Lab Manual

TE 416: Textile Wet Process III

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Experiment No.: 01

Name of the Experiment: Introduction to pantone paper and study its application and importance in dyeing and printing

Theory:

Pantone is a standard 'Color Matching System' where a code number is used to identify each color. Whatever the color, it is easy to identify any color with the help of Pantone Color Guide, because each color has a different or unique code number. A page has more than one swatch for just a single color, that means, the luminance varies from light to dark for any color like yellow and has many yellow colors. This Pantone Color Guide is used in the textile industry for color matching with dyed samples after fabric coloration process**.**

Importance of pantone paper in textiles:

The Pantone Color Guide is a blessing in disguise for fabric coloration in the textile industry. Suppose the buyer tells you from America that he will need 1000 kg of dyed fabric with 'light peach cream color'. But how do you know exactly what color he is talking about? In this case, your colleagues will give different opinions, but the correct decision can't be reached. But this will be easier if you have a Pantone Color Guide, if the buyer says the pantone number like "Peach Fuzz 13-1023 TPX" instead of the name of the color, then you can easily find that color from the Pantone Guide. In other words, Pantone Book has made it easy to get ideas about specific colors before dyeing and matching colors with the samples after coloration process.

Types of Pantone Color Guides

Pantone guide plays an important role in the textile industry in fabric dyeing and printing and also for shade matching. There are mainly two types of Pantone Guides- TCX & TPX. Both are designed from the Pantone Textile Color System.

1. **Textile Color on Cotton (TCX)**

These are colorful pure "Cotton Swatch" in each individual color. It looks like a passport guide or chip set. However, TCX Pantone books are much more expensive. Because it is a complete cotton swatch, it can cost from hundreds to thousands of dollars.

For example:
PANTONE 19-4052 TCX
Classic Blue

2. **Textile Color on Paper (TPX)**

In this case it is made of "Paper Swatch" instead of cotton swatch, and each swatch is colored in a unique color. The TPX Pantone Book is much cheaper than the TCX. The TPX Pantone book has recently been updated to the TPG Pantone book. TPX & TPG colors are the same, but the TPG is much more eco-friendly. (Textile Paper Green – All lead and chromium content removed from TPX products for eco-friendly update)

For example:
PANTONE 17-5126 TPX
Viridian Green

Uses of TCX and TPX

We already know about TCX & TPX. But we do not know which should be used in which cases or for what purpose. Both TCX and TPX are Pantone color standards, but they are designed separately for different purposes. Here TCX stands for "Textile Cotton eXtend" and TPX stands for "Textile Paper eXtend". TCX is commonly used as a standard color swatch for reactive and disperse dyeing and TPX is followed for pigments, that means it is used as color standard for printing**.**

Significance of PANTONE Numbers

TCX and TPX numbers are not just a unique number, they have some special meaning that reflects some of the characteristics of the colorant. We know that there are three color attributes, namely: Hue, Value and Chroma. The pantone number here consists of 6 digits, the first two digits of which express the Lightness of the color, the middle two digits represent the Hue, i.e., Red/ Yellow/Green/Blue and the last two digits represent Chroma i.e., the dullness/vividness or depth of the color.

For example:
1. PANTONE 19–4052 TCX (Classic Blue)
19 = Lightness
40 = Hue
52 = Chroma

Ranges of Lightness, Hue and Chroma-

- Lightness: Minimum- 11 & Maximum- 19
- Hue: Minimum- 1 & Maximum- 64
- Chroma: Minimum- 0 & Maximum- 64

Conclusion

The importance of Pantone Color Guide in the textile industry is immense. For those who work in the textile sector, especially in the dyeing and printing section, the issues of shade matching have to be maintained carefully. This pantone guide has made their job a lot easier. This article gives a clear idea about the significance of Pantone number and difference between the shades of TCX & TPX.

Experiment No.: 02

Name of the Experiment: Dyeing of 100% cotton/viscose fabric with reactive dye to produce combined shade

Theory: Reactive dyes are a class of highly colored organic substances, primarily used for tinting textiles, which attach themselves to their substrates by a chemical reaction that forms a covalent bond between the molecule of dye and that of the fibre. The dyestuff thus becomes a part of the fibre and is much less likely to be removed by washing. The most important characteristic of reactive dyes is the formation of covalent bonds with the substrate to be colored. Fiber reactive dyes are the most permanent of all dye types. Unlike other dyes, it actually forms a covalent bond with the cellulose or protein molecule. Once the bond is formed, what you have is one molecule, as the dye molecule has become an actual part of the cellulose fiber molecule.

Objective:

- ✓ To learn about dyeing process of cotton/viscose fabric by reactive dyes
- ✓ To dye cotton/viscose fabric with reactive dye by exhaustion process
- ✓ To make a combined shade using red, yellow, blue color substances.
- ✓ To write a report according to the experiment

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Reactive Dye	Coloring Substances to dye the fabric
Glauber Salt	Used as electrolyte & increases the affinity of the dye towards the cellulosic substrate
Soda Ash	To fix the dyestuffs and also maintain pH of the dye bath
Levelling Agent	Control of the exhaustion dye so that it is taken up evenly
Wetting Agent	Reduce surface tension for easy penetration of dyes into fabric

Sequestering Agent	Chelating agents that remove the hardness of water by deactivated metal ion.

Typical Recipe and Recipe Calculation:

SL	Process Parameter	Unit	Dossing	Stock Solution
01	Reactive Red Dye	%	1	1%
02	Reactive Yellow Dye	%	0.6	1%
03	Reactive Blue Dye	%	0.8	1%
04	Levelling Agent	g/L	1	1%
05	Wetting Agent	g/L	1	1%
06	Sequestering Agent	g/L	1	1%
07	Soda Ash	g/L	12	---
08	Glauber Salt	g/L	45	---
09	pH		10.5-11	
10	Sample Weight	gm	5	---
11	M:L	-----	1:30	---
12	Temperature	°C	60	---
13	Time	min	20	----

Calculation:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Reactive Red Dye $= \frac{5 \times 1\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 5 mL

Reactive Yellow Dye $= \frac{5 \times 0.6\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 3 mL

Reactive Blue Dye $= \frac{5 \times 0.8\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 4 mL

Wetting agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Levelling agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Sequestering agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Soda Ash $= \frac{150 \times 12}{1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{1000} \right)$
= 1.8 g

Glauber Salt $= \frac{150 \times 45}{1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{1000} \right)$
= 6.75 g

Initial Water = Total Liquor - (chemicals)
= 150 - (5+3+4+15+15+15) mL
= 150 - 57 mL
= 93 mL

Process Flowchart

Collection of 100% cotton/viscose pre-treated sample

↓

Dyeing with reactive dyes at 60℃ for 20 Minutes

↓

After Treatment

↓

Cold rinsing

↓

Hot wash

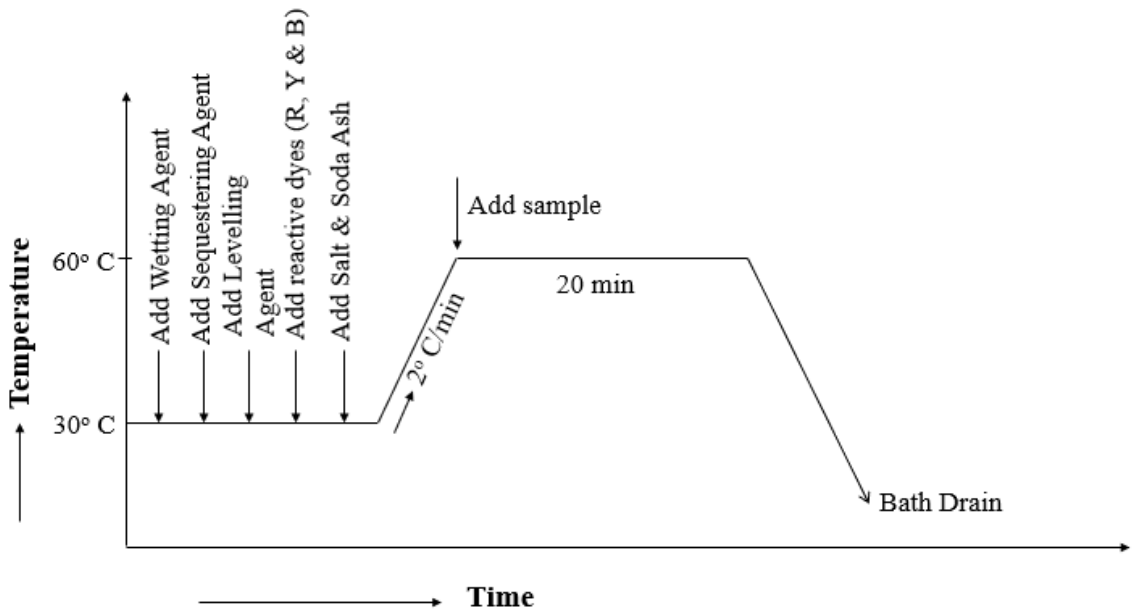
↓

Cold rinsing

↓

Drying

Process Curve



Sample Attachment

Conclusion/Comments

Experiment No.: 03

Name of the Experiment: Tie-Dyeing of 100% cotton fabric with reactive dye to produce combined shade

Theory: Reactive dyes are a class of highly colored organic substances, primarily used for tinting textiles, which attach themselves to their substrates by a chemical reaction that forms a covalent bond between the molecule of dye and that of the fibre. The dyestuff thus becomes a part of the fibre and is much less likely to be removed by washing. Tie-dyeing is one of the post-weaving physical resist-dyeing techniques using binding and compression to create patterning in textiles.

