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Research Composition of Collagen in Textile Materials

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ABSTRACT: In this article on the component giving fire-resistant capacity canvas cloth. Information on the results of the conducted studies on the fll penetration of the component into the tissue is given, article it is described the composition properties of the new synthesis on the basis of collagen based textile materials, the fire-technical classifications of the new recommended fireproof clothes and the results of the experimental tests. In this article it is described the composition properties of the new synthesis on the basis of collagen based textile materials, the fire-technical classifications of the new recommended fireproof clothes and the results of the experimental tests. Conditions of pretreatment of cotton for drawing of a fireproofing composition and structure of a composition are investigated. Light transmission gaseous products, duration of smoke blanketing at burning and quotient of smoking of the treated textiles are defined.

KEYWORDS: fire, burning, hold, textile materials, experiment, fire, burning, hold, textile materials, collagen, composite compounds, firearms.

I.INTRODUCTION

Today, the issue of creating fire and heat-resistant textile materials necessary for the production of special clothing, technical fabrics, insulation coatings for ensuring fire safety, emergency services, metallurgy, energy, food industries and other services is becoming increasingly important throughout the world. Heat-resistant, low-flammable and low-combustible fibers and threads, fabrics made of cotton and cotton-polyester fibers, subjected to special processing using flame retardant compositions are used in the production of such materials.

In world practice, certain success has been achieved in production of fire-resistant textile materials by various methods, the improvement of production technologies, and the improvement of their properties. In the process of studying the current state of production in this direction, as well as the results of scientific research, it was revealed that the fire-technical properties of fire-resistant textile materials used to produce special clothing, fire-retardant coatings and covers did not fully meet accepted standards and requirements, there are many unsolved problems in this direction. Therefore, today one of the most important tasks is the issue of developing methods for the production of durable fire-resistant materials that fully meet the requirements of fire, ignition, flame spread over the surface, smoldering.

Today, in Uzbekistan special attention is paid to increasing production and expanding the export of high-quality finished textile products, promoting national brands on the world market, widespread introduction of advanced innovative technologies, know-how, design developments, localization of production of modern fittings and accessories into the production process. Along with the production of a wide range of textile products based on new innovative technologies, the issue of establishing the manufacture of fire-resistant materials remains relevant.

In our country, certain success has been achieved in increasing the fire resistance of finished textile materials through the application of a finishing method, the creation of improved technologies for the production of fire-resistant materials using various paint-and-lacquer and other compositions. So, in order to saturate the domestic and foreign market with competitive fire-resistant materials obtained on the basis of compositions meeting the requirements, ensuring fire safety in enterprises, special attention is paid to the accelerated development of the production of finished products with additional cost. Increasing the degree of fire resistance of materials requires careful study of their physic-

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mechanical and operational properties, reducing the toxicity of smoke emitted during smoldering fabric, extending the shelf life of products, manufacturing advanced compositions and technologies for the use in the process of dressing using natural resources.

II. EXPERIMENTAL PROCEDURE

Cotton was treated with fire-retardant materials containing gases, that are incombustible at combustion temperature (fumarole acid, the acrylic emulsion, a carbamate, amorphous and polyacrylamide), and also the materials forming protecting films. Polyacrylamide and collagen along with fire-retardant properties carry out a film-forming function. While testing the material treated by fire retardant it has not undergone burning by fire influence, only glowing of the material was observed. After certain time after washing and drying the fabric has lighted up by fire influence. It has shown that the universal method of furnish that provides hardiness to light and weather and other physical and chemical influences, wet processing is not developed. For conservation of fire resistance while storing and operating the fabric it was planned to carry out research with the help of several methods.

The used composition is made in the following sequence.

The first stage. The leather after purification is cut into pieces of 2-3 mm.

The second stage. 3% caustic solution is prepared; the ground leather is put in the solution.

The admixture is put in a drying oven at temperature 60 ºC for 3-4 hours. Then acetic acid is added to it, having checked with the help of a locums a solution that should be neutral. The formed solution is conditionally called "collagen".

For increasing fire-resistant properties of a material, taking collagen as a basis, the technology of soaking in a fabric has been developed. For enhancing the interaction between a surface of a fabric and a fireproofing composition some means of pretreatment of a fabric are tested.

