. Synthetic dyes today evolved into a multi-billion dollar industry. They are widely used for dying and printing in a broad range of industries.

**Advantages of Synthetic Dyes:**

Synthetic dyes quickly replaced the traditional natural dyes. They cost less, they offered a vast range of new colors, and they imparted better properties to the dyed materials. Cheaper to produced, brighter, more color-fast, and easy to apply to fabric, these synthetic dyes changed the playing field.

**Disadvantages of Synthetic Dyes:**

Synthetic dyes often involve the use of highly toxic mordant so they do not let you “breathe” very well, which could be a problem considering that your skin is your largest organ and its help release toxins. The production of synthetic fibers may also involve fossil fuels (like oil). As well as this synthetic fibers can cause environmental harm, for the very reason that they do not easily degrade.