Volume 2, Issue 12, December - 2024 **ISSN (E):** 2938-3811

STUDY OF THE EFFECT OF "VES ANTI CREASE SB-38" BASED APPRET IN THE CHEMICAL FINISHING PROCESS OF COTTON-NITRON FIBER TEXTILE MATERIALS

Khasanova Makhfuza Shukhratovna
PhD, Associate Professor of the Department “Chemical and Printing Engineering”
of Tashkent Institute of Textile and Light Industry, Tashkent, Uzbekistan.
maxfuza.68@mail.ru

Abstract
By treating fabrics with various chemicals under certain conditions, their properties and qualities are changed according to the purpose. Blended fabrics are produced primarily using chemical fibers and threads, the share of which in the total volume of raw materials processed by the textile industry is over 97%, about 3% is natural fibers: silk, cotton and wool, which are used for the production of dress, haberdashery, lining and shirt fabrics. As a result of finishing, yarn yarns will not have the property of being completely wrinkle-free. Therefore, it is desirable to give them the property of low shrinkage. Mixed fiber fabrics containing hydrocellulose and cellulose fibers have sufficient plastic deformation properties. Such mixed fabrics wrinkle quickly. In the final finishing processes, blends of fabrics containing natural and man-made fibers were treated with a sizing compound using Ves Anti Crease SB-38 to achieve a low-crease, low-shrink finish. The effect of finishing agents concentration on the color characteristics of mixed fabrics was studied.

Keywords: Mixed fiber fabric, cotton-nitron, low permeability, low shrinkage, total opening angle, appret, dyeing.

Introduction

The domestic and foreign range of materials from mixtures of natural and chemical fibers is systematically expanding. This is due to the following reasons: the need to compensate for the deficit of natural fibers by increasing production and expanding the scope of application of chemical fibers; the possibility of purposefully imparting a range of valuable properties to products - dimensional stability, wear resistance, hydrophilicity or hydrophobicity, etc.; the need to replace natural fibers with valuable consumer properties with chemical fibers and their mixtures in the field of technical application [1].

For the textile industry of the Republic of Uzbekistan, the development of a comprehensive technology for processing PAN fiber nitron in pure form and in a mixture with cotton fiber is an urgent task. This work is based on the need to expand the scope of use of local fibrous raw materials - nitron fiber. High thermal insulation properties, the ability to regulate its physical and mechanical properties during the molding process, as well as its resistance to the effects of

light and weather are the basis for obtaining blended fabrics and knitted fabrics with new properties.

Chemicals that have been absorbed into the fabric through chemical treatment may be washed off, partially washed off, or not washed at all after three or four washes. Low-wash and non-washable preparations give fabrics properties such as low wrinkling, no wrinkling, and low penetration. The chemical structure, composition, and activity of the preparations used for chemical treatment determine their main properties. Anti-wrinkle and anti-shrink impregnation is carried out for cotton, linen and viscose fabrics and is a treatment during which a resin film (metazin and carbamol) is formed, reducing swelling and wrinkling of the fibers. As a result, a resin film is formed on the surface of the fabric, which increases wrinkle resistance by 35 - 45%. Anti-wrinkle finishing of cotton fabrics is obtained by impregnating them with synthetic preparations (carbamol, carbamol CEM, metazin, etamone DS, etc.) in a universal installation, followed by drying and heat treatment [2].

Aralash tolali matolarga makhsus hossalar beris yoki ularni tekhnologik zharayonlarini kulay olib borish maksadida turli yakuniy pardoz usullari kullaniladi [3].

Methods

By giving fabrics the property of low creasing or no creasing, it is necessary to provide for the immediate return of woven materials to their original shape and smoothing of wrinkled areas when they are freed from the action of the force causing creasing. Usually, this indicator is expressed quantitatively in terms of the smoothing angle of the folded areas of the fabric freed from the creasing force in the warp and weft (or their sum), determined in degrees. If the angle of recovery of the creasing of the finished yarn fabric is $75\text{-}80^0$, then the indicator of the finished fabric can be $130\text{-}150^0$ (180° when fully restored). The elastic-elastic property of the fiber determines the creasing of fibrous materials and is closely related to the molecular, especially supramolecular, structure of the polymer (fiber). Due to the fact that hydrocellulose and cellulose-based fibers (cotton, viscose fibers) have sufficient plastic deformation properties, they are easily wrinkled.

