

LAB MANUAL

ON

TEXTILE CHEMICAL PROCESSING-II

4th SEMESTER



INSTITUTE OF TEXTILE TECHNOLOGY

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EXPERIMENT NO-1

Aim of the experiment :

To dye the given sample of bleached polyester fabric using disperse dye by HTHP dyeing process.

Apparatus required:-

1. Measuring cylinder
2. Measuring pipette
3. Glass beaker
4. Weighing balance
5. Steel glass

Equipment required:-

HTHP dyeing M/C

Chemical and dyestuff required:

- Disperse dye
- Levocol WS (Dispersing agent)
- TRO (Turkey Red Oil)
- $\text{Na}_2\text{S}_2\text{O}_4$ (for reduction clearing process)

Fabric stage: Bleached polyester fabric ready for dyeing.

Recipe and condition:

Fabric weight=10 gm

Disperse dye=2% (stock soln 1%)

Dispersing agent=1%

T.R-Oil=1-2 drops

M:L=1:3

Temperature=130⁰ C

Time=2hrs

For Reduction Clearing process:

NaOH =4gpl (8ml of 5% stock solution)

$\text{Na}_2\text{S}_2\text{O}_4$ =4gpl (8ml of 5% stock solution).

Procedure:

The required amount of disperse dye is taken in a beaker and required amount of T.R-Oil is added to it to make a paste. Equal amount of dispersing agent (Levocol WS) is added, stirred to prepare an aqueous dispersion of disperse dye. The dispersion is further added with warm water to make it 100 ml to prepare 1% stock solution. The beakers of the HTHP-dyeing m/c are removed, thoroughly cleaned. The sample of polyester fabric are cut in to small pieces. The required amount of water as per M.L ratio are taken in the beakers and the disperse dye solutions are equally added to the beakers and the lids are tightly fixed and are fitted with the clamps inside the HTHP m/c. The temperature and the time of the HTHP m/c are set at 130⁰C and 2hours respectively and the m/c is started for dyeing. The process is continued for 2hr and after the preadjusted time the m/c stops automatically. Then the fabric samples are removed from the beakers for after treatment.

After treatment (RC process):

Then the dyed fabric samples are washed in cold water treated in a solution containing 4gpl NaOH (8ml of 5% stock solution) and 4gpl $\text{Na}_2\text{S}_2\text{O}_4$ (8ml of 5% stock solution) at a temperature of 60°C for 30 mins. This process is called as reduction clearing process. The purpose is to remove the unfixed dye molecules and residual carrier from the surface of the fabric to improve its washing and rubbing fastness. fabric is then washed and dried.

conclusion:

Disperse dyes are insoluble in water . Dispersing agent (Levocol WS) is required to prevent the agglomeration of dye molecules . Acidic pH is required for dyeing. It has good stability for high temperature. It has good fastness to light and washing.

EXPERIMENT NO -2

Aim of the Experiment

To dye the given bleached polyester fabric with disperse dye by carrier method.

Theory

Certain chemicals called as carrier such as o-phenyl-phenol, p-phenyl-phenol, dichloro-benzene (tumescol BDN) trichloro-benzene are added to the dye dispersion. They act like a swelling agent to swell the fibre at boiling temperature by which the molecular chain of polyester fibre move apart increasing the space between them to accommodate the dye molecules inside the fibre.

Apparatus Required

1. Measuring cylinder
2. Measuring pipette
3. Glass rod
4. Beaker
5. Weighing Balance
6. Water bath

Dye and chemical required:

Chemicals for dyeing :

1. Disperse dye
2. O-phenyl phenol (carrier)
3. Levocol WS (dispersing agent)
4. T.R-Oil (wetting agent)
5. Acetic acid

Chemicals for R-C process

- NaOH = 4gpl (8ml of 5% stock solution)
- $\text{Na}_2\text{S}_2\text{O}_4$ = 4gpl (8ml of 5% stock solution)

Fabric Stage:

Bleached polyester fabric ready for dyeing.

Recipe and condition

1. Fabric Wt. - 10gms
2. Disperse dye -5% (stock solution -1%)
3. Phenol - 10gpl (10ml of stock solution)
4. T.R.O =1-2 drop
5. Acetic acid = 1-2 ml

For R-C process:

1. NaOH = 4gpl (8ml of 5% stock solution)
2. Na₂S₂O₄ = 4gpl (8ml of 5% stock solution)
3. Time = 2hrs
4. Temperature = 100° C
- 5 . M:L Ratio = 1:30

Procedure :

The required amount of water is taken in a steel glass and the required quantity of carrier (O-Phenol) is added to the water .Phenol liberating agent such as acetic acid of quantity 1ml is added to the steel glass to prepare the blank bath. The blank bath is heated to 60°C and the polyester fabric is worked in the blank bath for 30min. Acetic acid is added to keep the pH at 6.5 . In the case of O-phenyl phenol as carrier, acetic acid help liberating phenol which helps the fibre to swell , 1-2 drops of T.R.O and equal amount of dispersing agent (Levocol WS) is added to make a paste. A little warm water is added to the paste.

Further warm water is added to the dispersion to make it 100ml of 1% stock solution .Then the required amount of dye dispersion is added to the blank bath to prepare the dye bath .The polyester fabric is introduced in the dye bath. Now the temperature of the dye bath is slowly raised to boiling temperature, fabric is regularly stirred and worked for 2hrs . Small amount of carrier is added to the dye bath intermittently,so as to improve easy penetration of the dye molecules .The carrier should not be added at once other wise the dye will rush into the fibre causing uneven dyeing.

