

Dyeing of Cotton Fabric by Using Different Technique with Azoic Color & Their Comparative study

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Abstract- There are lots of important topics in the subject textile technology to study on. And the project work is perhaps the most liberal & formal way to have a detailed study on these topics. Here we choose topic Study of Dyeing of Cotton Fabrics by Using Different Technique with Azoic Colors & Their Comparative Study. To carry out the entire project we select our college [Now Bangladesh University of Textiles] laboratory since all necessary arrangements are available here. We did not adopt the conventional way to carry out experiments; rather we used a conventional & standard method in this project.

Index Terms- Naphtholation, Diazotization & Coupling.

I. INTENTION BEHIND THIS PROJECT

We had certain objectives to carry out this project work. These are pointed out here.

- a) The world consumption of azoic components in textile dyeing fell from 35*105 ton per annum to 22*103 and till then decline. Some positive research may again lead to use of this versatile dyestuff. There are not a number of research papers that focus this topic. Thus our first intention is to investigate the different method & their comparative study.
- b) We tried to maintain a standard method here. So, the result can be well used by the interested azoic dye user.
- c) The azoic colors are no longer being used exclusively. The paper may bring interest to users.
- d) The azoic dyes comprise a major parts of pigment dyes, vat dyes. They are also being used in producing metal complex dyes. Though these classes of dyes are being banned in many countries, their use in the mentioning dyes is getting more interest day by day. Therefore, obviously this topic is a usable one.

II. INTRODUCTION

The dyes belonging to the azoic class are not “ready made” dyes but are formed in the fibre substance by the dyer or printer from two components usually referred to as naphthols and based or as azoic coupling components and azoic Diaz components respectively. The colored substance formed from these essentially colorless compounds is insoluble in water and therefore the washing fastness of the shades produced is excellent. However, since the insoluble dye is formed in the fibre substance from water-soluble components and since the application is carried out in an aqueous medium, the two compounds combine in the fibre surface and partly suspend in the application bath. This surface deposition of the pigment leads to poor rubbing fastness i.e. when the dyed material is rubbed

against any surface some of the pigment is removed from the material by the rubbing surface.

The pigment thus formed contains an azo group and hence it is called “azoic pigment”. During the formation of the pigment diazotization reaction is use for which ice is required and therefore these pigments are also called “ice color”.

In theory any azoic coupling component can be combined with any diazotized base so that with 30 different naphthols and 50 bases, there are 1500 possible combinations. However in practice all these are not used. This is due to the fact that amongst these 1500 combinations, many of the shades repeat. Some are “dirty” shades and some do not possess adequate fastness properties.

III. MATERIAL & METHODS

MATERIAL:

Fabric used: Cotton woven fabric.

Fabric type: Cotton fabric.

Pretreatment: Scoured, Bleached & Mercerized.

Source: College Lab.

Naphthol used:

- o Naphthol Bs
- o Naphthol ANL


Base used:

- a) Fast Red Rc
- b) Fast Red Gc
- c) Fast Garnet Gc.

Chemicals used:

- I. Hydrochloric acid
- II. Formaldehyde
- III. Caustic soda
- IV. Levelling agent

Equipment used:

1. Dyeing pan
2. Steel Bowl & Mug
3. Beaker
4. Burette
5. Pipette
6. Thermometer
7. Stirring rod
8.  Paper
9. Funnel
10. Tripod
11. Burner
12. Grey scale: to know wash & rubbing fastness [Rating: 1 to 5, where 1 is poor and 5 is excellent].

METHODS:

Naphtholization:

- Cold dissolving method
- Hot dissolving method

Here we applied two types of method:

- First Naphtholization then Diazotization (N/D)
- First Diazotization then Naphtholization (D/N)

Process description:

It has been mentioned earlier that the azoic dyeing process comprises of two operations- naphtholation & coupling. For our convenience, we divided our operations in the steps:

In case of first Naphtholation, we follow:

Naphthol dissolution



Naphtholation



Diazotization



Coupling



Washing off.

In case of first Diazotization, we follow:

Diazotization



Naphthol dissolution



Naphtholation



Coupling



Washing off

Recipe for Naphthols used:

For cold dissolving method

Naphthol AS : 3% owf
Caustic soda : 1 ml/gm
Wetting agent : 10 ml/l
M:L : 1:50
Time : 30 mins.

Naphthol ANL : 3% owf
Caustic soda : 1 ml/gm
Wetting agent : 10 ml/l
M: L : 1:50
Time : 30 mins.

For hot dissolving method

Recipe for Naphthol of per Kg.

Wetting Agent/TR oil = 3-5 g/l
Caustic soda = 0.75 liter
Boiling water = 10 liter
Formaldehyde = 1 liter
NaCl = 15 g/l
M:L = 1:20
Temp = 90°C
Time = 20 min.

