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INTENSIFICATION OF THE PROCESS OF DYEING POLYESTER FABRICS BY DISPERSIVE DYES UNDER CONDITIONS OF ACOUSTIC VIBRATIONS OF ULTRASONIC RANGE

ИНТЕНСИФИКАЦИЯ ПРОЦЕССА КРАШЕНИЯ ПОЛИЭФИРНЫХ ТКАНЕЙ ДИСПЕРСНЫМИ КРАСИТЕЛЯМИ В УСЛОВИЯХ АКУСТИЧЕСКИХ КОЛЕБАНИЙ УЛЬТРАЗВУКОВОГО ДИАПАЗОНА

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Key words: dyeing, polyester fibers, disperse dyes, ultrasound, colorfastness.
Ключевые слова: крашение, полиэфирные волокна, дисперсные красители, ультразвук, устойчивость окраски

Abstract. The authors of the work carried out experimental studies on the dyeing of polyester fabrics by dispersed dyes under conditions of acoustic oscillations of the ultrasonic range affecting the dyeing solution. The results show that an increase in the power and temperature of the of the dyeing bath can reduce the temperature and time of the dyeing process of polyester fabrics with dispersed dyes, increase the color stability to physicomechanical influences.

Аннотация. Авторами работы проведены экспериментальные исследования по крашению полиэфирных тканей дисперсными красителями в условиях воздействия акустических колебаний ультразвукового диапазона на красильный раствор. Результаты показывают, что увеличение мощности и температуры озвучивания красильной ванны позволяют снизить температуру и время протекания процесса крашения полиэфирных тканей дисперсными красителями, повышают устойчивость окраски к физико-механическим воздействиям.

INTRODUCTION

For the dyeing of textile materials from polyester fibers, dispersed dyes widely used, which have a small molecule size, are polar organic compounds that are poorly soluble in water [1]. The limited solubility (0.1-150 mg / l) is due to the presence of strongly polar groups (- NO_2, -OH, -NH_2, -NHR, etc.) in small molecules. The solubility of the dyes increases at a temperature above 80 ° C and in the presence of surfactants.

Dye solutions of this type are highly disperse systems in which the dye particles are found both in the monomolecular (soluble) and in the solid phases. As the fiber absorbs dye molecules, an additional amount of colorant passes into the solution. Dye molecules diffuse into the fiber and fix on the fiber due to the weak intermolecular forces of Man der Waals and hydrogen bonds.

In order to increase the rate of diffusion of dispersed dyes into highly crystalline synthetic polymers, dyeing is carried out at high temperatures, or in the presence of special substances that cause swelling of the fiber or reduce the degree of its crystallinity.

Ultrasonic oscillations with a frequency of 20-100 kHz can increase the rate of dissolution of dyes in surfactant solutions and increase the dispersity of the dye as a result of cavitation [2]. Therefore, one of the innovative ways to address the issue of improving the dyeing technology of modern textile materials is the use sounding of dyeing baths under conditions of acoustic vibrations of ultrasonic range conclusions.

METHODS

The fabric of complex polyester yarns of decorative purpose with a surface density of 250 g/cm^2 was chosen as the object of research.

Dyeing of aqueous dispersions by a periodic method (traditional) was carried out according to the scheme shown in Fig. 1.

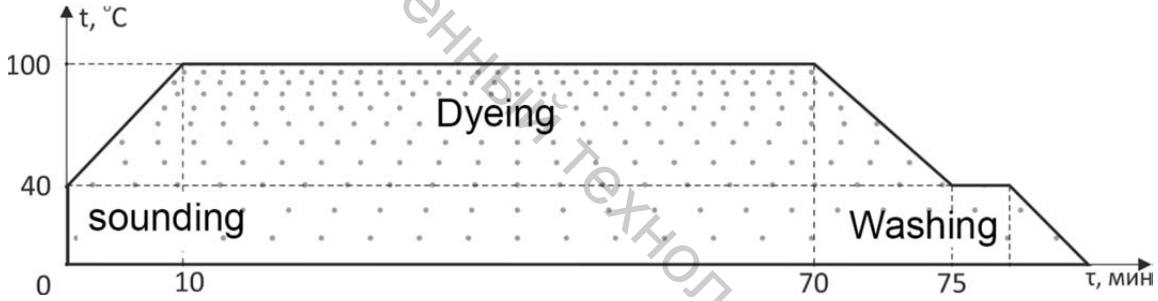

Figure 1 – The scheme of dyeing in the traditional way

Dyeing using ultrasound was carried out according to the scheme shown in Figure 2.

Preparation of the dye bath was accompanied by sounding the dye solution with ultrasonic vibrations at a frequency of 35 kHz for 5 minutes and 10 minutes. The intensity of ultrasonic oscillations ranged from 0.86 to 8.6 W / cm^2. A tissue sample was placed in the dyeing dye and the sample was heated for 5 minutes to a temperature of 100 °C. The dyeing process was carried out at the temperature of the dyeing solution 100 ° C for 30 minutes.