Objective:

- To learn about tie-dyeing process of cotton fabric by reactive dye.
- To dye cotton fabric by reactive dye.
- To make a combined shade using red, yellow, blue color substances.
- To write a report according to the experiment.

Apparatus:

- ✓ Polyester Thread
- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Reactive Dye	Coloring Substances to dye the fabric
Glauber Salt	Used as electrolyte & increases the affinity of the dye towards the cellulosic substrate
Soda Ash	To fix the dyestuffs and also maintain pH of the dye bath
Levelling Agent	Control of the exhaustion dye so that it is taken up evenly
Wetting Agent	Reduce surface tension for easy penetration of dyes into fabric
Sequestering Agent	Chelating agents that remove the hardness of water by deactivated metal ion.

Typical Recipe and Recipe Calculation:

SL	Process Parameter	Unit	Dossing	Stock Solution
01	Reactive Red Dye	%	1	1%
02	Reactive Yellow Dye	%	0.6	1%
03	Reactive Blue Dye	%	0.8	1%
04	Levelling Agent	g/L	1	1%
05	Wetting Agent	g/L	1	1%
06	Sequestering Agent	g/L	1	1%
07	Soda Ash	g/L	12	---
08	Glauber Salt	g/L	45	---
09	pH		10.5-11	
10	Sample Weight	gm	5	---
11	M:L	-----	1:30	---
12	Temperature	°C	60	---
13	Time	min	20	----

Calculation:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Reactive Red Dye $= \frac{5 \times 1\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 5 mL

Reactive Yellow Dye $= \frac{5 \times 0.6\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 3 mL

Reactive Blue Dye $= \frac{5 \times 0.8\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 4 mL

Wetting agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Levelling agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Sequestering agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Soda Ash $= \frac{150 \times 12}{1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{1000} \right)$
= 1.8 g

Glauber Salt $= \frac{150 \times 45}{1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{1000} \right)$
= 6.75 g

Initial Water = Total Liquor - (chemicals)
= 150 - (5+3+4+15+15+15) mL
= 150 - 57 mL
= 93 mL

Process Flowchart

Collection of 100% cotton pre-treated sample

↓

Tied the sample with polyester thread in a repeated way for producing a pattern

↓

Dyeing with reactive dyes and other chemicals at 60℃ for 20 Minutes

↓

After Treatment

↓

Cold rinsing

↓

Hot wash

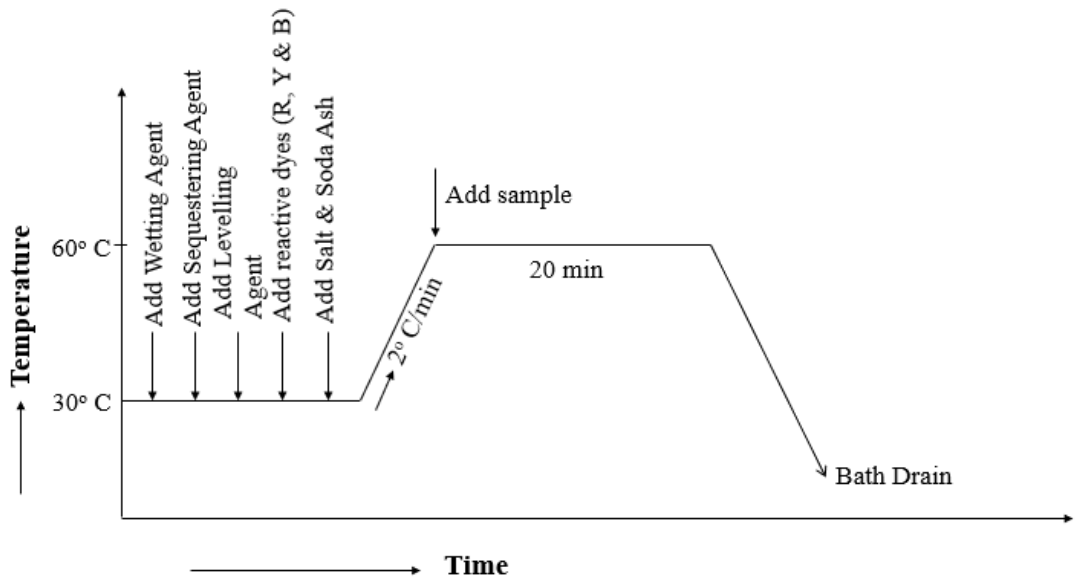
↓

Cold rinsing

↓

Drying

Process Curve



Sample Attachment

Conclusion/Comments

Experiment No.: 04

Name of the Experiment: Dyeing of 100% cotton fabric with sulphur dye to produce combined shade

Theory: Sulphur dyes are complex heterocyclic molecules or mixtures formed by melting or boiling organic compounds containing amino or nitro groups with Na-polysulphide and Sulphur. Sulphur dyes are so called as they all contain Sulphur linkage within their molecules. Sulphur dyes are highly colored, water insoluble compounds and have to be converted in to water soluble substantive forms (lucoforms) before application to the textile materials. This conversion is carried out by a treatment with a reducing agent like dilute aqueous Na_2S.

Objective:

- ✓ To learn about dyeing process of cotton fabric by sulphur dyes
- ✓ To dye cotton fabric with sulphur dye by exhaustion process
- ✓ To make a combined shade using red, yellow, blue color substances.
- ✓ To write a report according to the experiment

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Sulphur Dye	Coloring Substances to dye the fabric.
Na_2S	It is a reducing agent
Glauber Salt	Its work as electrolyte
Soda Ash	To maintain pH
Wetting Agent	Reduce surface tension for easy penetration of dyes into fabric.
Sequestering Agent	To reduce water hardness

Typical Recipe and Recipe Calculation

SL	Chemical Name/Process Parameter	Amount	Stock Solution%

01	Sulphur red dyes	0.8%	1%
02	Sulphur yellow dyes	1.2%	1%
03	Sulphur blue dyes	1.5%	1%
04	Na_2S	10 g/L	-
05	Wetting Agent	1 g/L	1%
06	Sequestering Agent	1 g/L	1%
07	Glauber Salt	10 g/L	-
08	Soda Ash	4 g/L	-
09	Sample Weight	5 g	-
10	M:L	1:40	-
11	Reduction Temperature × Time	80℃ × 10 min	-
12	Dyeing Temperature × Time	100℃ × 20 min	-
13	pH	12~13	-

❖ **Calculation**:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 40
= 200 mL

Sulphur red dyes $= \frac{5 \times 0.8\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 4 mL

Sulphur yellow dyes $= \frac{5 \times 1.2\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 6 mL

Sulphur blue dyes $= \frac{5 \times 1.5\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 7.5 mL

Wetting Agent $= \frac{200 \times 1}{1\%\ X\ 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 20 mL

Sequestering Agent $= \frac{200 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 20 mL

Na_2S $= \frac{200 \times 10}{1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{1000} \right)$
= 2 g

Glauber Salt $= \frac{200 \times 10}{1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{1000} \right)$
= 2 g