R-C process : [After treatment]

Then the dried fabric samples are washed in cold water and treated with a solution containing 4gpl NaOH (8ml of 5% stock solution) and Na₂S₂O₄ (8ml of 5% stock solution) at a temprature of 60° C for 30mins. This process is called as reduction clearing process The purpose is to remove the unfixed dye molecules and residual carrier from the surface of the fabric to improve its washing and rubbing fastness. The fabric is then washed and dried.

EXPT NO - 3

Aim of the Experiment :

To print the given bleached fabric by screen printing method using hot brand reactive dye and finally fixed it by hot air over method.

EXPERIMENT NO -2

Aim of the Experiment

To dye the given bleached polyester fabric with disperse dye by carrier method.

Theory

Certain chemicals called as carrier such as o-phenyl phenol, dichloro benzene (turnoscol BDN) trichloro benzene are added to the dye dispersion. They act like a swelling agent to swell the fibre at boiling temperature by which the chain molecule of polyester fibre move apart increasing the space in between them to accommodate the dye molecules inside the fibre.

Apparatus Required

1. Measuring cylinder
2. Measuring pipette
3. Glass rod
4. Beaker
5. Weighing Balance
6. Water bath

Dye and chemical required

Chemical for dye :

1. Disperse dye
2. O-phenyl phenol (carrier)
3. Levocol WS (dispersing agent)
4. T.R-oil (wetting agent)
5. Acetic acid

Chemical for R-C process

- a. NaOH
- b. Na

Fabric Stage

Bleached polyester fabric ready for dyeing.

Recipe and condition

1. Fabric WT - 10g
2. Disperse dye -5% (stock solution -1%)
3. Phenol - 10gpl (10ml of stock solution)
4. T.R.O =1-2 drops
5. Acetic acid = 1-2 ml

For R-C process:

1. NaOH = 4gpl (8ml of 5% stock solution)
2. Na₂H₂SO₄ =4gpl (8ml of stock solution)
3. Time = 2hr
4. Temperature = 100°C
5. M : L ratio = 1 :30

Procedure :

The required amount of water is taken in a steel glass and the required quantity of carrier (O-phenol) is added to the water. Phenol liberating agent such as acetic acid of the quantity 1ml is added to the steel glass to prepare the blank bath. The blank bath is heated to 260°C and the polyester is worked in the blank bath for 30min. Acetic acid is added to keep the pH at 6.5. In the case of O-phenyl phenol

as carrier acetic acid help liberating phenol which helps the fibre in a beaker , 1-2 drops of T.R.O and equal amount of dispersing agent (Levecol WS) is added to make a paste. A little warm water is added to the paste.

Further the warm water is added for dispersion to make 100ml of 1% stock solution .Then the required amount of dye dispersion is added to the blank bath to prepare the dye bath .The polyester fabric is introduced in the dye bath. Now the temprature of the dye bath is slowly raised to boiling temprature, fabric is regularly stirred and worked for 2hr . Small amount of carriers is added to dye bath , in termitately . So ,as to improve easy penitretion of the dye molecule .The carrier should not be added at once other wise the dye stuff will rush in to the fibre causing uneven dyeing.

R-C process : [After treatement]

Then the dried fabric samples are washed in cold water and treated with a solution containing 4gpl NaoH (8ml of 5% stock solution) and Na2H2So4 containing 4gpl (8ml of 5% stock solution) at a temprature of 600c for 30min. This process is called as reduction curing process The purpose is to remove unfixed dye molecule and recidual carrier from the surface of the fabric to improve its washing and rubbing fastness. The fabric is then washed and dried.

EXPERIMENT NO-3

Aim of the experiment:

To print the given sample of bleached cotton fabric by screen printing method using hot brand reactive dye and finally fix it by thermofixation process .

Apparatus required:-

- Screen
- Steel pot
- Squeezer
- Breaker
- Glass rod
- Weighing balance

Equipment required:

Hot air oven.

Chemicals required:

1. Hot brand reactive dye
2. Urea (hygroscopic agent)
3. Sodium Carbonate (Na_2CO_3) [fixing agent]
4. Thickener (Sodium alginate)

Fabric stage:

Bleached cotton fabric ready for printing.

Recipe and condition:

- Dye - 2 parts.
- Urea - 8 parts.
- Na_2CO_3 - 2 parts.
- Thickener - 60 parts
- Rest water - 28 parts
- Total -100 parts

Condition:

After printing the fabric is immediately dried at 80°C for 5mins in a hot air oven to prevent the dye molecules spread side way of the motif .Then it is fixed at 130°C in the oven for another 5mins.

Procedure:

First the required amount of dye stuff, urea, Na_2CO_3 and few drops of warm water is taken in beaker. 100 ml of water (warm) is taken and 5-6 % of sodium alginate is added to the warm water with constant stirring. It should be carefully observed that no lumps of sodium alginate is present in the thickener. The viscosity of the thickener should be checked properly and warm water or sodium alginate is added to it if required. The viscosity of the thickener is so maintained that it easily penetrate through the openings of the design of the screen. Then 60 % of this thickener is taken and added with the thick dye solution and required quantity of warm water is added and stirred briskly to prepare the printing paste. Urea is added to the paste as a hygroscopic agent which help the moisture retain in the paste results the dye molecules to migrate from the printing paste on to the fabric surface. An alkali Na_2CO_3 is used as a fixing agent. Then sample of bleached cotton fabric are now pinned on the printing table and printed by the printing paste with the help of screen and squeezer as per the design. After printing the fabric samples are immediately dried in a hot air oven at 80°C for 5mins to prevent spreading of dye molecules side way of the motif. Then all the samples are thermofixed in the oven for another 5mins at 130°C . Then the fabric samples are taken from the oven for after treatment.

After treatment:

The printed fabric samples are then treated with 5gpl soap solution in warm water for 10-15 mins to remove the exhausted printing paste from the fabric surface. Then the fabric is washed with cold water and dried.