When testing fabrics for creasing, the material sample is bent and then crushed under load. After the sample is unloaded, the bending strains that are lost and those that are not lost are determined by measuring the angle formed on the sides of the bent sample. In the first, the bending line of the sample lies in the horizontal plane. In these tests, the weight of the material has a significant effect on the results obtained. When tested according to the second type, the bending line is located in the vertical plane.

The opening angle is the result of the manifestation of the reverse part of the deformation and serves as a measure of the resistance to creasing.

According to GOST 9782, the resistance to creasing of fabrics is characterized by the opening (restoration) angle of a rectangular or T-shaped sample.

There are many methods of giving final finishing to fabrics based on cotton fiber. In the scientific work, mixed fiber fabrics with a finish based on Ves Anti Crease SB-38 and cotton fiber fabrics for comparison were given a final finish based on the following technological

sequence: Soaking (Ves Anti Crease SB-38 15 g/l; NaH_2PO_4 -10 g/l; PVA- 25 g/l; pH- 10÷11; T- 30^{0}C; Time- 1 minute) → Compression 90% → Drying 105^{0}C, τ = 5 minutes → Heat treatment 140^{0}C for 10 minutes.

Results

The quality of the coating of the fabric surface with a new composition of the finishing agent and the indicators of low permeability and low wrinkle resistance of the fabrics were the objectives of the research work, the concentration of the Ves Anti Crease SB-38 preparation in the composition of the treatment bath was studied in the range from 0% to 10% and the optimal option was selected. The cotton/nitron fiber and cotton fabrics taken as the object were treated with a composition containing Ves Anti Crease SB-38 -15g/l; NaH_2PO_4 -10 g/l; PVA- 25 g/l in an environment with a pH of 10÷11 and a temperature of 30ºC.

As a result of this process, the polycondensation reaction occurring inside the fiber accelerates, preventing the transfer of the finishing agent from one place to another during drying. The functional groups of the fiber are activated and during thermal treatment the finishing agent binds well to the fiber and the wrinkle resistance decreases.

In order to give the fabrics a low-wrinkle and low-permeability effect, mixed fiber fabrics were treated with different concentrations of finishing agents. Based on the results of the study, the overall opening angle and low-permeability of the fabrics were determined.

Table-1 The effect of Ves Anti Crease SB-38 concentration on the quality parameters of cotton and cotton-nitron blended fiber fabrics

Ves Anti Crease SB-38 concentration, g/l	Total opening angle, degrees		Shrinkage, %	
	Cotton	Cotton/nitron	Cotton	Cotton/nitron
0	130	150	5	2
10	136	158	5	2
20	137	162	4	3
30	138	170	3	2
40	135	178	2	1
50	133	165	2	1

Note: Final finishing mode: Ves Anti Crease SB-38 - 0÷50g/l; NaH_2PO_4 –10 g/l; PVA- 25 g/l; pH- 10÷11; T-30ºC; processing duration - 1 minute.

An increase in the total opening angle of mixed fiber fabrics was observed at a solution of 30 g/l of Ves Anti Crease SB-38, while the permeability of the fabric decreased at a solution of 40 g/l of VesAnti CreaseSB-38.

The finishing agent is bound to the fabric by up to 4-5%. The fact that the washing of the finishing agent is an average of 0.5% indicates a high degree of binding of the finishing agent to the fabric. To increase the elastic-elastic deformation properties of fabrics, it is necessary to stabilize the fiber structure. For this, additional strong covalent bonds are introduced into the fiber structure, that is, "stitches" are formed between the fiber macromolecules. To give the fabric low wrinkling properties in the wet state, cross-links are formed between the

macromolecules of the spun fiber, since the interfibril space in the spun fiber increases, making it easier for chemical compounds that form the stitch to penetrate between the macromolecules. When the fiber, whose macromolecules or fibril structures are intertwined, is spun, that is, in the wet state, its tendency to plastic deformation disappears. However, the fabric that has undergone such a process cannot demonstrate high wrinkle resistance in the dry state. During drying of the fabric, due to dehydration of the fiber, the fibrils come closer to each other and the tension (strength) of the cross-links between the cellulose macromolecules weakens. As a result, the displacement of the structural elements relative to each other under the influence of external forces is preserved.

It is known that the shape retention properties of textile materials and products made from them are of great importance. The shapes of cellulose fabrics and products based on them are not stable. Therefore, it is advisable to stabilize their shape in chemical finishing processes. Fabrics finished with finishes retain their shape sufficiently, but at the same time, subsequent processing processes can cause some difficulties. For example, it becomes more difficult to iron out creases or sew various products on fabrics that have been given low-wrinkle properties using pre-condensate. In order to study the effect of various finishes on the permeability and wrinkle properties of fabrics, experimental work was carried out using sodium dihydrogen phosphate and polyvinyl acetate (PVA) compounds in the above regime [4].