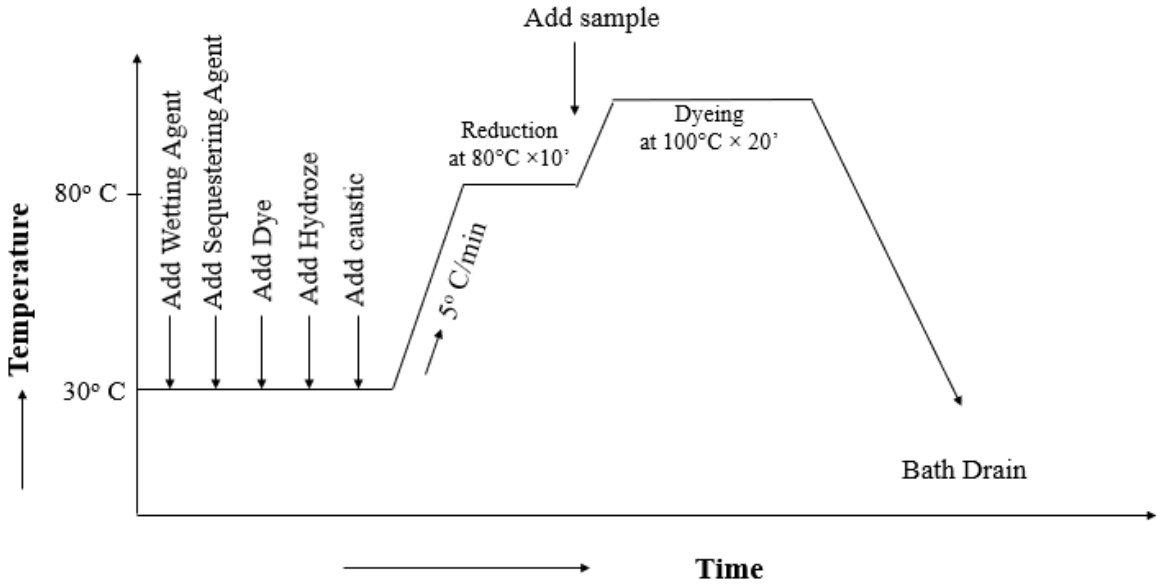
Soda Ash $= \frac{200 \times 4}{1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{1000} \right)$
= 0.8 g

Initial Water = Total Liquor - (chemicals)
= 200 - (4+6+7.5+20+20) mL
= 150 - 57.5 mL
= 92.5 mL

Process Flowchart

Collection of pre-treated samples
↓
Set water level
↓
Add dye solution
↓
Add Na_2S solution
↓
Add wetting agent solution
↓
Add sequestering agent solution
↓
Add Glauber salt solution
↓
Add soda ash
↓
Raise the temperature to 80°C
↓
Reduction at 80°C for 10 minutes
↓
Add fabric sample
↓
Raise the temperature to 100°C
↓
Dyeing at 100°C for 20 minutes
↓
Bath drops at 70°C
↓
Rinsing
↓
Drying

Process Curve



Sample Attachment

Conclusion/Comments

Experiment No.: 05

Name of the Experiment: Dyeing of 100% polyester fabric with disperse dye at carrier method to produce combined shade

Theory: The dyeing of hydrophobic fibres like polyester fibres with disperse dyes may be considered as a process of dye transfer from liquid solvent (water) to a solid organic solvent (fibre). Disperse dyes are added to water with a surface-active agent to form an aqueous dispersion. Carrier dyeing is a method of dyeing polyester materials that is used when necessary. Although usage of carriers in dyeing enables the dyeing of polyester materials at atmospheric pressure, the undesirable properties of the carriers are drawbacks. Carriers can be used when dyeing at higher temperatures than 100°C to promote the leveling of the more difficult disperse dyes. In the presence of a carrier substance in the dye bath, the dyeing behavior of the disperse dyes may become sensitive to dyeing temperature and dye bath concentration changes. Disperse dyes may show distinct dyeing properties in combination dyeing in carrier dyeing although they belong to the same energy level.

Objective:

- ✓ To learn about dyeing process of polyester fabric by disperse dye
- ✓ To learn about the properties of disperse dyes and polyester fibres
- ✓ To learn about the carrier method
- ✓ To write a report according to the experiment

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Disperse Dye	Coloring Substances to dye the fabric.
Acetic Acid	To maintain pH of the dye bath.
Dispersing Agent	To increase the solubility of disperse dyes in water
Carrier	o swell the polyester fibres, increase inter polymer space and let the dye molecules to enter the polymer system easily

Wetting Agent	Reduce surface tension for easy penetration of dyes into fabric.
Sequestering Agent	To reduce water hardness

Typical Recipe and Recipe Calculation:

SL	Chemical Name/Process Parameter	Amount	Stock Solution%
01	Disperse red dyes	0.6%	1%
02	Disperse yellow dyes	1.0%	1%
03	Disperse blue dyes	1.0%	1%
04	Dispersing Agent	2 g/L	2%
05	Carrier	6 g/L	4%
06	Acetic Acid	0.6 g/L	1%
07	Sequestering Agent	1 g/L	1%
08	Wetting Agent	1 g/L	1%
09	Sample Weight	5 g	-
10	M:L	1:30	-
12	Dyeing Temperature × Time	100℃ × 20 min	-
13	pH	4.5~5.5	-

❖ **Calculation**:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Disperse Red Dye $= \frac{5 \times 0.6\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 3 mL

Disperse Yellow Dye $= \frac{5 \times 1\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 5 mL

Disperse Blue Dye $= \frac{5 \times 1\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 5 mL

Dispersing Agent $= \frac{150 \times 2}{2\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Carrier $= \frac{150 \times 6}{4\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 22.5 mL

Acetic Acid $= \frac{150 \times 0.6}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 9 mL

Wetting Agent $= \frac{150 \times 1}{1\%\ X\ 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$

= 15 mL

Sequestering Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 15 mL

Initial Water = Total Liquor - (Chemicals)
= 150 - (3+5+5+15+22.5+9+15+15) mL
= 150-89.5 mL
= 60.5 mL

Process Flowchart

Collection of 100% polyester sample

↓

Add all the required dyes & chemicals at room temperature

↓

Check pH

↓

Dyeing with disperse dyes at 100°C for 20 Minutes

↓

After treatment

↓

Hot wash

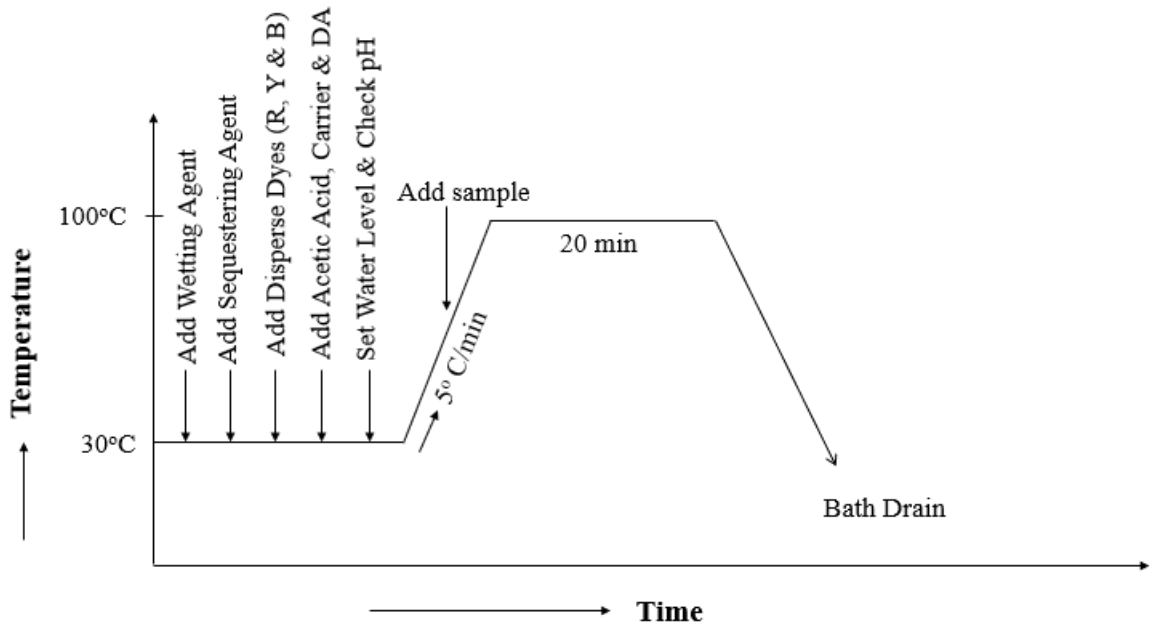
↓

Cold rinsing

↓

Drying

Process Curve



Sample Attachment

Conclusion/Comments:

Experiment No.: 06

Name of the Experiment: Tie Dyeing of 100% polyester woven fabric with disperse at HTHP dye to produce combined shade

Theory: The term "disperse dye" have been applied to the organic coloring substances which are free from ionizing groups, are of low water solubility and are suitable for dyeing hydrophobic fibres. Disperse dyes have substantivity for one or more hydrophobic fibres such as cellulose acetate, nylon, polyester, acrylic and other synthetic fibres. The negative charge on the surface of hydrophobic fibres like polyester cannot be reduced by any means, so non-ionic dyes like disperse dyes are used which are not influenced by that surface charge. Tie-dyeing is one of the post-weaving physical resist-dyeing techniques using binding and compression to create patterning in textiles.