The textile has preliminarily been treated by alkali solution, salt cake, surfactant OP-10, muriatic acid.

Processing is carried out in the following technological sequence:

Imbibition (according to the chosen admixture), T=18-20 °C, time - 30-60 seconds. Squeezing - 80- 90%. Flush (in pure cold water), then squeezing (to the residual of a moisture of 5-10%). Drying at 60- 80 °C, time - 10-15 minutes.

After these processes performed according to the set technological sequence, the fabrics received by each method have been permeated by a fireproofing composition of identical consist.

Acrylic emulsion, polyacrylamide, carbamate, fumarole acid, hydro phosphate of ammonia is used as a part of a composition contained. In order to make a tentative estimation of influence of pretreatment the fabric was exposed to direct fire.

Test data convincingly show advantages or disadvantages this or that method of pretreatment.

Processing by a solution of salt cake and surfactant has little influence on fire resistance of a fabric.

Processing by a muriatic acid solution is absolutely not acceptable, as the fabric is blasted after processing. The positive result is yielded by processing by a solution of ox hydroxide of sodium.

Some samples do not inflame even under continuous explosion to direct fire.

Then a series of experiments was conducted to define an acceptable consist of fireproofing composition. Consist of a composition includes fumarole acid, carbamate, acrylic emulsion, polyacrylamide, collagen, amorphous and water. The various combinations of substances are tested.

Pre-treatment with alkali tissue allows you to dissolve waxy substances present on the surface of the fabric, which prevent the penetration of the flame retardant composition into the fabric, and subsequent washing allows you to remove them, as a result, the surface of the fabric is cleaned. Due to this, the fire retardant composition is well impregnated with fabric, it is achieved its strong binding to the textile base. At the same time, hydroxyl groups of cotton cellulose are available for interaction with reagents of flame retardant composition. As a result of the interaction, the flame retardant substances are chemically bound to the fibers of the textile material.

Then a series of experiments was conducted to determine the acceptable composition of the flame retardant composition. The composition includes boric acid, carbamide, acrylic emulsion, polyacrylamide, collagen, ammonium hydrogen phosphate and water. Various combinations of substances were tested, the most studied of which are presented in Table 2.

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Table 2.
The dependence of the fire resistance of the fabric on the composition for flame retardant treatment

Substances in composition	Number of composition and amount of substances in it			
	1	2	3	4
Boric acid	3 g	5 g	10 g	5 g
Carbamide	5 g	5 g	10 g	
Acrylic emulsion	5 ml	10 ml	-	-
Polyacrylamide, 3% solution	-	10 ml	20 ml	20 ml
Collagen	20 ml	-	20 ml	40 ml
Ammophos	5 g	-	-	-
Test data	Fabric lit up	Fabric lit up through 10 s	Fabric didn't light up	Fabric didn't light up

After these processes performed according to the set technological sequence, the fabrics received by each method have been permeated by a fireproofing composition of identical consist. Acrylic emulsion, polyacrylamide, carbamide, fumarole acid, hydro phosphate of ammonia are used as a part of a composition contained. In order to make a tentative estimation of influence of pretreatment the fabric was exposed to direct fire. Test data are presented in table 3.

Table 3.
Dependence of hardiness to influence of direct fire on the fabrics treated by a fireproofing composition by a pretreatment processing method

Pretreatment processing method	Concentration of material and test data Concentration of material and test data				
	0,5%	0,75%	1 %	2%	3%
Sodium oxyhydroxide	The fabric has lighted up in 20 seconds	The fabric has lighted up in 20 se-conds	The fabric has lighted up in 30 seconds	The fabric has not lighted up	The fabric has not lighted up
Salt cake	has lighted up in 2 seconds	has lighted up in 2 seconds	has lighted up in 4 seconds	has lighted up in 10 seconds	has lighted up in 15 seconds
Surfactant	has lighted up in 5 seconds	has lighted up in 10 seconds	has lighted up in 10 seconds	has lighted up in 20 seconds	has lighted up in 20 seconds
Muriatic acid	Fabric destruction is observed				

As can be seen from the table, the qualitative and quantitative composition of the composition significantly affects the combustibility of the textile material. In addition to the fact of fire, the materials are tested for other parameters of fire resistance. Samples of stuffs are given to the research centre on problems of fire safety of the Higher.