By using polybasic carboxylic acids as a sewing agent, an environmentally safe technology for imparting low permeability properties to cotton fabrics has been proposed [5].

When determining the optimal concentration of NaH_2PO_4 for mixed fiber samples, a concentration of NaH_2PO_4 of 9 g/l was considered optimal. Then, when the effect of PVA concentration on the quality parameters of the samples was studied, the total opening angle of cotton/nitron and cotton fiber fabrics was 132 and 163 degrees, respectively. The results of the effect of NaH_2PO_4 concentration on the quality parameters of fiber fabrics are presented in table 2.

Table-2 The effect of NaH_2PO_4 concentration on the quality parameters of cotton and cotton-nitron blended fiber fabrics

NaH_2PO_4 concentration	Total opening angle, degrees		Shrinkage, %	
	Cotton	Cotton/nitron	Cotton	Cotton/nitron
0	120	140	5	2
3	130	145	5	2
6	135	150	4	2
9	145	160	3	1
12	143	155	2	1
15	140	153	2	0

Note: Final finishing mode: Ves Anti Crease SB-38 -15 g/l; NaH_2PO_4 –(0÷15) g/l; PVA- 25 g/l; pH- 10÷11; T-30ºC; processing duration - 1 minute.

In experiments to determine the role of NaH_2PO_4 in the finishing process, when the concentration of NaH_2PO_4 was 6 g/l, the UOB of cotton fiber was 140, and the UOB of cotton nitron fiber fabrics was 148^0C. Then, the effect of PVA concentration on the quality indicators of the samples was studied. The results obtained are presented in table 3.

Table-3 Effect of PVA concentration on quality parameters of cotton and cotton-nitron mixed fiber fabrics

PVA concentration	Total opening angle, degrees		Shrinkage, %	
	Cotton	Cotton/nitron	Cotton	Cotton/nitron
0	120	155	5	2
5	130	160	4	2
10	132	163	3	2
15	136	166	2	1
20	138	162	2	1
25	135	160	2	1

Note: Final finishing mode: Ves Anti Crease SB-38 -15g/l; NaH_2PO_4 –9 g/l; PVA- 0÷25 g/l; pH- 10÷11; T-30ºC; processing duration - 1 minute

The PVA concentration of 15 g/l was found to be acceptable for both samples. In order to impart anti-wrinkle and anti-shrink properties, the chemicals attached to the finished fabrics, including the PVA emulsion, should not be washed off. Depending on the type of chemical bonds and the reaction that occurs in the finishing substances that bind to the fabric fibers and cover the surface and fill the gaps in the fabric structure, we can impart anti-wrinkle and anti-shrink properties to the fabrics. It was found that the UOB opening angle of the mixed fiber fabric is 10-15ºC higher than that of cotton fiber, and the fabric permeability is 50% lower. According to the results presented, the maximum indicator of the total opening angle gives different results in cotton and cotton nitron fiber fabrics with changes in different components of the finishing. In this case, under the influence of a 15 g/l solution of Ves Anti Crease SB-38, the total opening angle (GCA) of cotton fiber fabrics was 136 degrees, and the GCA of cotton nitron fiber fabrics was 158.

As a result of the study of the effect of the components in the appret on the quality of the mixed fiber fabric, the optimal concentration, temperature and process duration of each component were selected, and a mode of imparting properties of low shrinkage and low permeability to cotton nitron fiber fabrics was developed. Compared to the composition and procedure of the available final finishing:

Traditional Technology:

VesAntiCrease SB-38 – 15 g/l;

NaH_2PO_4 – 10 g/l;

PVA – 25 g/l;

up to pH=10,

T=60ºC, τ = 30 sec → Compression 90±1% → Drying T=105^{0}C, τ = 5 min → Thermal treatment T=140ºC, τ = 5 min.

Proposed Technology:

VesAntiCreaseSB-38 – 15 g/l;
NaH_2PO_4 - 9 g/l;
PVA- 15 g/l;
pH- 10÷11;
T-30ºC; τ = 1min → Compression 90% → Drying T=105ºC, τ = 5 min→ Thermal treatment T=140ºC, τ = 5 min.

