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INTENSIFICATION OF THE PROCESS OF DYING SILK FABRICS WITH ACTIVE DYES

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Abstract: *The results of studying the possibilities of textile auxiliaries chitosan for intensifying the process of dyeing silk fabric with reactive dyes are presented. It was found that the used intensifiers chitosan increase the fixation degree of reactive dyes.*

Keywords: *chitosan, silk fabric, reactive dyes, dyeing, fixation degree.*

Currently, taking into account market relations and the growing competition between textile enterprises in the context of increasing requirements for the quality of textile materials, there is a tendency to create resource-saving and environmentally friendly technologies using domestic local resources. Undoubtedly, at present, interest in aminopolysaccharides, especially in chitosan (ChZ), which has a number of valuable properties, such as biodegradability, environmental friendliness, film-forming and thickening properties, is increasing [1]. It is known that chitosan has antibacterial properties, good biological activity, and the ability to form film. In addition to these properties, chitosan undergoes biological degradation without the formation of harmful substances and is obtained by chemical modification of renewable natural compounds and is an environmentally friendly biodegradable polymer.

We have obtained chitosan from the bee dead by a chemical method. The chemical method is based on deproteination, demineralization and depigmentation using chemical reagents, acids, alkalis, peroxides, etc. [2-4].

A significant reserve of raw materials for the production of chitosan is the sub-population of bees Apis Mellifera

Fig. 1 .Apis Mellifera Honey bees (bringing honey)

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It is gratifying that chitosan is actively used even in the textile industry for dyeing, printing and finishing various natural fabrics, such as wool, cotton and silk [5-7]. The unique structure of the chitosan macromolecule and the presence of a positive charge expands the scope of its application. It is known that it is possible to intensify the dyeing process when fixing dyes by introducing organic compounds so that the substance can be easily removed and biologically degraded. In turn, the use of intensifiers provides for high economic efficiency and minimum concentration in the dye bath [8-9].

Reactive dyes fundamentally differ from dyes of other classes in their ability to adhere to the fiber during the dyeing process due to the formation of a stable covalent chemical bond with the fiber. These dyes consist of molecules that determine the color (i.e., chromogen) and active groups that can chemically bind to the fiber. By chemical nature, these are derivatives of cyanuric chloride or vinyl sulfone. Depending on their structure, they are more or less reactive. Cellulose fibers, natural silk, nylon are dyed with active dyes. Despite the widespread use of chitosan for printing as a thickener [10], its introduction into the dyeing of silk fabrics is hampered by the lack of technology.

In comparison with dyes of other classes, the considered active dyes have a number of advantages. First of all, it should be noted that they give exceptionally bright and pure shades with a comparative ease of use, and have a good leveling ability. The colors obtained have a high resistance to wet processing and dry cleaning, as well as a satisfactory resistance to light. We dye natural silk with active dyes according to a periodic technology using a two-stage alkaline method. In the second stage, in a slightly alkaline medium (at pH 10.0-10.5), a covalent bond is formed between the dye and silk fibroin, which discolors the high color fastness to washing. The two-stage technology helps to reduce the hydrolysis of the active dye, which is accelerated in an alkaline medium, simultaneously with the main reaction of the dye with silk. In the alkaline method, the dyeing solution consists of an active dye, an electrolyte (sodium sulfate); in the second stage of the methods, an alkaline agent sodium carbonate (Na_2CO_3) is introduced.

For the study, we used synthesized chitosan from the dead bees Apis Mellifera., Crepe de Chine fabric produced by Bukhara Brilliant Silk, as well as an active dye “active red S-3B-150” (DCTA).

A composition for dyeing natural silk with active dyes, containing an active dye, sodium carbonate, electrolyte and water, additionally contains a dye intensifier, which is used as chitosan, and sodium sulfate (Na2SO4) is used as an electrolyte, which increases the selectivity of the dye from the solution to silk. Sodium carbonate is used as an alkaline agent, which creates an optimal pH environment for the reaction of the dye with silk. With the following ratio of components, g / l: dye - 0.4 g / l; sodium carbonate - 2 g / l; sodium sulfate - 20 g / l; chitosan - 0.1-1.5 g / l; water - up to 1 liter. The claimed composition is prepared in a known manner; into the measured amount of softened water with vigorous stirring with a stirrer, to a concentration of 0.4 g / l (or 3% by weight of silk), then stir until the dye is completely dissolved at a temperature of 25-30^{0}C, then add chitosan.[11-13]

We used synthesized chitosan from Apis Mellifera bees' dead bees (Table 1).

Table 1.Test results of CHITOSAN Apis Mellifera

MM × 103 (XZ) = 282,000; SDA (XZ) = 82.4%

№	Indicator name	Actually
1.	Appearance	powder
2.	Color	Light beige

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3.	Solubility	Acetic and hydrochloric acid
4.	Potential of hydrogen, pH	5,4

The synthesized chitosan as an intensifier was further used to dye the crepe fabric of Crepe de Chine. Process data and examples of results are shown in Table 2.

Table 2

№	Name of chemicals	Known	Suggested composition. examples		
		1	2	3	4
1	Dye, g / l	0,6	0,4	0,4	0,4
2	Sodium carbonate, g / l	2,0	2,0	1,5	1,5
3	Sodium sulfate, g / l	20	15	15	10
4	Chitosan, g / l	-	0,5	1,0	1,5

Effect of chitosan on the degree of fixation, penetration of dyes and the intensity of color when dyeing silk fabrics

Table 3

The name of indicators		
Indicators	Colorant without intensifier, g / l	colorant + Chitosan 1.0 g / l
Fixation degree,%	34	37
Penetration rate,%	68	74
Color intensity, K / S	5.0	6.8
Increase K / S,%	-	36
Durability of colors, point		
To wash	4/4/5	5/5/5
To friction To wet To dry	 4/5 5/4	 5/5 5/5

Table 3 shows that the proposed composition at a concentration of 1.0 g / l leads to an increase in the degree of fixation of the active dye by 37 g/ kg.

Thus, the biodegradable polymer chitosan provides a high penetration rate of the active dye and a uniform, intense color. The work is carried out on the basis of an applied grant FZ 2019081633. Synthesis of chitin and chitosan from the local death of Apis Mellifera bees and obtaining biodegradable polymer films on their basis (2020-2022)

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