On the basis of graft copolymers of cellulose of cotton fabric, collagen, polymethyl-crylate, polyacrylamide and the fumarole acid initiated by persulphate of potassium, the composition for fireproof processing of textiles is obtained. Research on hot-fire properties has shown high performance of the offered composition and a method of obtaining a fire-resistant textile.

As it can be seen from the table, qualitative and quantitative consist of a composition considerably influences combustibility of textile. Except the fact of ignition stuffs are tested on other parameters of fire resistance. Samples of

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stuffs are given to the research center on problems of fire safety of the Higher Technical School of Fire Safety of Ministry of Internal Affairs of the Republic of Uzbekistan.

Research on experimental definition of the coefficient of smoke-formation is conducted on samples in the following conditions. Indoor conditions: temperature, 0C - 14,2; atmospheric pressure, kPa - 97,7; relative humidity, % - 65. The name, consist and physical and chemical properties of material or reference document
instructions on a stuff: a textile material with conditional number.

The characteristic of measuring devices: "Installation by determination of a coefficient of smoke-formation" in accordance with GOST 12.1.044-89, the certificate № 0903125 from June, 24th, 2014, a phylum stop watch - C-1-2a. The dimensions of samples 40x40x0,5. Power of heat flux P=475 W (U=235B).

Table 4.

Results of determination of a coefficient of smoke-formation of textiles

Test mode	Specimen number	Weight of the sample, m, g		Light transmission, %		Duration of smoke blanketing, min	Coefficient of smoke-formation for each sample, Dm, m2/kg
		Before test	After	The initial, T0	The final Tmin		
Decays	1	0,9	-	29,1	22,8	9	173,8
	2	0,8	0,4	26,9	24,6	15	71,5
	3	0,8	0,4	26,6	22,3	15	141,5
	4	0,8	0,3	26,6	22,8	14	123,2

Based on the test results the following conclusion is drawn: tested textile samples have smoke formation coefficient Dm=71,5-173,5 m2/kg that corresponds to dimensions of moderated smoke formation ability according to GOST of 12.1.044-89 "Fire and explosion hazard of substances and materials" and SHNK 2.01.02-04 "Fire safety of buildings and constructions".

Thus, all tested samples of textile materials have moderate smoke-formation ability. On the other hand, different samples have different size of smoke –formation coefficient. The highest value of coefficient of smoke-formation has appeared in samples №1, and the lowest - in samples №2.

Analyzing a consist of compositions, with which samples of textiles are treated, it can be concluded that presence of carbamate and collagen in a composition leads to high coefficient of smoke282 76th Plenary Meeting of the ICAC. Digest of scientific and technical achievements formation. It was to be expected because at strong heating or influence of strong radiance, especially in the presence of water vapor, the carbamate decays with allocation of ammonia and carbonic gas.

Collagen also decays under influence of a powerful heat flux with allocation of gases. Therefore, consist of composition should be modified taking into account tests of other hot- fire properties.

III. CONCLUSION

The scientific novelty of the thesis research is as follows:

A composition for fire retardant processing of textile materials and methods of chemical bonding to fabric fibers by grafting is revealed;

New processing methods have been identified to extend the shelf life and use of textile materials, reduce the amount of toxic smoke during combustion;

A method has been developed to improve the fire retardant properties of a fabric by starching with anti-foam compositions before weaving spun of cotton threads;

Ecologically safe fire-resistant textile materials have been created by means of the composite treatment of the strained and weft threads with the extension of the periods of their storage and use;

The composition, methods of obtaining fire-resistant textile materials based on graft copolymers, the effect of technological production on the flame-retardant and physic-mechanical properties of the material;

Highly insulating canvas materials to protect the cotton fields are created.

The practical results of the research are as follows:

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The fire retardant properties of graft copolymers were revealed, textile fabrics with stable properties were obtained during storage and operation;

In the process of producing textile materials, a new method of their flame retardant treatment has been applied;

Physic-mechanical and fire retardant indices have been sharply increased by one-step starching and flame retardant treatment; an adapted material has been created, a production method has been proposed that is suitable for small enterprises;

A new range of samples of fire-resistant canvas materials was obtained, their physical-mechanical, technological and operational properties were revealed.

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