Recipe for base color:

Base (Fast Red Rc) :3% owf

Water : 50 ml
Acetic acid : 1 ml/l
HCl : 12 ml/l
M:L : 1:20
Temp : 8°C
Time : 20 mins
pH : 5

Base (Fast Red Gc) :3% owf
Water : 50 ml
Acetic acid : 1 ml/l
HCl : 12 ml/l
M: L : 1:20
Temp : 8°C
Time : 20 mins
pH : 5
Base (Fast Garnet Gc) :3% owf
Water : 50 ml
Acetic acid : 1 ml/l
HCl : 12 ml/l
M: L : 1:20
Temp : 8°C
Time : 20 mins
pH : 5

Calculation:

For g/l = Recipe amount (g/l)* Total liquor (c.c.)/ 1000*Stock Solution%

For % = Recipe amount* Total Liquor

Washing off:

There remain a risk of insoluble pigment becoming formed in the liquor during coupling and being deposited on the surface of the fibre, thereby causing poor rubbing fastness. This always happens to a greater or less extent and is more pronounced in heavy shades. Cotton yarns dyed with azoic colors are very often used for effect threads and lack of rubbing fastness can cause staining on adjacent areas during scouring, bleaching or other finishing operations. Discolorations caused in this manner can be extremely difficult to remove. All azoic dyeing are therefore, as a final operation, washed well with soap or some synthetic dispersing agent in a machine giving adequate agitation or squeezing to dislodge the adhering partials. Liquor contains 2 lb of soap, or 2 pints of Lissapol N, or 10 oz of Lissapol D paste, with 2 lb of soda ash is effective.

For Naphtholation in cold dissolving method. The sequence as below:

Naphthol is pasted with wetting agent



Caustic soda added to it



Clear solution prepare with cold water



Caustic soda is again added for complete dissolution

For Naphtholation in hot dissolving method, the sequence as below:

Naphthol is pasted with wetting agent



Caustic soda added to it
↓
Clear solution prepare with hot water
↓
Caustic soda is again added for complete dissolution
↓
For Diazotization, we follow the ways:
Base is added to water
↓
HCl is added to it along the water
↓
Temperature is maintained around 8°C
↓
Water is added to the liquor 300 ml
↓
Acetic acid is added to maintain the P_H
↓
The bath is kept for 15 mins.
↓
For Coupling, the sequence is as follows:
The diazonium salt is prepared while the Naphtholation is proceeding
↓
The common salt is dissolved in 100 ml water
↓
The Naphtholated fabric is added to the solution
↓
This is now added to the diazotization base solution
↓
The temperature is kept in 8-12°C
↓
30 mins allowed for coupling

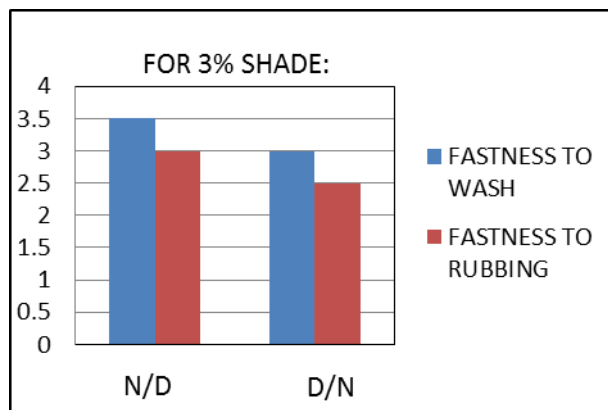
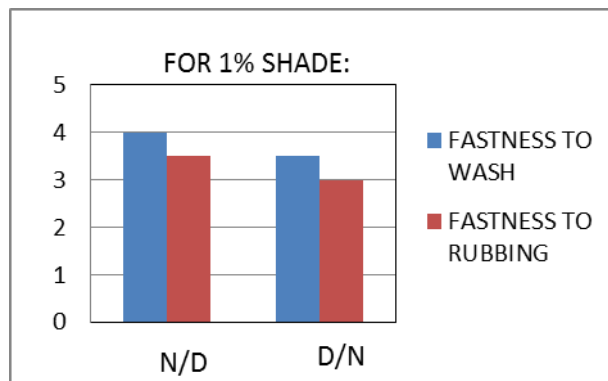
IV. COMPARISON OF RESULTS BETWEEN TWO METHODS

From the dyed sample it is clear that that the shades found in N/D method is deeper & brighter than the shades found in D/N method.

REASON:

P_H Factor: The medium required for coupling is acidic (P_H range 4 to 6). Naphtholation medium is alkaline & diazotization medium is acidic. So in N/D method the coupling occurred in acidic medium. So actual depth & accuracy of color is obtained. On the other hand in D/N method the coupling occurred in alkaline medium. For this reason the actual coupling condition is not maintained. So the shades are duller & lighter.

V. GRAPHICAL PRESENTATION OF FASTNESS



COMMENTS:

Fastness is an important criteria to assess the quality of a color. From the above test & results we can evaluate that-

The wash fastness of color developed by N/D method is better than fastness of color developed by D/N method & the overall wash fastness of azoic color is good.

The rubbing fastness of color developed by N/D method is better than fastness of color developed by D/N method. The fastness of dry rubbing is always better than the wet rubbing & the overall rubbing fastness of azoic color is not so good.

VI. CONCLUSION

Azoic color is now used to a limited extent. But thesis work onto azoic dye is still going on. We have carried out a part of this vast thesis work. There may be many outcomes. Any result may possible which depends upon the accuracy of experiment. We have tried our best to find out the almost accurate result. There were many no of obstacles. But our supervising teacher Kawser Parveen Chowdhury has provide us the maximum support & has helped us in every steps to keep us in good touch in every moment.

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