

Studying the Process of Dyeing Cotton Mixed Fiber Materials with a Mixture of Dyings

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Abstract:

Information is provided on dyeing polyester and cotton blended fabrics using a one-stage, one-bath method. Research results have shown that painting can be done under high temperature and alkaline conditions. This method saves time, energy and water, and improves the production efficiency of equipment. As a result of its use, the consumption of the dye is reduced and its hydrolysis is prevented.

Key words: Fiber, cotton, intron, polyester, dyeing, active, cationic dyes, soaking, solution, ratio, mixture, steaming, pressing, washing.

The dyeing of 50/50 wool/acrylic yarn with a mixture of monotriazine structural reactive dyes was studied.

Hydrolyzed PAN fiber containing nitroamine and carboxyl groups, as well as PEF, PA, S-fibers stitch fabrics, fabrics and knitwear at a temperature of 105-140 °C at a pressure of 1.5-2 atm. It is washed with water under pressure, then painted in a dye solution with a concentration of amide and carboxylic acid or hydrazine of 0.02-0.06 mol/l.

Indian scientists show that the cause of uneven coloring of dyed fabrics is the influence of the linear density of the fibers and the degree of maturity. As a result of research, it is possible to obtain an even color as a result of improving the properties of mixed fibers. Even dyeing of chemical fibers was also observed.

Blends of polyester and cotton fiber in different proportions were treated with ultrasound. Dyeing was carried out with various molecular disperse and active dyes. It was compared with the results of

fabric dyed using the traditional method. As a result, ultrasonic dyeing of polyester fibers is carried out at low temperatures. Auxiliary substances are used to reduce the volume of wastewater.

When dyeing unfixed 50% (permeability 16-20%) and fixed 50% (permeability 2-4%) mats made of PAN fiber, cationic dye, color-evening acetic acid (pH = 4.5-5), bath temperature 80. at -85 0C for 10-20 minutes, and the temperature is increased to 102-104 0C at a rate of 1 degree/5 minutes and carried out for 30-60 minutes. Then it is slowly lowered to 40-50 0C and washed for 20-30 minutes.

Among all fibers, cotton ranks high. Elimination of defects in cotton fabrics is achieved by modifying them during the finishing process.

It is reported that the influence of the type of finishing on the aesthetic and hygienic properties of cotton and cotton-polyester fabrics used for clothing has been studied. Two types of treatments (using starch and elastomers) were carried out on samples of twenty different proportions (100% cotton, 67% cotton and 33% polyester, 50% cotton and 50% polyester, 33% cotton and 67% polyester). Dimensional changes after washing, wrinkle resistance, drapability and breathability were analyzed. The indicators are given.

A method for producing fabric dyed in different colors using one dye composition has been patented. With this method, synthetic fabric threads are dyed, consisting of separate parts and having different orientations. A dye bath for dyeing fabrics should consist of at least two categories: high concentration, medium contrast and low contrast dyes. Allows you to obtain multi-colored fabric based on one dye composition. In those parts of the resulting fabric that have the same base color, images of different colors will appear.

It has been shown that it is possible to dye mixed polyester and cotton fabrics with disperse dyes using a cross-linking agent and an acid catalyst that reacts with the hydroxy groups of cotton fibers. This ensures that dispersed dye molecules enter the amorphous part of the cellulose. Polyester and cotton blend fabrics can be dyed in the same bath.

For dyeing polyester and cotton blended fabrics, it contains a mixture of dispersed or active and dispersed dyes, nonionic surfactants with anti-migrating, thickening and oxyethyl oxygen-saving compounds, since the aqueous thickener contains sodium salt of stimorol, containing a copolymer of stimorol and maleic acid. anhydride. Nonionic surfactant 9/10 BV with oxyethyl oxygen-preserving compound, its vinyl butyl ether and oxyethylene fatty alcohol, is given in the following components, g/l:

Dye -10-40

Sodium salt of stimorol, copolymer of stimorol and maleic anhydride 8-14

Sitanol 9/10 BV vinyl butyl ether oxyethylene fatty alcohol 1-2

Water up to 1 liter.

There is a known method for dyeing textile fibers and fabrics with natural dyes based on quercetin. Natural dyes based on quercetin contain 65-75% quercetin and 25-35% lignocarbohydrate complex in wood leaves. When processing with this substance, 0.2-4.0% of the dry mass is consumed.

In the dyeing method, a group of inorganic salts is selected according to quality: sodium chloride, ferric chloride, aluminum sulfate, sodium carbonate, potassium dichromate, lead sulfate in an amount of 2% relative to the absolutely dry mass.

It has been established that when dyeing cotton-polyester fibers, a polyester component is used in the workpiece, and an active cubic sulfur dye is used in cotton fibers. Dyeing is carried out in two stages, since each dye belongs to a different class, so they were carried out in advance. The

possibilities of one-stage dyeing with mixed dyes have been studied. Various disperse dyes have been studied. Many of these dyes are expensive, so their use in factories is limited. As a result of the search for dyes, it was found that fabrics made from cellulose fibers can be dyed with some disperse dyes. To achieve this condition, it is necessary to pre-treat the cellulose component with water-soluble solvents, such as dimethylolurea.

