

Lecture-13

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The Sulphur dyes contain Sulphur linkage within their molecules. They are insoluble in water but can be made soluble in water by treating them with reducing agents. This also makes them substantive towards cellulosic fibres. Na_2S acts as reducing agent that breaks the Sulphur linkage and break down the longer molecules in to simple components which can penetrate the material (fiber/fabric) surface easily.



Water insoluble sulphur dye molecules

Water soluble leuco form produced by splitting the sulphur linkage

Dyeing with Sulphur Dye (Continued)

Chemistry of dyeing with S-dyes (Continued)

This thios containing the –SH groups are readily oxidized by the action of atmospheric O₂ or any other oxidizing agents. This reconverts the water soluble leuco form of Sulphur dye into previous water insoluble form which has a very good wash fastness property.



Sulphur dyes are negatively ionized. Addition of salt improves efficiency of dyeing by increasing physical force.

Dyeing with Sulphur Dye (Continued)

Reducing Step of Sulphur Dyes

Reducing step is the most important in the application of sulphur dyes. Unless the dyes are converted into the completely soluble form, the full colour value cannot be achieved. The solubility of reduced sulphur dyes varies appreciably from dye to dyes. The reducing agents used for sulphur dyes are:

- 1) Na-Sulphide
- 2) Na-Hydro Sulphide
- 3) Thioglycolic Acid

But, Na Sulphide is the most widely used reducing agent for dissolving sulphur dyes. These may be replaced by Na-Hydrosulphide in some cases. Again, over reducing of the dye may take place, leading to a product having lower affinity for cellulosic fibres. Hence lower colour yields are obtained along with wastage of dyestuff. In some cases lower wash fastness results if Na-Hydrosulphide is used. It also decreases the life time of the vessel.

Dyeing with Sulphur Dye (Continued)

Oxidation Step of Sulphur Dye

After dyeing the reduced water soluble form of the dyes have to be converted in to the original water insoluble form by oxidation. The commonly used oxidizing agents are-

- 1) Potassium dichromate
- 2) Na-Perborate
- 3) Na-per carbonate
- 4) Na-peroxide

The method of oxidizing agent selection plays an important role in the development of correct shades & their optimum fastness properties. Using of different oxidizing agents may give the following results-

- 1) Use of perborate or per carbonate in presence of acetic acid gives brighter shade.
- 2) Treating dyed material with dichromate without rinsing reduces color losses and causes dull shade.

Dyeing with Sulphur Dye (Continued)

After treatment

- I) The dyed substance is soaped which makes the color bright and gives the permanent shade.
- II) The light fastness of Sulfur dyes, which is generally good, can be improved by after treatment with certain metallic salt. Thus a treatment with CuSO_4 and acetic acid in the presence of sodium or potassium dichromate improves the light fastness. When the dichromate is present, the washing fastness is slightly improved.

$\text{CuSO}_4 \rightarrow 0.5-1\% \text{ owf}$

Na/K-dichromate $\rightarrow 1-1.5\%$

Acetic acid $\rightarrow 1-2\%$

Time $\rightarrow 20-30 \text{ min}$

Temp $\rightarrow 70^\circ\text{C}$



**Thank
You!**