Objective:

- ✓ To learn about tie-dyeing process of cotton fabric by reactive dye.
- ✓ To dye cotton fabric by reactive dye.
- ✓ To make a combined shade using red, yellow, blue color substances.
- ✓ To write a report according to the experiment.

Apparatus:

- ✓ Cotton thread for tie-up
- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Disperse Dye	Coloring Substances to dye the fabric.
Acetic Acid	To maintain pH of the dye bath.
Dispersing Agent	To increase the solubility of disperse dyes in water
Wetting Agent	Reduce surface tension for easy penetration of dyes into fabric.
Sequestering Agent	To reduce water hardness

Typical Recipe and Recipe Calculation:

SL	Chemical Name/Process Parameter	Amount	Stock Solution%
01	Disperse red dyes	0.6%	1%
02	Disperse yellow dyes	1.0%	1%
03	Disperse blue dyes	1.0%	1%
04	Dispersing Agent	2 g/L	2%
06	Acetic Acid	0.6 g/L	1%
07	Sequestering Agent	1 g/L	1%
08	Wetting Agent	1 g/L	1%
09	Sample Weight	5 g	-
10	M:L	1:30	-
12	Dyeing Temperature × Time	130℃ × 20 min	-
13	pH	4.5~5.5	-

❖ **Calculation**:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Disperse Red Dye = $\frac{5 \times 0.6\%}{1\%}$ mL ($\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)}$)
= 3 mL

Disperse Yellow Dye = $\frac{5 \times 1\%}{1\%}$ mL ($\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)}$)
= 5 mL

Disperse Blue Dye = $\frac{5 \times 1\%}{1\%}$ mL ($\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)}$)
= 5 mL

Dispersing Agent = $\frac{150 \times 2}{2\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 15 mL

Acetic Acid = $\frac{150 \times 0.6}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 9 mL

Wetting Agent = $\frac{150 \times 1}{1\%\ X\ 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 15 mL

Sequestering Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 15 mL

Initial Water = Total Liquor - (Chemicals)
= 150 - (3+5+5+15+9+15+15) mL

= 150-67 mL
= 83 mL

Process Flowchart

Collection of 100% polyester sample

↓

Tied the sample with cotton thread in a repeated way for producing a pattern/design

↓

Dyeing with disperse dyes and other chemicals at 130℃ for 20 Minutes

↓

After Treatment

↓

Cold rinsing

↓

Hot wash

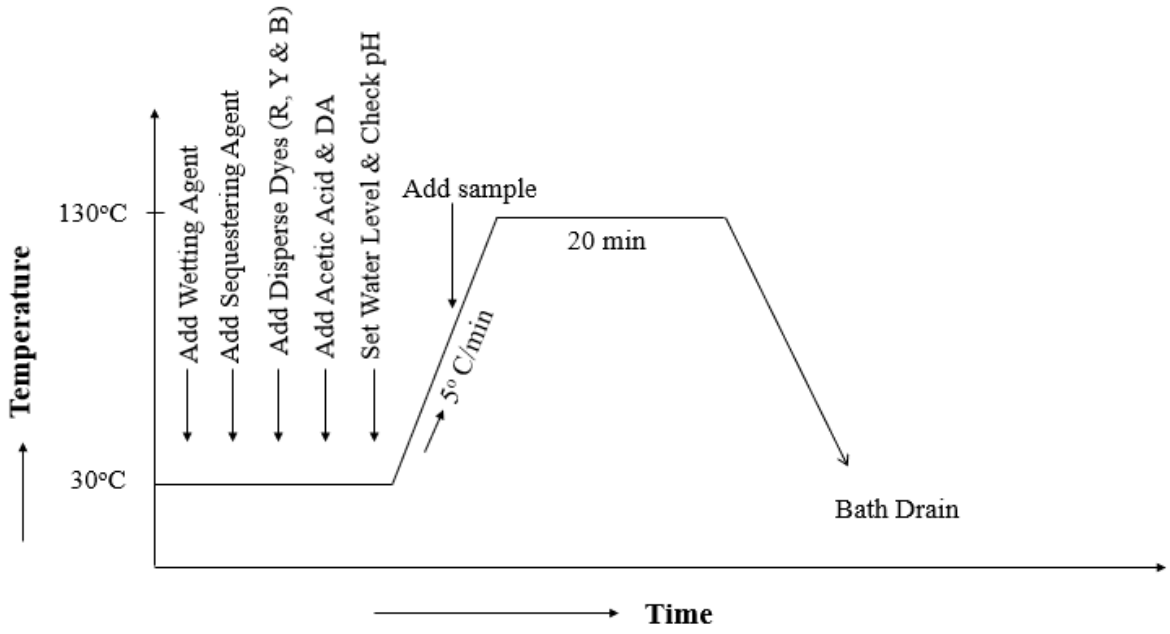
↓

Cold rinsing

↓

Drying

Process Curve



Sample Attachment

Conclusion/Comments

Experiment No.: 07

Name of the Experiment: Pigment Dyeing of 100% cotton fabric to produce combined shade

Theory: Pigment dyeing is a comparatively recent addition. In the process of pigment dyeing no actual chemical reaction takes place between the dye and the fabric. Instead, what happens is that the pigments get seated on the fabric with the help of binders. There is a challenge in pigment dyeing. Pigments are not soluble in water and shows no affinity for fiber. So, conventional dyestuff-based dyeing conditions are not feasible for pigment dyeing. To come to terms with such limitations, a new kind of pigments have been formulated for use in fibers. These are maintained in a stable dispersion in the medium of water by anionic surfactants. This type of pigment is known as pigment resin color (PRC), primarily used in printing. Some of the popular pigments used in fabrics.

Objective:

- ✓ To learn about dyeing process of cotton fabric by pigment.
- ✓ To dye cotton fabric by pigment.
- ✓ To make a combined shade using red, yellow, blue color substances.
- ✓ To write a report according to the experiment.

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Pigment	Coloring Substances to print the fabric.
Binder	Produce thin & clear film to attach the fabric and pigment
Fixer	Cross linking agent, helps to form cross link between film & fibre

Acetic Acid	To maintain pH

Typical Recipe and Recipe Calculation:

SL	Chemical Name/Process Parameter	Amount	Stock Solution%
01	Pigment Red	0.8%	1%
02	Pigment Yellow	0.6%	1%
03	Pigment Blue	1.2%	1%
04	Binder	6 g/L	4%
05	Fixer	2 g/L	2%
06	Sequestering Agent	1 g/L	1%
07	Acetic Acid	0.6 g/L	1%
08	Sample Weight	5 g	-
09	M:L	1: 30	-
10	Temperature	60℃	-
11	Time	20 min	-
12	pH	5~6	-

❖ **Calculation**:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Pigment Red $= \frac{5 \times 0.8\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 4 mL

Pigment Yellow $= \frac{5 \times 0.6\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 3 mL

Pigment Blue $= \frac{5 \times 1.2\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 6 mL

Binder $= \frac{150 \times 6}{4\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 22.5 mL

Fixer $= \frac{150 \times 2}{2\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Sequestering Agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Acetic Acid $= \frac{150 \times 0.6}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$

= 9 mL

Initial Water = Total Liquor - (Chemicals)
= 150 - (4+3+6+22.5+15+15+9) mL
= 150-74.5 mL
= 75.5 mL