The following heat treatment ensures the penetration of the dye into the cotton fiber. This fiber is intended for dyeing with water-soluble disperse dyes, as well as dyes soluble in solvents.

a. Nitron and cotton fiber with active dyes possibilities for painting kalavas.

In it, a modified mixture of nitron and cotton in a ratio of 67:33 was selected as the active dye for dyeing kalavas. When studying the dyeing process, an active dye from the company Ostazin was used. The samples were painted with turquoise, blue, yellow and red paints. When studying the dyeing kinetics, the samples dyed turquoise and blue turned out to be correct. Based on the results obtained, the optimal regime for dyeing mixed kalava threads with the indicated dyes using the alkaline method was determined. Based on the results obtained, it was found that the clear color and physical and mechanical parameters of the painted samples improved.

Dyeing cotton mixed kalava in one-bath style.

The dyeing of cotton wool with dyes such as Lanazol and LS in the presence of the auxiliary substance YDR was studied. The above method showed a high level of color rendering and a high level of flat color.

Study of the physical and mechanical properties of cotton fabric intended for the manufacture of high-quality knitted products.

The production of fabrics consisting of a mixture of natural and synthetic fibers is generating interest in increasing the range of knitted products. The physical and mechanical properties of a cotton-nitron mat with elastomeric thread have been studied.

One-step dyeing of mixed carpets consisting of polyester and cellulose fibers. A method of dyeing mixed fabric consisting of polyester and cellulose fibers in one dye bath was studied.

1.2. Dye mixed knits directly with dye evenly.

A comprehensive assessment of the influence of various types of TVV on the color characteristics of cotton-polyamide knitted fabric is given. The results obtained made it possible to divide the dyeing of cotton and polyamide in 1 bath with the tested direct dyes into 2 groups. For each group of dyes, a TVB group has been selected, which allows you to obtain a uniform and intense color on both polyamide and cotton. The concentration, time and temperature parameters of the process of direct dyeing of cotton-polyamide knitted fabric have been optimized.

Dyeing of mixed wool fabrics in a neutral environment using sulfate ethyl sulfanol reactive disperse dyes.

For dyeing wool polyester and blended fabrics at different pH values, 2 samples of anionic sulfate ethyl sulfone reactive dispersion dyes were used. Maximum dye release was observed at pH=7. The results show that there is a bisulfate ethyl sulfone group. Reactive disperse dyes are more suitable for dyeing wool and blended fibers than existing monosulfate ethyl sulfone dyes. All dyed fabrics have good moisture retention properties.

1.3. Study of the combination of active and cationic dyes

The dissertation is devoted to the study of the process of dyeing knitted fabric with a mixture of cotton and nitron fibers. It is known that a number of positive results have been achieved in the production of mixed fiber varieties. At the same time, certain difficulties are encountered during the

chemical finishing of such materials. The used nitron fiber is dyed with cationic dye, and cotton fiber is dyed with anionic and direct dyes, as well as cubic and sulfur dyes. When dyeing cotton nitron fabric with active and cationic dyes in the bath, precipitation of a mixture of these dyes is observed.

Taking into account the above, during the research, the possibilities of dyeing mixed cotton-nitron fiber fabric with active and cationic dyes were studied. In previous works, the possibilities of coloring such mixtures directly, in a mixture of cationic dyes (BezACRYL BLAU GRL 300) and only with an active dye (ChemACTIVE BLUE BRFX) were studied and corresponding technologies were created. When dyeing mixed fiber materials with reactive dyes only, dark colors cannot be obtained, and monochromatic colors are difficult to obtain. In a mixture of active and cationic dye, a stable solution is formed in a very short period of time.

At the first stage of the research, 0.2 and 2% solutions of cationic (BezACRYL BLAU GRL 300) and active (ChemACTIVE BLUE BRFX) dyes were prepared and their optical densities were determined according to the method. The light filter and cuvette were chosen to separate solutions with similar optical densities. The optical densities of the prepared solutions in various filters and cuvettes are presented in Table 1.1.

1.1 – Table Optical densities of the studied dye solutions Depending on the filter and cuvette number

Active dye		Cationic dye	
0.2% solution	2 % solution	0,2 % solution	2 % solution
0,675	1,05	0,47	1,35
0,6	3,0	0,74	3,0
0,27	2,5	0,66	∞
0,25	2,3	0,8	∞
0,44	∞	2,5	∞
0,95	∞	∞	∞
0,95	∞	∞	∞
1,68	∞	∞	∞
1,1	2,0	2,2	2,5

From the data presented in Table 1.1, it is clear that 2% solutions of cationic and active dyes do not have optical densities in the required range (0.1-1.0). 0.2% solutions were selected for further studies. The values of these solutions obtained in cuvettes No. 2 and 5 are not close to each other or have an infinite value for all filters. Light filters 2, 3, 4 were selected for active and cationic dyes in cuvette No. 1. The results obtained were in the optical density range (0.1–1.0), and these optical densities were considered acceptable for further studies. At the second stage of the research, 0.2% solutions of both dyes were prepared and mixed in a ratio of 0:100 – 100:0, and the results in the 2nd filter turned out to be satisfactory, since their optical densities were close. Continuing to use this filter and observing its stability, the results obtained are presented in Table 1.1.