It is known that the final finishing process is carried out on fabrics dyed or printed. If the fabrics are given a final finishing in a bleached or dyed form, then they are finished in a wet state, and if the fabric is finished after printing, then it is subjected to the final finishing process in a dry state [6].

The proposed finishing process is intended to provide fabrics with low shrinkage and low wrinkling properties while the fabrics are being dyed. Considering that the dyeing process is carried out after the dyeing process of mixed fiber fabrics, it is important to study the changes in their color parameters. The reason for the decrease in color intensity of the finished fabrics is that as a result of the final finishing, a fabric finishing film is formed and the color of the fabric becomes slightly dull. In order to improve these parameters, a combined dyeing and final finishing process was tested. That is, the final top coat was added to the dye bath at 60^{0}C 10 minutes before the end of the process. Table 4 shows the color intensity indicators of mixed fiber fabrics apprized at different pressures.

Table-4 Effect of appret content on color intensity of dyed fabrics

Samples	Color intensity, K/S		
	Dyed	Primed after dyeing	The dyeing and finishing process was carried out together.
Cotton	18	13	17
Cotton/nitron	19	15	18

The results in the table show that the treatment of fabrics in one bath with dyeing and finishing components gives high indicators of color intensity of fabrics.

The color fastness of dyes to various physicochemical effects depends on the nature of the bond between the dye and the fiber, the water solubility of the dye in the fiber pores. The light fastness of the color mainly depends on the chromophore system of the dye, its concentration in the fiber, the type of bond and the nature of the fiber. For example, anthraquinone, phthalocyanine chromophore systems are more light fast than azo dyes. Yarns and fabrics are dyed mainly in aqueous conditions, including the active dye reacts with water molecules,

hydrolyzes and, while retaining its color, loses its activity and is wasted. It complicates the post-dyeing washing process because the dyestuffs that have hydrolyzed and are intermolecularly bound to the fiber cannot be washed out, resulting in reduced color fastness [7]. Due to reduced color fastness, a smooth, even color is not produced on the fabric.

As a result of the final finishing of the dyed fabrics with Ves Anti Srease SB, the color fastness of the fabrics to wet and dry processing was determined, and the results of the study are included in table 5.

Table-5 Effect of color fastness of dyed and apprized fabrics on wet and dry processes (evaluated in points)

Fabric samples		Color fastness		Frictional strength	
		to soap	to sweat	dry	wet
Unappretized dyed fabric	Cotton	5/3/3	5/3/3	5/5/5	5/4/4
	Cotton/nitron	5/3/4	5/3/3	5/5/5	5/5/4
Dyed fabric treated with Ves Anti Srease SB-38	Cotton	5/5/5	5/5/5	5/5/5	5/5/4
	Cotton/nitron	5/5/5	5/5/5	5/5/5	5/5/4

Conclusion

When mixed fiber fabrics are treated with Ves Anti Srease SB-38 based finishing, the water-based finishing, i.e., in soapy water, perspiration fastness solution, and wet rubbing, is higher than that of untreated dyed fabrics. From this, it can be concluded that the color performance of cotton nitron fiber blended fabrics treated with finishings that provide low-wrinkle and low-permeability properties does not lose its properties as a result of finishing.

References

1. www.textinfo.ru The Present and Future of Chemical Fibers. A Look into the Next Century.
2. B. Buzov, N. Alymenkova “Materials Science in the Production of Light Industry Products (Sewing Production)”, Moscow, 2004.
3. https://moodle.kstu.ru/pluginfile.php/229115/mod
4. M.Kh. Mirzakhmedova, D.B. Khudayberdieva, A.A. Miratayev, N.S. Amirova. To study the possibilities of using composite finishes based on formaldehyde-free preparations to increase the operational properties of cotton fiber fabrics. Composite materials. 2021 No. 2, pp. 189-193.
5. Shubina V.V., Kurnykina E.Yu. Application of new crosslinking agents in low-wrinkle finishing of cotton fabrics https://cyberleninka.ru
6. M.Kh. Mirzakhmedova, D.B. Khudaiberdieva, M.Z. Abdukarimov, G.K. Sadikova. Influence of the nature of active dyes on the quality of finishing and dyeing of silk fabrics in a combined method. Technology of the textile industry, 2017, No. 1, pp. 139-141
7. A. Nabiyeva, M.Z. Abdukarimova, M.Sh. Khasanova "Chemical Technology of Textile Products" textbook. - Tashkent: TITLI, 2017, ISBN 9789943381-872. 240 p.