Process Flowchart

Collection of pre-treated samples

↓

Set water level

↓

Add Pigment solutions

↓

Add binder solution

↓

Add fixer solution

↓

Add fabric sample

↓

Raise the temperature to 60℃

↓

Run time for 20 minutes

↓

Bath drop

↓

Padding

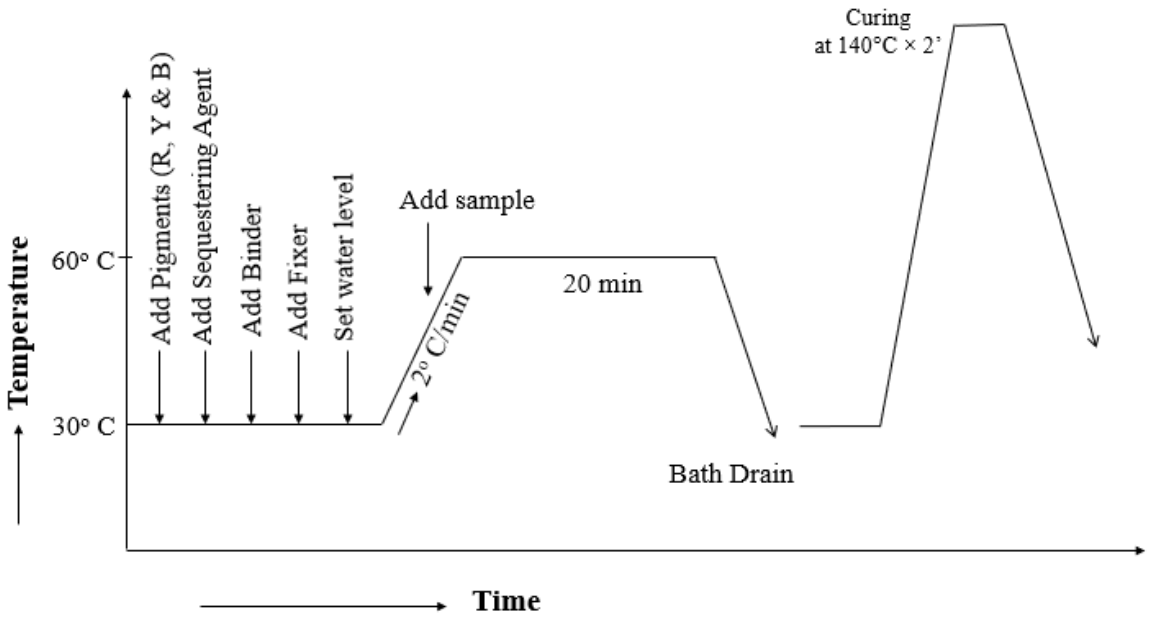
↓

Curing at 140℃ for 2~3 min

↓

Wash

Process Curve



Sample Attachment

Conclusion/Comments:

Experiment No.: 08

Name of the Experiment: Pigment Dyeing of 100% polyester fabric to produce combined shade

Theory: Pigment dyeing is not really "dyeing" in its truest form because the pigments stick on the fabric with the help of binders. Pigments are insoluble in water. They exist in the form of finely ground molecules, milled for garment dyeing purposes into a paste. When anionic dispersing agents are added, a slightly negative charge is present, thus the foundation for pigment dyeing is born. When a positively charged cationic pre-treat is added to the fiber a magnetic bond is formed. The process is complete when a cationic binder is added to "lock" the pigment into place. In pigment dyeing no actual chemical reaction takes place between the dye and the fabric.

Objective:

- ✓ To learn about dyeing process of polyester fabric by pigment.
- ✓ To dye polyester fabric by pigment.
- ✓ To make a combined shade using red, yellow, blue color substances.
- ✓ To write a report according to the experiment.

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Pigment	Coloring Substances to print the fabric.
Binder	Produce thin & clear film to attach the fabric and pigment
Fixer	Cross linking agent, helps to form cross link between film & fibre
Acetic Acid	To maintain pH

Typical Recipe and Recipe Calculation:

SL	Chemical Name/Process Parameter	Amount	Stock Solution%
01	Pigment Red	0.8%	1%
02	Pigment Yellow	0.6%	1%
03	Pigment Blue	1.2%	1%
04	Binder	6 g/L	4%
05	Fixer	2 g/L	2%
06	Sequestering Agent	1 g/L	1%
07	Acetic Acid	0.6 g/L	1%
08	Sample Weight	5 g	-
09	M:L	1: 30	-
10	Temperature	100℃	-
11	Time	20 min	-
12	pH	5~6	-

❖ **Calculation**:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Pigment Red $= \frac{5 \times 0.8\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 4 mL

Pigment Yellow $= \frac{5 \times 0.6\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 3 mL

Pigment Blue $= \frac{5 \times 1.2\%}{1\%}$ mL $\left(\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)} \right)$
= 6 mL

Binder $= \frac{150 \times 6}{4\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 22.5 mL

Fixer $= \frac{150 \times 2}{2\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Sequestering Agent $= \frac{150 \times 1}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 15 mL

Acetic Acid $= \frac{150 \times 0.6}{1\% \times 1000}$ mL $\left(\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000} \right)$
= 9 mL

Initial Water = Total Liquor - (Chemicals)
= 150 - (4+3+6+22.5+15+15+9) mL

= 150-74.5 mL
= 75.5 mL

Process Flowchart

Collection of pre-treated samples

↓

Set water level

↓

Add Pigment solutions

↓

Add binder solution

↓

Add fixer solution

↓

Add fabric sample

↓

Raise the temperature to 100℃

↓

Run time for 20 minutes

↓

Bath drop

↓

Padding

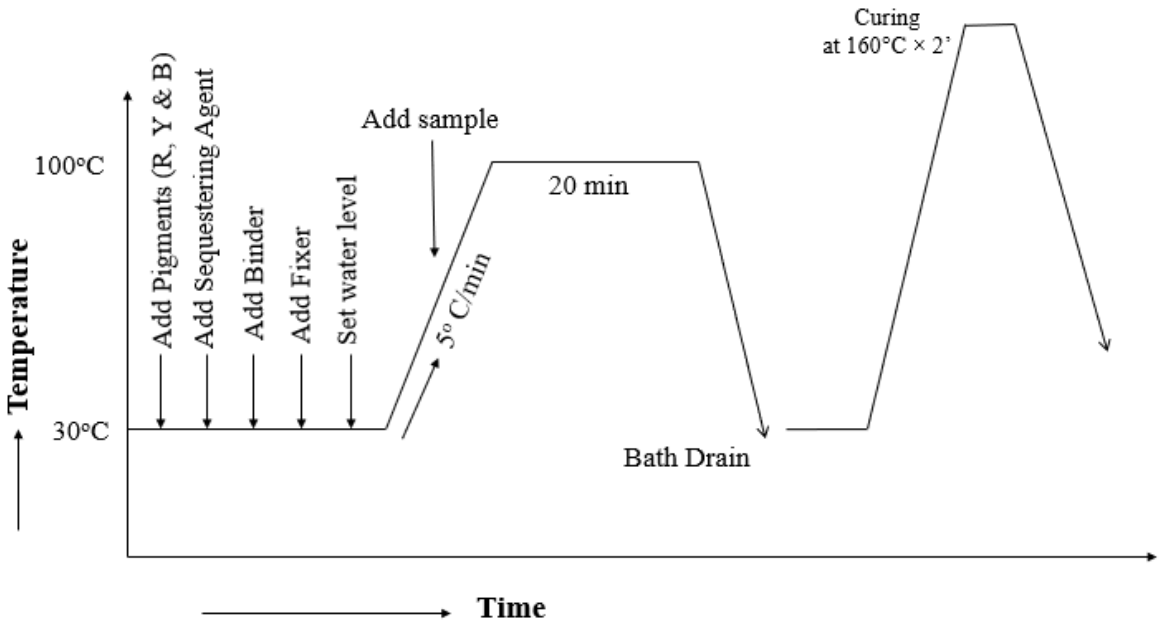
↓

Curing at 160℃ for 2~3 min

↓

Wash

Process Curve



Sample Attachment

Conclusion/Comments:

Experiment No.: 09

Name of the Experiment: Dyeing of cotton fabric with natural turmeric dye by using mordant

Theory: Turmeric is fabulous as a natural dye and super easy for special events such as a party dress, to decorate a wedding or event, to show children how to make color in a safe manner. Turmeric is a great natural dye for beginners. It yields a warm gold color on undyed natural cotton fabrics, silk and wool. The color will fade quickly if washed very often. The yellow pigment in turmeric can also be used in the food product as a natural colorant and shows good market potential. Turmeric is what's called a fugitive dye; this means that the color will fade pretty quickly regardless of anything you do to it (mordanting wise).

Objective:

- ✓ To learn about dyeing process of cotton fabric by turmeric dyes
- ✓ To know about mordant and its function
- ✓ To write a report according to the experiment.