1.2 – table Stability of the color mixtur depending on shelf life

Cation/active b. m. mixture	0.2% early results
1 : 9 in proportion	0,77
2 : 8 in proportion	0,7
3 : 7 in proportion	0,64
4 : 6 in proportion	0,8
5 : 5 in proportion	0,89

6 : 4 in proportion	0,9
7 : 3 in proportion	0,81
8 : 2 in proportion	0,82
9 : 1 in proportion	0,91

As can be seen from the table, solutions with a ratio of 3:7, 5:5 are stable under the influence of time and temperature. The optical densities of these solutions were determined and the possibility of their use in dyeing mixed fabrics was studied. The results of the study are presented in the next section.

1.2.1. The fibrous composition of the studied mixed fabric based on cotton-nitron was tested by the thiocyanate method and it was found that its composition is in the ratio 83:17. Considering that each fabric has its own characteristics, the task was to paint the object evenly. Active and cationic dyes were chosen as dyes. Research began with the study of continuous reactive dyeing methods. Dyeing methods: soaking-steaming, soaking-drying, soaking-heat treatment. A mixed fabric sample was dyed to match each style. In the same way it was painted with a cationic dye. The color fastness of the painted samples was tested when treated with soap. The color intensity of the samples was measured on a Minolta spectrophotometer. The results of the checks are presented in Table 1.3.

Table 1.3 Samples painted using the one-bath dyeing method. quality indicators

Dye name	Soaking-steaming method		Soak and dry method		Squeeze-heat treatment method	
	Color consistency	K / S	Color consistency	K / S	Color consistency	K / S
Active	5 / 4 / 5	4 : 2.5	3 / 3 / 2	4.6 : 4.6	5 / 5 / 4	4.8 : 4.7
Cation	4 / 4 / 4	4.9 : 7	3 / 3 / 3	6 : 6	4 / 5 / 4	4.5 : 10

Among the methods studied, soaking-steaming and soaking-heat treatment received high results, so it was planned to study these methods in more depth. To do this, a two-bath type of dyeing was studied and the sequence of the process was changed, that is, the sequence of active cationic dyes was used:

Option 1: Soaking - spinning - spinning - spinning - steaming - washing - drying.

Option 2: Soak - squeeze - steam - soak - squeeze - steam - wash - dry.

Option 3: Soak - squeeze - steam - wash - soak - squeeze - steam - wash - dry.

The process of two-bath dyeing using the heat treatment method was also studied. The modified process was carried out in the following sequence:

Option 1: Soaking - spinning - spinning - spinning - drying - heat treatment - washing - drying.

Option 2: Soaking - spinning - drying - spinning - spinning - drying - heat treatment - washing - drying.

Option 3: Soaking - spinning - drying - heat treatment - washing - spinning - spinning - drying - heat treatment - washing - drying.

Based on this, the sequence of dyes was changed, i.e. a soaking-heat treatment method based on a sequence of cationic and active dyes was studied.

Table 1.2 Quality indicators of samples painted using the two-bath painting method.

Dye name	1 – option		2 – option		3 – option	
	Color consistency	K / S	Color consistency	K / S	Color consistency	K / S
Shim - steam-active/cationic	4 / 3 / 4	12 : 4.8	4 / 5 / 5	4.7 : 4.4	4 / 3 / 3	15 : 18
Pants - t/work active/cation	5 / 5 / 5	4.4 : 4.4	4 / 5 / 4	10 : 12	4 / 4 / 5	28 : 28
Pants - t/work cation/active	5 / 4 / 5	7 : 11	4 / 5 / 5	7 : 9	4 / 4 / 5	9 : 7

In the soaking-steaming method, the 2nd option was chosen based on the sequence of active and cationic dyes. Option 1 was chosen according to the above sequence of the soaking - heat treatment method. Option 2 was selected using the soak-heat treatment method based on the sequence of the cation and active dye. Fabric samples dyed according to the selected options have a smooth color, are resistant to soap treatments, and are color stable.

Reactive and cationic dyes were dyed using a one-bath, continuous method. The resistance to soapy water and the color intensity of dyed samples of mixed fabrics were determined. A two-bath method of continuous dyeing with active dye was studied. In this case, a mixed fabric sample was boiled in a mixed dye solution for 30 minutes and dyed in sequence with reactive dyes for 15 minutes and cationic dyes for 15 minutes.

The results obtained are presented in the table. Table 1.4

Continuous method with active and cationic dye quality indicators of painted samples

Dye name	Continuous dyeing method	
	Color consistency	Color intensity
Cation	3 / 4 / 4	2 : 4,5
Active	5 / 5 / 5	4,5 : 3,5
30 minutes with asset	4 / 5 / 5	5 : 4,9
15 minutes with asset	5 / 5 / 5	4,7 : 4,6

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