VKR TEX - Tutorials

Manufacture of All Kinds of Auto loom Fabrics and Natural Dye Fabrics.

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Dye

Yarn drying after being dyed in the early American tradition, at Conner Prairie living history museum.

A **dye** can generally be described as a colored substance that has an affinity to the substrate to which it is being applied. The dye is generally applied in an aqueous solution, and may require a mordant to improve the fastness of the dye on the fiber.

Both dyes and pigments appear to be colored because they absorb some wavelengths of light preferentially. In contrast with a dye, a pigment generally is insoluble, and has no affinity for the substrate. Some dyes can be precipitated with an inert salt to produce a lake pigment.

Archaeological evidence shows that, particularly in India and the Middle East, dyeing has been carried out for over 5000 years. The dyes were obtained from animal, vegetable or mineral origin, with no or very little processing. By far the greatest source of dyes has been from the plant kingdom, notably roots, berries, bark, leaves and wood, but only a few have ever been used on a commercial scale.

Organic dyes

The first human-made (synthetic) organic dye, mauveine, was discovered by William Henry Perkin in 1856. Many thousands of synthetic dyes have since been prepared.

Synthetic dyes quickly replaced the traditional natural dyes. They cost less, they offered a vast range of new colors, and they imparted better properties upon the dyed materials.[1] Dyes are now classified according to how they are used in the dyeing process.

Acid dyes are water-soluble anionic dyes that are applied to fibers such as silk, wool, nylon and modified acrylic fibers using neutral to acid dyebaths. Attachment to the fiber is attributed, at least partly, to salt formation between anionic groups in the dyes and cationic groups in the fiber. Acid dyes are not substantive to cellulosic fibers.

Basic dyes are water-soluble cationic dyes that are mainly applied to acrylic fibers, but find some use for wool and silk. Usually acetic acid is added to the dyebath to help the uptake of the dye onto the fiber. Basic dyes are also used in the coloration of paper.

Direct or **substantive dyeing** is normally carried out in a neutral or slightly alkaline dyebath, at or near boiling point, with the addition of either sodium chloride (NaCl) or sodium sulfate (Na_2SO_4). Direct dyes are used on cotton, paper, leather, wool, silk and nylon. They are also used as pH indicators and as biological stains.

Mordant dyes require a mordant, which improves the fastness of the dye against water, light and perspiration. The choice of mordant is very important as different mordants can change the final color significantly. Most natural dyes are mordant dyes and there is therefore a large literature base describing dyeing techniques. The most important mordant dyes are the synthetic mordant dyes, or chrome dyes, used for wool; these comprise some 30% of dyes used for wool, and are especially useful for black and navy shades. The mordant, potassium dichromate, is applied as an after-treatment. It is important to note that many mordants, particularly those in the hard metal category, can be hazardous to health and extreme care must be taken in using them.

Vat dyes are essentially insoluble in water and incapable of dyeing fibres directly. However, reduction in alkaline liquor produces the water soluble alkali metal salt of the dye, which, in this leuco form, has an affinity for the textile fibre. Subsequent oxidation reforms the original insoluble dye. The indigo color of blue jeans is a vat dye.

Reactive dyes utilize a chromophore containing a substituent that is capable of directly reacting with the fibre substrate. The covalent bonds that attach reactive dye to natural fibers make it among the most permanent of dyes. "Cold" reactive dyes, such as Procion MX, Cibacron F, and Drimarene K, are very easy to use because the dye can be applied at room temperature. Reactive dyes are by far the best choice for dyeing cotton and other cellulose fibers at home or in the art studio.

Disperse dyes were originally developed for the dyeing of cellulose acetate, and are substantially water insoluble. The dyes are finely ground in the presence of a dispersing agent and then sold as a paste, or spray-dried and sold as a powder. They can also be used to dye nylon, cellulose triacetate, polyester and acrylic fibres. In some cases, a dyeing temperature of 130 °C is required, and a pressurised dyebath is used. The very fine particle size gives a large surface area that aids dissolution to allow uptake by the fibre. The dyeing rate can be significantly influenced by the choice of dispersing agent used during the grinding.

Azo dyeing is a technique in which an insoluble azoic dye is produced directly onto or within the fibre. This is achieved by treating a fibre with both diazoic and coupling components. With suitable adjustment of dyebath conditions the two components react to produce the required insoluble azo dye. This technique of dyeing is unique, in that the final color is controlled by the choice of the diazoic and coupling components.

Sulfur dyes are two part "developed" dyes used to dye cotton with dark colors. The initial bath imparts a yellow or pale chartreuse color. This is oxidized in place to produce the dark black we are familiar with in socks.

Food dyes

One other class which describes the role of dyes, rather than their mode of use, is the food dye. Because food dyes are classed as food additives, they are manufactured to a higher standard than some industrial dyes. Food dyes can be direct, mordant and vat dyes, and their use is strictly controlled by legislation. Many are azoic dyes, although anthraquinone and triphenylmethane compounds are used for colors such as green and blue. Some naturally-occurring dyes are also used.

Other important dyes

A number of other classes have also been established, including:

- Oxidation bases, for mainly hair and fur
- Leather dyes, for leather
- Fluorescent brighteners, for textile fibres and paper
- Solvent dyes, for wood staining and producing colored lacquers, solvent inks, coloring oils, waxes.
- Carbene dyes, a recently developed method for coloring multiple substrates

Chemical classification

By the nature of their chromophore, dyes are divided into: Category:Acridine dyes, derivates of acridine

- Category:Anthraquinone dyes, derivates of anthraquinone
- Arylmethane dyes
    - Category:Diarylmethane dyes, based on diphenyl methane
    - Category:Triarylmethane dyes, derivates of triphenyl methane
- Category:Azo dyes, based on -N=N- azo structure
- Cyanine dyes, derivates of phthalocyanine
- Diazonium dyes, based on diazonium salts
- Nitro dyes, based on a -NO_2 nitro functional group
- Nitroso dyes, based on a -N=O nitroso functional group
- Phthalocyanine dyes, derivates of phthalocyanine
- Quinone-imine dyes, derivates of quinone
    - Category:Azin dyes
        - Category:Eurhodin dyes
        - Category:Safranin dyes, derivates of safranin
    - Indamins
    - Category:Indophenol dyes, derivates of indophenol
    - Category:Oxazin dyes, derivates of oxazin
    - Oxazone dyes, derivates of oxazone
    - Category:Thiazin dyes, derivates of thiazin
- Category:Thiazole dyes, derivates of thiazole
- Xanthene dyes, derived from xanthene
    - Fluorene dyes, derivates of fluorene
        - Pyronin dyes
        - Category:Rhodamine dyes, derivates of rhodamine
    - Category:Fluorone dyes, based on fluorone