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Turmeric Dye	Coloring Substances to dye the fabric.
Tannic Acid	Pre-treat the fabric to increase absorbency of dyes

Typical Recipe and Recipe Calculation:

SL	Chemical Name/Process Parameter	Amount	Stock Solution%
01	Mordant as Tannic Acid	5 g/L	4%
02	Turmeric Powder	4%	2%
03	Sequestering Agent	1 g/L	1%

04	Sample Weight	5 g	-
05	M:L	1: 30	-
06	Mordanting Temperature × Time	100℃ × 10’	-
07	Dyeing Temperature × Time	80℃ × 20’	-

❖ **Calculation**:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Tannic Acid = $\frac{150 \times 5}{4\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 20 mL

Turmeric Powder = $\frac{5 \times 4\%}{2\%}$ mL ($\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)}$)
= 10 mL

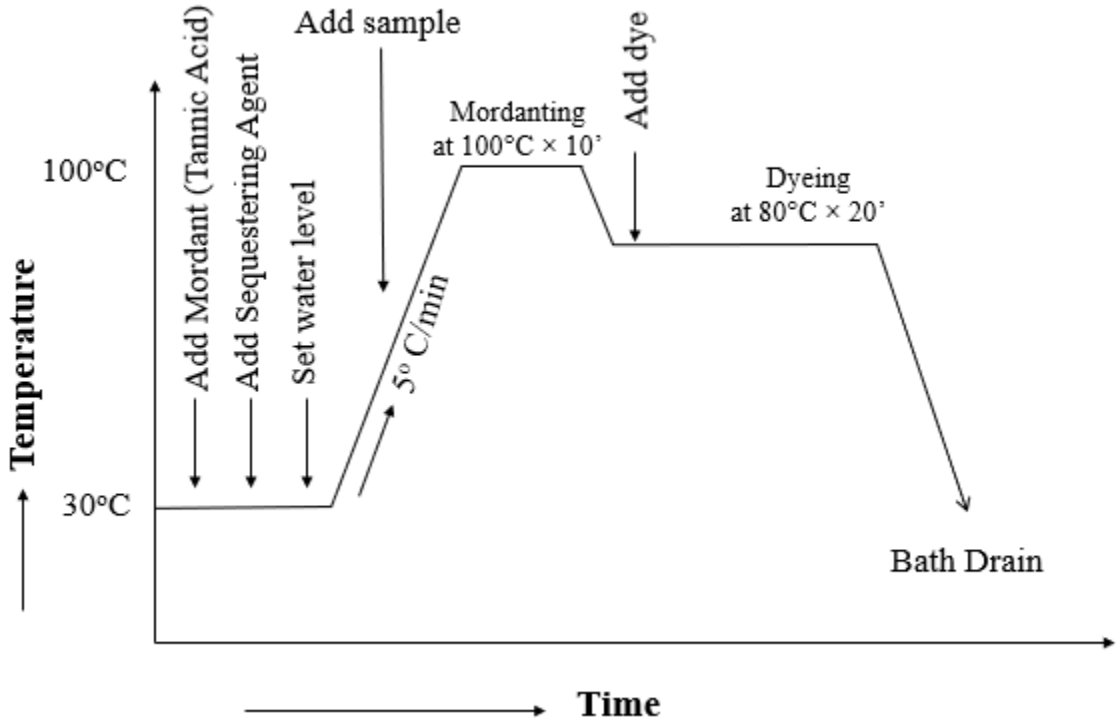
Sequestering Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 15 mL

Initial Water = Total Liquor - (Chemicals)
= 150 - (20+10+15) mL
= 150 - 45 mL
= 105 mL

Process Flowchart

Collection of 100% cotton pre-treated fabric.
↓
Mordanting of the fabric by Tannic Acid at 100°C for 10 minutes
↓
Dyeing of the fabric with natural turmeric dye at 80°C for 20 minutes
↓
After treatment
↓
Cold rinsing
↓
Hot wash
↓
Cold rinsing
↓
Drying

Process Curve



Sample Attachment

Conclusion/Comments

Experiment No.: 10

Name of the Experiment: Dyeing of cotton fabric with natural henna dye by using mordant

Theory: Henna is an ancient medicinal plant that's been used as a natural dye for over 4,000 years. Its antifungal and antimicrobial properties may be beneficial for the hair and scalp, particularly for premature graying and reducing dandruff. The changes of colors have been noticed by using different types of mordant. The dye exhaustion percentage, wash, rubbing, and light fastness results reveal that the extract of henna can be used for coloration of cotton and silk fabric. Henna produces a brown color tending toward a red-orange on protein fibres. Henna bonds well with protein, hence it is used to dye skin (mehedi), hair, fingernails, leather, silk and wool. On cellulose fibres henna yields light yellow greens.

Objective:

- ✓ To learn about dyeing process of cotton fabric by henna dyes
- ✓ To know about mordant and its function
- ✓ To write a report according to the experiment.

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of chemicals	Function
Henna Dye	Coloring Substances to dye the fabric.
Mordant (Tannic Acid)	Pre-treat the fabric to increase absorbency of dyes

Typical Recipe and Recipe Calculation:

SL	Chemical Name/Process Parameter	Amount	Stock Solution%
01	Mordant as Tannic Acid	4 g/L	2%
02	Henna Powder	4%	2%

03	Sequestering Agent	1 g/L	1%
04	Sample Weight	5 g	-
05	M:L	1: 30	-
06	Mordanting Temperature × Time	100℃ × 10’	-
07	Dyeing Temperature × Time	80℃ × 20’	-

❖ **Calculation**:

Total Liquor = Material Weight × L { M:L }
= 5 gm × 30
= 150 mL

Tannic Acid = $\frac{150 \times 4}{2\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 30 mL

Henna Powder = $\frac{5 \times 4\%}{2\%}$ mL ($\frac{Material\ weight \times chemical\ amount\ (\%)}{stock\ solution\ (\%)}$)
= 10 mL

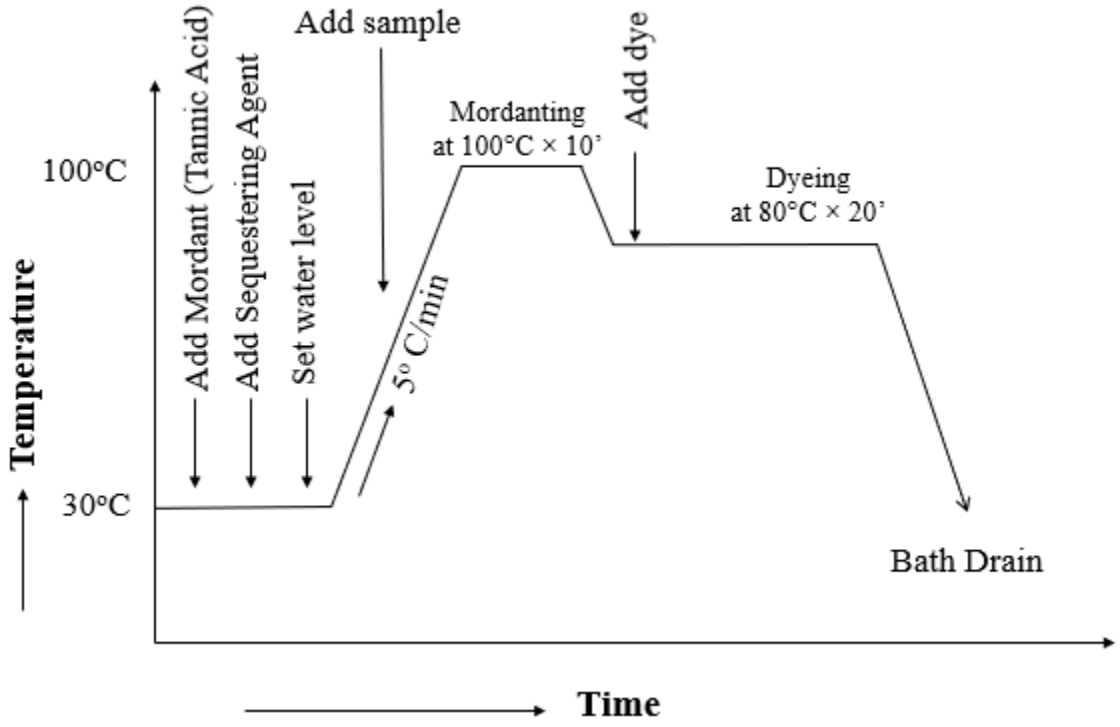
Sequestering Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)
= 15 mL

Initial Water = Total Liquor - (Chemicals)
= 150 - (30+10+15) mL
= 150 - 55 mL
= 95 mL

Process Flowchart

Collection of 100% cotton pre-treated fabric.
↓
Mordanting of the fabric by Tannic Acid at 100°C for 10 minutes
↓
Dyeing of the fabric with natural turmeric dye at 80°C for 20 minutes
↓
After treatment
↓
Cold rinsing
↓
Hot wash
↓
Cold rinsing
↓
Drying

Process Curve



Sample Attachment

Conclusion/Comments

Experiment No.: 11

Name of the Experiment: Pigment printing on 100% cotton fabric by screen printing method

Theory: By the term textile printing we mean the localized application of dyes or pigment and chemical by any method, which can produce particular effect of color on the fabric according to the design. In this practical we print cotton fabric with pigment colorants by screen printing method. Screen printing is a printing technique where a mesh is used to transfer ink or dye onto a substrate, except in areas made impermeable to the ink by a blocking stencil. A squeegee is moved across the screen to fill the open mesh apertures with ink, and a reverse stroke then causes the screen to touch the substrate momentarily along a line of contact. This causes the ink to wet the substrate and be pulled out of the mesh apertures as the screen springs back after the blade has passed. One color is printed at a time, so several screens can be used to produce a multi-colored image or design.

