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STUDY OF THE POSSIBILITIES OF PATTERNING WITH THE USE OF ACTIVE AND DISPERSING DYES ON FABRICS WITH A MIXED STRUCTURE

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Annotation.

The article investigates the possibility of using active printing and dispersed dyes in mixed fabrics based on cotton and polyester fibers in three proportions.

Keyword

Printing, cotton and polyester fibers

Fabrics containing cotton and polyester fibers are widely used in the manufacture of household and special outerwear for different seasons with different ornaments and patterns. The range of cotton and polyester fabrics is available in dyed or floral prints. In addition to the aforementioned color properties, the accuracy of the floral border on the surface of the fabric and the fullness of the ink to the fiber structure, while the ink-dyed fabric is oriented towards the same color intensity, saturation, smoothness, strength and other dye properties in both fiber components. The coloristic, consumer and technological properties of patterned fabrics depend on the type and number of components in the pattern printing ink, the pattern printing process and the fiber ratio. A number of studies are carried out by domestic and foreign scientists to improve the technology of printing patterns on fabrics containing polyester and cotton fibers, and to increase the efficiency of the process.

Of particular importance in this direction are the studies carried out by A.V. Fevalitin [1]. The author has achieved positive results while simultaneously performing the pattern printing process and the final decoration of fabrics containing cotton and polyester fibers.

There are technologies for thermal printing (copying) of fabrics from a mixture of cotton and polyester fibers, which use dispersed dyes with sublimation properties [2]. In the work of Chinese scientists [3], pattern printing on fabric with a mixture of cotton-polyester fibers consists of the following stages: preparation of a dye for pattern printing, the process of applying pattern printing itself, fixing the dye on the fiber macromolecule, and washing. The pattern ink is composed of 1-20% starch thickener, 0.01-2% SAM, 0.02-2% dispersant, 15% reactive dye, 15% dispersed dye and water. The pattern is drawn on special paper with color printed ink. It is passed between the paper and the heated wall of the fabric, at which point the pattern on the paper transfers to the fabric.

Scientists from the People's Republic of China have also presented in a protected scientific study the technology of printing patterns by a one-step method using a mixture of cotton and polyester fibers in fabrics with active and dispersed dyes [4]. According to the results of the study, first, the dispersed dye is thoroughly mixed with the thickener, and then the active dye is added, and the electrolyte and the alkaline agent are added simultaneously with the dye. Heat treatment temperature for fixing the dye on the fiber is 205-215^{0}C, duration is 2-4 minutes. The dye, which does not react with the fibrous substrate, is removed from the fabric by washing at a temperature of 1350 ° C. The pattern formed on the surface of the fabric is distinguished by its brightness, resistance to various influences and a high utilization rate of the active dye. [5] In the course of the study, the technology of printing colors with a mixture of active and dispersed dyes on a fabric with a mixture of cotton-polyester fibers was protected.

The literature describes the technology of two-stage patterned printing on blends of cotton and polyester with dispersants and reactive dyes [6]. With this technology, the fabric is first prepared and the pattern is applied in a neutral environment, and then the fabric is dried. The absence of an alkaline agent in the patterned print ensures the stability of the active dye.

Due to the unique properties of polyester and cotton fibers, their mixture is widely used in industry. When dyeing textile materials containing hydrophilic and hydrophobic fibers, it is especially important to select the class of dye or their mixture, as well as textile fillers and dyeing technology that are part of the dye solution. The use of a combination of dyes when dyeing mixed fibrous materials allows an intense and even color to be obtained [7].

It is known that high-quality patterns can be formed in cotton fiber fabrics with active, cubic and insoluble dyes, as well as in polyester fiber fabrics using dispersed dyes. Due to the fact that the fabrics participating in the study are intended for sewing outerwear, in the studied range were excluded from the study, cubic dyes, which in turn are considered less resistant to friction, and were also excluded and insoluble in water dyes, which show low characteristics when exposed to water on them. The possibility of using active and dispersed dyes for pattern printing on three different types of fabrics containing cotton and polyester fibers was studied.

In the course of scientific research, the possibility of printing patterns in one step was studied using a dispersant and an active dye. In this case, the printing process was carried out by heat treatment at 1600C after drying the printed patterns. The qualitative characteristics of samples with patterned printing with active Chemactive RED W-3B and dispersed mixtures of magenta color are shown in Table 1.

Table 1.

Quality metrics for patterned samples using Active Chemactive RED W-3B and magenta color dispersions

Samples Cotton/PE	Quality indicators of patterned print					
	Friction resistance in points		Accuracy of pattern boundaries in%	Colour intesity, K/S		Soap resistance
	Dry	Wet		Front side	Back side	
100% cotton	4/4	4/3	100	27	14	4/3/3
75/25	4,5/4,5	4,5/3,5	106	18	11	3/4/4
57/43	4,5/4	4,5/3	112	21	12	3,5/3/4,5
44/56	5/4,5	4,5/3,5	113	23	12	4,5/4,5/4,5

The data in the table shows that it is possible to obtain vibrant colors when printing patterns in one operation using two classes of dyes. However, poor boundary line accuracy and low color fastness indicate that the reactive dye is hydrolyzed and the amount of covalent bonding to the fiber is low due to the presence of an alkaline agent in the patterning dye. Therefore, in subsequent studies, a thermal treatment sequence was used: the alkaline agent was removed from the pattern dye, the patterns were printed in a neutral medium on the samples, and then they were soaked in an alkaline solution.

Table 2.

Quality indicators of samples impregnated with an alkaline solution by printing patterns with the active substance Chemactive RED W-3B and dispersed mixtures of violet color.

Samples Cotton/PE	Quality indicators of patterned print					
	Friction resistance in points		Accuracy of pattern boundaries in%	Colour intesity, K/S		Soap resistance
	Dry	Wet		Front side	Back side	
100% cotton	5/5	4,5/5	100	30	16	5/4/4
75/25	5/5	5/4,5	101	24	15	4,5/4,5/5
57/43	5/5	5/4,5	102	22	11	5/5/5
44/56	5/5	5/5	100	24	13	5/5/5

According to the results of the research presented in the table, a two-stage method of printing patterns with active and dispersed dyes is proposed for three different assortments of fabrics containing cotton and polyester fibers in different proportions. In this case, when printing a pattern on the surface of the

fabric with a dye in a neutral medium, the dye molecule is uniformly absorbed on the surface of the fabric and diffuses to the active centers of the fiber. Diffusion of the dye molecule into the fiber continues until balance is achieved in the system. When the dried printed fabric is impregnated with an alkaline solution, the dye molecules covalently bond with the active sites of the fiber to these active sites. Thus, the color fastness of the formed patterns and the precision of the pattern border gave a positive result. In addition, the absence of an alkaline agent in the dye reduced its hydrolysis, which led to slightly higher color intensity in samples containing more cotton fiber.

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