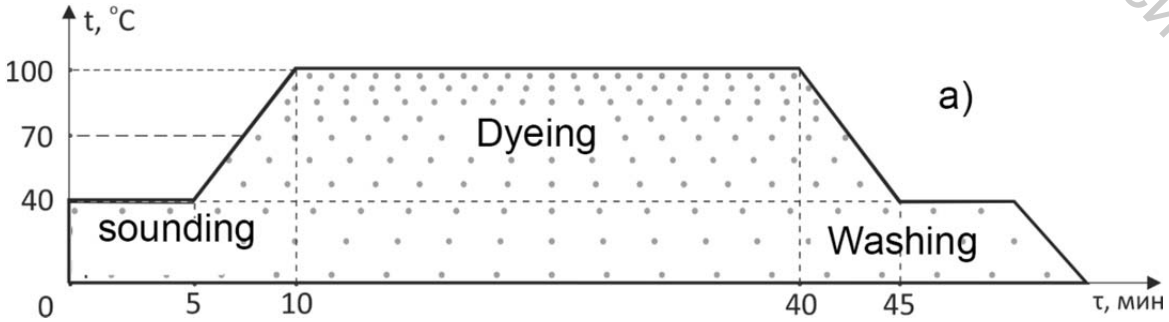

Figure 2 a – Diagram of polyester dyeing with a sounding dye

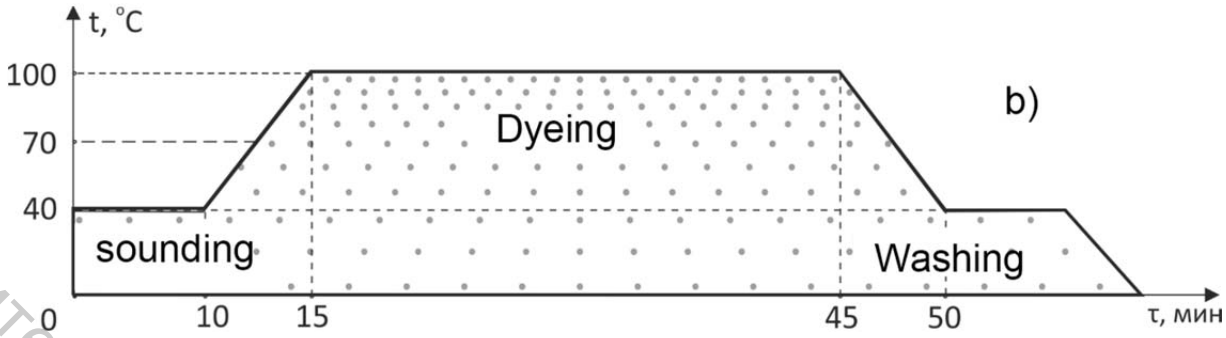

Figure 2 b – Diagram of polyester dyeing with a sounding dye

RESULTS

The results of measurements of color stability to the physicochemical effects and technological parameters of dyeing with the sounded dye solution (samples No. 1-8) and the traditional method (sample No. 9) are given in Table 1.

Table 1 – Parameters of sounding of a dye solution

№	Solution Sound Mode			Sustainability assessment		
	Temperature, °C	Power, W	Time, min	Dry friction	Wet friction	Washing
1	40	50	5	4,5	4,5	2,5
2	40	50	10	4,0	4,0	2,5
3	40	100	5	4,5	4,0	2,5
4	40	100	10	4,0	4,5	3,0
5	70	50	5	4,5	4,5	2,5
6	70	50	10	4,5	4,5	3,0
7	70	100	5	5,0	4,5	3,5
8	70	100	10	5,0	5,0	3,5
9	100	–	60	5,0	4,5	3,5

As a result of studies of the process of dyeing fabrics of polyester fibers with a dispersed dye, it has been established that preliminary sounding of a dyeing solution under conditions of ultrasonic vibrations with a frequency of 22-35 kHz influences the geometric dimensions of the dye particles, which facilitates their dissolution and accelerates the diffusion into the fiber structure, duration of the dyeing process while maintaining a high uniform color of the fabric.

The regime parameters for the preparation of dye solutions using ultrasonic vibrations and the process of dyeing polyester fabrics with a dye solution (preliminary sounding of the dyeing solution for 5-10 minutes at a power of ultrasonic radiation of 100 W (intensity 8.6 W / cm^2), a solution temperature of 100 ° C).

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EVALUATION OF CONSUMER PROPERTIES OF FURNITURE MATERIALS

ОЦЕНКА ПОТРЕБИТЕЛЬСКИХ СВОЙСТВ МЕБЕЛЬНЫХ МАТЕРИАЛОВ

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Key words: materials for upholstery, consumer-oriented properties, durability and strength.

Ключевые слова: мебельные материалы, потребительские свойства, долговечность, прочность.

Abstract. This article presents the results of studies of consumer properties of materials for upholstery: tapestry, jacquard, chenille, flock.

Аннотация. В статье представлены результаты исследования потребительских свойств материалов для обивки мебели: гобелен, жаккард, шенил, флок.

Padding is one of the first elements, which the consumer pays attention to when choosing furniture. Upholstery must have a set of aesthetic and performance properties to meet the requirements of furniture manufacture and the consumer. According to TR CU 025/2012 [1] for the manufacture of furniture should not be used flammable, and belonging to the group of T4 toxicity of combustion products of upholstery textiles.

For upholstery use fabrics, nonwoven fabrics and knitted fabrics, leather, eco-leather. Analysis of the furniture market revealed that Omsk manufacturers often use for upholstery fabrics of different fibrous composition and structure, flocking materials. As objects of study in the work silk upholstery materials were selected, including tapestry, jacquard, chenille, flock (table 1).