Objective:

- ✓ To learn about printing process of cotton fabric by pigment
- ✓ To learn about screen printing process
- ✓ To write a report according to the experiment

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Scissor
- ✓ Printing block

Function of the Chemicals

Name of chemicals	Function
Pigment	Coloring Substances to print the fabric.
Binder	Produce thin & clear film to attach the fabric and pigment
Fixer	Cross linking agent, helps to form cross link between film & fibre
Acetic Acid	To maintain pH of the print paste
Thickener	To maintain viscosity of print paste

Typical Recipe and Recipe Calculation:

SL Number	Chemical Name	Amount

1	Pigment Red	8 parts
2	Pigment Yellow	5 parts
3	Pigment Blue	6 parts
4	Binder	20 parts
5	Fixer	5 parts
6	Acetic Acid	1-2 parts
7	Thickener (Starch)	35-40 parts
8	Water	10-15 parts
	Total	**100 parts**

Process Flowchart

Collection of pre-treated 100% cotton woven fabric

↓

Preparation of print paste with thickener and other ingredients

↓

Application of print paste on pre-treated sample according to screen printing method

↓

Drying at 100°C for 3-5 minutes

↓

Curing at 150°C for 3 minutes

Sample Attachment

Conclusion/Comments:

Experiment No.: 12

Name of the Experiment: Pigment printing on 100% polyester fabric by screen printing method

Theory: By the term textile printing we mean the localized application of dyes or pigment and chemical by any method, which can produce particular effect of color on the fabric according to the design. In this practical we print polyester fabric with pigment colorants by screen printing method. Screen printing is a printing technique where a mesh is used to transfer ink or dye onto a substrate, except in areas made impermeable to the ink by a blocking stencil. A squeegee is moved across the screen to fill the open mesh apertures with ink, and a reverse stroke then causes the screen to touch the substrate momentarily along a line of contact. This causes the ink to wet the substrate and be pulled out of the mesh apertures as the screen springs back after the blade has passed. One color is printed at a time, so several screens can be used to produce a multi-colored image or design.

Objective:

- ✓ To learn about printing process of polyester fabric by pigment
- ✓ To learn about screen printing process
- ✓ To write a report according to the experiment

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Scissor
- ✓ Printing block

Function of the Chemicals

Name of chemicals	Function
Pigment	Coloring Substances to print the fabric.
Binder	Produce thin & clear film to attach the fabric and pigment
Fixer	Cross linking agent, helps to form cross link between film & fibre
Acetic Acid	To maintain pH of the print paste
Thickener	To maintain viscosity of print paste

Typical Recipe and Recipe Calculation:

SL Number	Chemical Name	Amount

1	Pigment Red	8 parts
2	Pigment Yellow	5 parts
3	Pigment Blue	6 parts
4	Binder	20 parts
5	Fixer	5 parts
6	Acetic Acid	1-2 parts
7	Thickener (Starch)	35-40 parts
8	Water	10-15 parts
	Total	**100 parts**

Process Flowchart

Collection of pre-treated 100% polyester woven fabric

↓

Preparation of print paste with thickener and other ingredients

↓

Application of print paste on pre-treated sample according to screen printing method

↓

Drying at 105°C for 3-5 minutes

↓

Curing at 160°C for 3 minutes

Sample Attachment

Conclusion/Comments:

Experiment No.: 13

Name of the Experiment: Application of softener on 100% cotton fabric by exhaustion method

Theory: Textile finishing provides a method whereby deficiencies in the textile can be corrected or specific properties can be introduced. To change the hand properties of a fabric, we can apply mechanical, physical, chemical or combined techniques. As a general rule, the softening agents are hygroscopic or lubricating agents, which facilitate the fiber sliding within the fabric structure, thus granting easier deformation and creasing of the fabric. Softener is an auxiliary that, when applied to textile materials, brings about an alteration in the handle, resulting in the goods being more pleasing to the touch.

Objective:

- ✓ To learn about softening agent.
- ✓ To learn about the process of finishing any fabric with a softening agent
- ✓ To improve abrasion resistance
- ✓ To increase tearing strength

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pod stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of the Chemicals	Functions
Wetting agent	It removes surface tension of water
Sequestering Agent	To remove the water hardness by deactivating metal ion
Softening Agent	To improve hand-feel of the fabric

Typical Recipe and Recipe Calculation:

SL	Chemical/Process Parameter	Unit	Dossing	Stock solution:

01	Softening Agent	g/L	4	2%
02	Wetting Agent	g/L	1	1%
03	Sequestering Agent	g/L	1	1%
04	Sample Weight	gm	5	---
05	M:L	-----	1:30	---
06	Temperature	°C	50	---
07	Time	min	15	----

Recipe Calculation

Total Liquor = Material Weight × L { M:L }

= 5 gm × 30

= 150 mL

Softener = $\frac{150 \times 4}{2\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 30 mL

Wetting Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 15 mL

Sequestering Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 15 mL

Initial Water = Total Liquor - (chemicals)

= 150 - (30+15+15) mL

= 150 - 60 mL

= 90 mL

Process Flowchart

Collection of 100% cotton knit sample

↓

Set water level

↓

Add sequestering agent

↓

Add wetting solution

↓

Add Softening agent

↓

Add fabric sample

↓

Raise the temperature to 50°C

↓

Run time for 15 minutes

↓

Bath drop

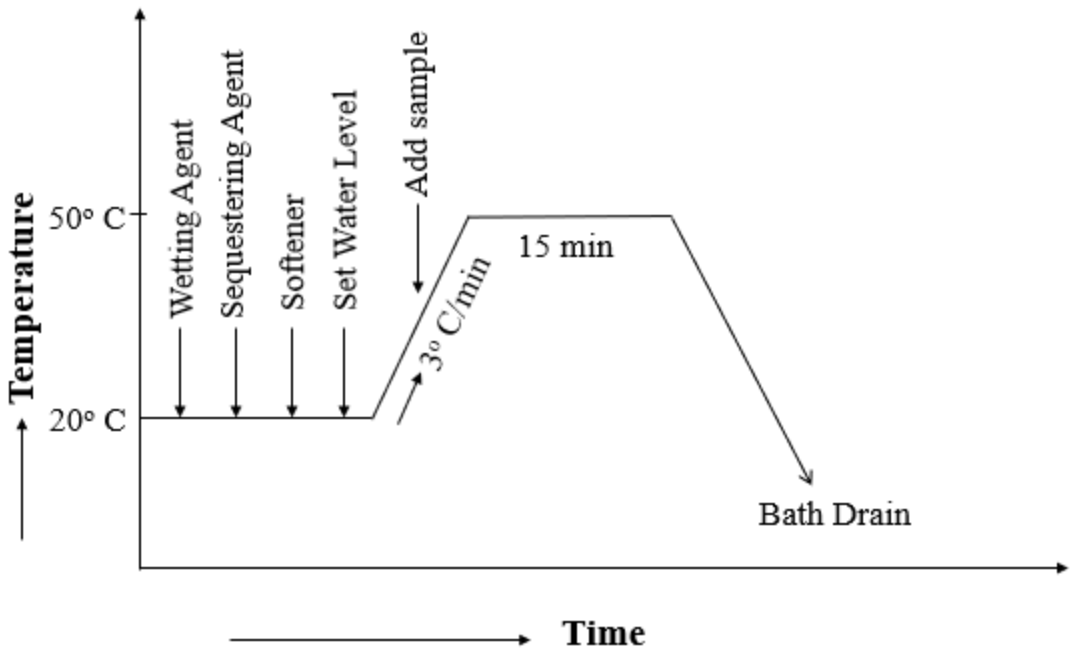
↓

Rinsing

↓

Drying

Process Curve



Sample Attachment

Conclusion/Comments:

Experiment No.: 14

Name of the Experiment: Application of Soil release finish on 100% cotton woven fabric

Theory: Soil release is a chemical finish that permits relatively easy removal of soils with ordinary laundering. The soil releasability characteristics of a given textile depend on the kind of fibres from which it is made and the kind of finishing agent which has been applied to it. Natural fibres such as cotton and wool exhibit little soil repellency, but when they do become soiled they are readily cleaned, as they exhibit a high level of soil releasability. Some of the synthetics, notably polyester, exhibit not only a low level of soil repellency but also a low level of soil releasability. Soil repellent finishes are very useful in carpeting and upholstery and are desirable in draperies and fabric window shades.

Objectives:

- ✓ To learn about soil release finishing agent.
- ✓ To learn about the process of finishing any fabric with a soil release chemical
- ✓ To clean the fabric surface
- ✓ To write the report according to the experiment

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pot stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of the Chemicals	Functions
Wetting agent	It removes surface tension of water
Sequestering Agent	To remove the water hardness by deactivating metal ion
Finishing Agent (Soil release)	To remove soils/dirt particles with ordinary home laundering

Typical Recipe and Recipe Calculation:

SL	Chemical/Process Parameter	Unit	Dossing	Stock solution:
01	Finishing Agent	g/L	5	2%
02	Wetting Agent	g/L	1	1%
03	Sequestering Agent	g/L	1	1%
04	Sample Weight	gm	5	---
05	M:L	-----	1:30	---
06	Temperature	°C	50	---
07	Time	min	15	----

Recipe Calculation

Total Liquor = Material Weight × L { M:L }

= 5 gm × 30

= 150 mL

Finishing Agent = $\frac{150 \times 5}{2\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 37.5 mL

Wetting Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 15 mL

Sequestering Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 15 mL

Initial Water = Total Liquor - (chemicals)

= 150 - (37.5+15+15) mL

= 150 – 67.5 mL

= 82.5 mL

Process Flowchart

Collection of 100% cotton knit sample

↓

Set water level

↓

Add sequestering agent

↓

Add wetting solution

↓

Add finishing agent

↓

Add fabric sample

↓

Raise the temperature to 50°C

↓

Run time for 20 minutes

↓

Bath drop

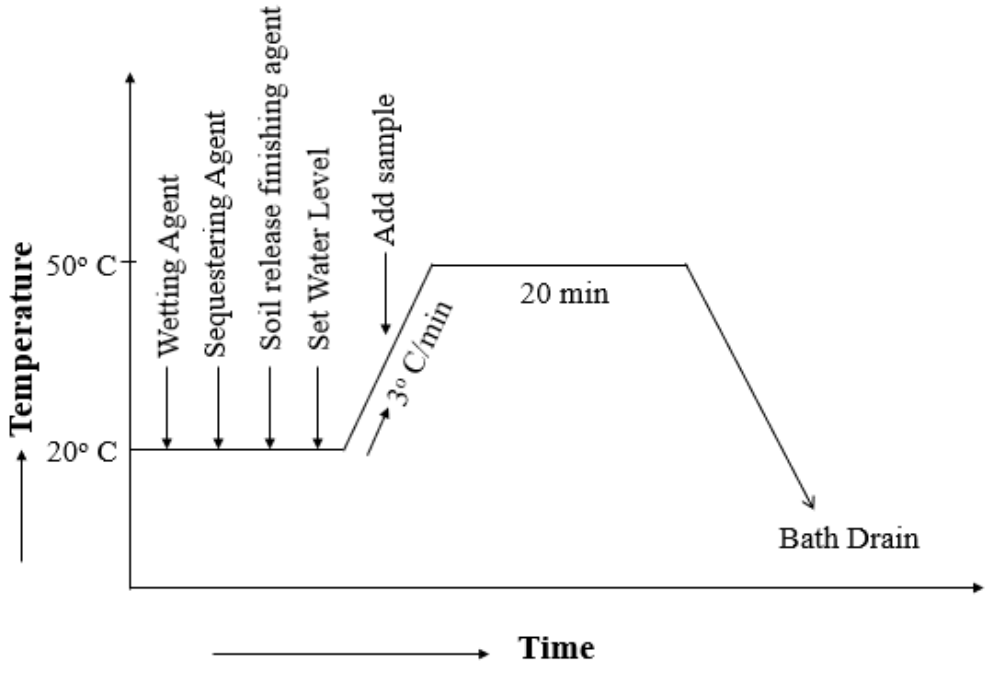
↓

Rinsing

↓

Drying

Process Curve



Sample Attachment

Conclusion/Comments:

Experiment No.: 15

Name of the Experiment: Flame retardant finish on 100% cotton knit fabric

Theory: A fabric can be considered flame resistant if it does not burn or does not continue to burn when subjected to a flame or heat source, with or without removal of the source. A chemical applied to a fabric to impart flame resistance is called a flame retardant. Different factors affecting flammability of textiles include type of fibre, yarn structure, fabric structure, and any chemicals / coatings applied on the fabric. Three necessary components for a fire are fuel, heat and oxygen. Flame retardant finishes improve flame resistance by masking or removing any one or more components that are required for burning.

Objectives:

- ✓ To learn about flame retardant finishing agent.
- ✓ To learn about the process of finishing any fabric with a flame retardant chemical
- ✓ To improve the flame resistance property
- ✓ To write the report according to the experiment

Apparatus:

- ✓ Beaker
- ✓ Measuring Cylinder
- ✓ Pipette
- ✓ Pot
- ✓ Tri-pot stand
- ✓ Gas Burner
- ✓ Glass rod
- ✓ Digital Balance
- ✓ Thermometer
- ✓ pH meter
- ✓ Scissor

Function of the Chemicals

Name of the Chemicals	Functions
Wetting agent	It removes surface tension of water
Sequestering Agent	To remove the water hardness by deactivating metal ion
Finishing Agent (Flame retardant)	To improve the flame resistance property of cotton fabric

Typical Recipe and Recipe Calculation:

SL	Chemical/Process Parameter	Unit	Dossing	Stock solution:
01	Finishing Agent	g/L	4	2%
02	Wetting Agent	g/L	1	1%
03	Sequestering Agent	g/L	1	1%
04	Sample Weight	gm	5	---
05	M:L	-----	1:30	---
06	Temperature	°C	50	---
07	Time	min	15	----

Recipe Calculation

Total Liquor = Material Weight × L { M:L }

= 5 gm × 30

= 150 mL

Finishing Agent = $\frac{150 \times 4}{2\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 30 mL

Wetting Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 15 mL

Sequestering Agent = $\frac{150 \times 1}{1\% \times 1000}$ mL ($\frac{Total\ Liquor \times chemical\ amount\ in\ gm/L}{Stock\ solution(\%) \times 1000}$)

= 15 mL

Initial Water = Total Liquor - (chemicals)

= 150 - (30+15+15) mL

= 150 – 60 mL

= 90 mL

Process Flowchart

Collection of 100% cotton knit sample

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Set water level

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Add sequestering agent

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Add wetting solution

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Add finishing agent

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Add fabric sample

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Raise the temperature to 50°C

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Run time for 20 minutes

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Bath drop

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Rinsing

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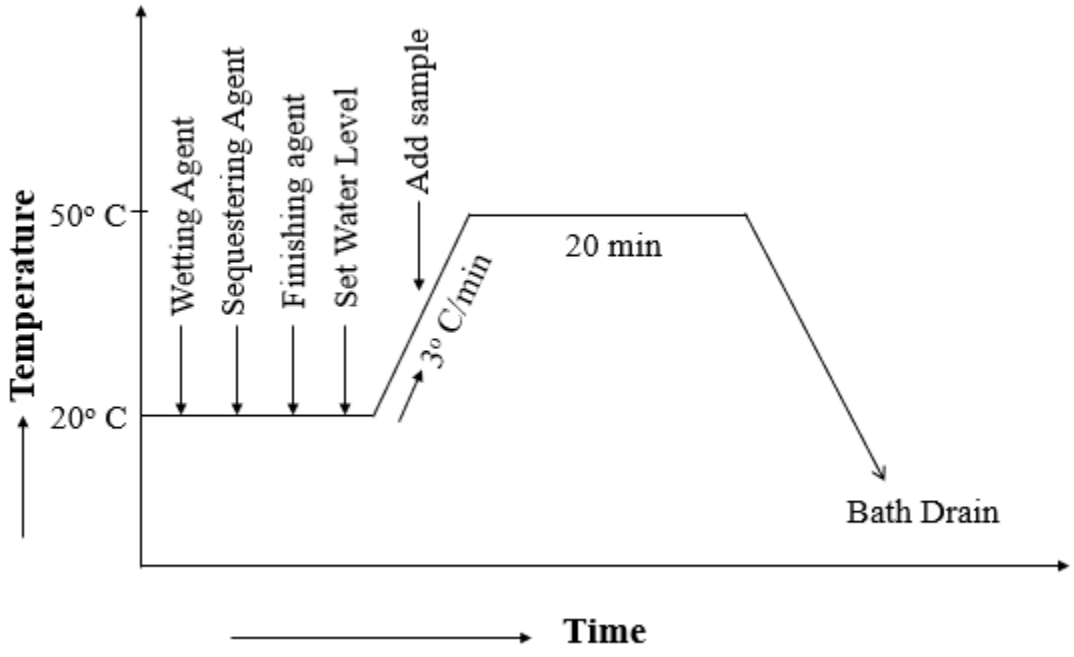
Drying

Process Curve



Sample Attachment

Conclusion/Comments: