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The Search for Composition of Collagen on Textile Materials

O.M.Yuldosheva, M.Sh. Hakimova, X.Yu. Mahmudov

Candidate of technical Sciences, associate professor of Tashkent Institute of Textile and Light Industry, Uzbekistan, Tashkent.
Manager of laboratory, Tashkent Institute of Textile and Light Industry, Tashkent, Uzbekistan
Student, Tashkent Institute of Textile and Light Industry, Tashkent, Uzbekistan

ABSTRACT*:* In this article on the component giving fire-resistant capacity canvas cloth. Information on the results of the conducted studies on the full 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.

KEYWORDS: fire, burning, hold, textile materials, experiment

I.INTRODUCTION

It is an effective method of preventing fire and the use of fire-protective coatings and fire-prevention fireproof coatings that do not disperse the fire due to an emergency [1].

Practical investigations into fire safety indicate that a major shortage of recommended material is their low shelf life [2]. Furthermore, the use of fire-fighting cloths is the task of developing a low-cost fire-resistant fabric that meets the fire safety standards, with the excessive amount of toxic smoke emitted during the fire, as well as the cost of fire-resistant fabrics that meet the required level.

Among various ways of copolymerization, the grafting as a method of synthesis of composition high-molecular substances and materials of a special purpose has special value [2–5]. Establishment of regularities of receiving, physical and chemical and mechanical characteristics of graft copolymers of natural polymers with the functional and fissile monomers, taking into account specific properties of polymeric compositions, is an urgent problem of chemistry and polymer technology. Researches of regularities and the mechanism of synthesis of graft copolymer sand on receiving reinforced films on the basis of a collagen and the poly (acrylic acid) [3–6] are earlier conducted. The real work is devoted to definition of dependence of a molecular mass, solubility, density and thermal properties of copolymers from a ratio of components and conditions of synthesis, processes of the copolymers occurring when heating.

II. EXPERIMENTAL PROCEDURE

In order to address the aforementioned problems, the composition of the fire-fighting designs for textile materials has been created [4]. The collagen was taken as a basis for the composition. One of the most common features of collagen is its ability to transmit gelatin or glue when heated in water. Preparation of collagen solution from raw material is carried out in the following order. The skin was smashed into a lukewarm suspension to clean the jeans and epidemics. The skin was wiped clean and the lime and wool were thoroughly washed away. The separated skin was split into 2-3 mm small pieces and measured at 120 g, subjected to a pre-prepared solution of alkaline solution and left at room temperature for one day. To accelerate the process, it was put into a 50^0S drying cupboard and occasionally mixed. When the skin is completely dissolved, it is made of plastic material to remove tiny residues and neutralized with acetic acid until neutral. We investigated the effects of alkaline (NaOH) and mass fraction of the skin on the mass fraction of collagen in solution (Table 1). When dissolved water, transparent, yellowish sticky mass is formed which can dissolve in water. This mass is treated with ethanol and dried to form solid collagen fragments.

The experiments have shown that the increased concentration of sodium hydroxide solution increases the solubility of collagen and time of melting decreases, and the mass of the skin particles increases with melting time. The

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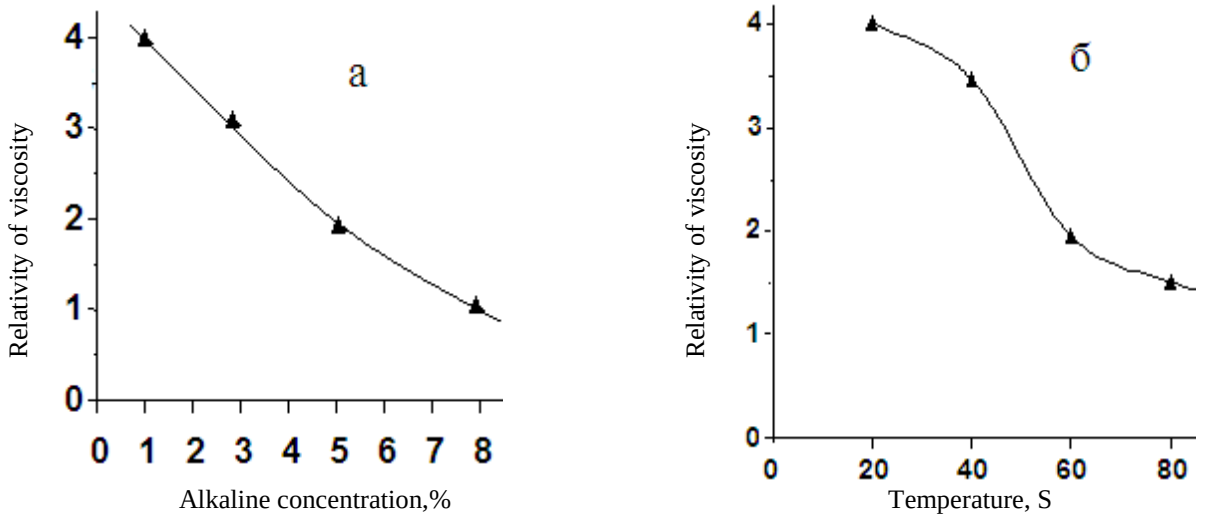
resulting dependencies comply with the general principles of physicochemical processes. The relative viscosity of the collagen solution is determined by its alkali concentration and temperature (Figure 1).

Table 1

The dependence of collagen on dissolving time and the mass fraction of the solution in alkali concentration. The weight of the alkaline solution is 50 g, the melting point is 50°S.

NaOH concentration, %	Mass of leather pieces	Breast feeding time, hours	Mass fraction of collagen in solution %
1	30	It does not melt	
2	30	5,6-6,0	14
3	30	4,8-5,2	16
4	30	4,0-4,3	15
5	30	3,6-3,8	12
2	20	4,4-4,7	10
2	40	6,0-6,5	18
2	50	6,8-7,3	24



Picture 1. The relative viscosity of the collagen solution depends on alkali concentrations (a) and temperature (b).

When the concentration of the alkalis increases, the relative viscosity of the collagen solution decreases even when the melting point increases. In particular, there is a sharp reduction in relative viscosity when the temperature exceeds 50S. As you know, the relative viscosity of the solution depends on the size of the particles in it. With the concentration of alkaline and the hydrolysis of the temperature, the size of the protein macromolecules decreases and the molecular mass decreases.

The molecular mass of a low-polymeric fraction of a collagen is determined by a cryoscopy method. Exemplars with a molecular mass to 4•103 according to cryoscopy measurements are selected. The same exemplars are investigated by a viscometric method. Knowing their molecular masses, the schedule of dependence of a logarithm of a molecular mass on a logarithm of intrinsic viscosity is constructed. The tangent of angle of an inclination of rectilinear dependence on an axis abscises is equal α, the piece which is cut off on an axis of ordinates is equal to lg K [12]. Mean values by results of several measurements are calculated: K=0,21 • 10-4 and α=0,7. These constants were used when determining a molecular mass of high-polymeric fractions of a collagen by a viscometric method. An average molecular mass of a collagen it turned out within 15000-25000. On values of an average molecular mass of a collagen, the constitutional repeating unit, effectiveness of an inoculation, monomer concentration, the initiator and a collagen it is possible the average molecular mass (MM) of vaccinated chains is calculated.

Density of copolymers of a collagen and the poly(acrylic acid) (PAK) was determined by a piknometrichesky method, thermal properties investigated by method of the differential thermal analysis (DTA). The temperature measuring range made 0-900^{0}C; heat rate equaled 10 K/min.

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Collagen copolymer with the acrylic monomers represents plast of yellowish color, bulks up in water and organic solvents. At extent of transformation to 20-25% the received product is dissolved in water and dimethyl form amide, not dissolved in ethanol, dioxin, acetone, hydrocarbons. Density of a product is influenced by both copolymer composition, and conditions of its obtaining (table).

Table 2

Dependence of density of graft copolymers of a collagen on structure and conditions of receiving.

Copolymer composition, masses. %		Concentration of the personal computer at synthesis, $mol \cdot l^{-1} \cdot 10^{2}$	Fusion temperature, ^{0}C	Average MM of vaccinated chains	Density, $g \cdot ml^{-3}$
Collagen	PAK				
88	12	0,38	$60^{0}C$	4700	1,138
74	26	1,12	$60^{0}C$	4200	1,125
65	35	1,87	$60^{0}C$	4100	1,117
57	43	1,12	$60^{0}C$	4800	1,112
74	26	1,12	$50^{0}C$		1,128
74	26	1,12	$70^{0}C$		1,123

According to table 1 with increase in a share of PAK and concentration of the personal computer copolymer density decreases. It is bound to two factors: emergence of three-dimensional structure at the larger maintenance of PAK and increase in frequency of intermolecular communications; increase in a share of polymer with a smaller density. Copolymer consolidation indirectly demonstrates interlacing at sufficient extent of transformation and sufficient content of synthetic polymer.

Differential and thermal curves of a collagen, collagen copolymer are removed from PAK. Rate of curves of a thermogravimetric (TG), DTA and differential thermo gravimetric (DTT) is defined to generally collagenic components.

Loss of mass of an exemplar of a collagen and its copolymer begins with joint stock company at temperatures over $100^{0}C$ (figure 1,2). Intensive loss of mass of a collagen begins at a temperature of $280^{0}C$, and its copolymer at a temperature of $230^{0}C$.

The small loss of weight (to 8%) happening to slight absorption of warmth in the range of 100-$230^{0}C$ (with the largest speed at $172^{0}C$ for a collagen and at $137^{0}C$ for copolymer a collagen PAK)corresponds to a volatilization of the combined water.

In order to recommend special clothing, fireproof coatings, fireproof curtains from various tissues that have been tanned, the properties of the heat were investigated in the scientific-laboratory conditions, which were smashed to the gray, chit, satin, knitted fabric and breeches.

In order to ensure that the selected textile fabrics are fully absorbed in the composition, the test fabric was boiled in water containing 2% soda and 3% laundry soap. The fabric was dried into the recommended composition to increase the heat of the fabric. After a certain period of study the properties of the test sample were investigated and the combustion of the fabric was observed and the observed condition was explained as follows;

The composition gives the chemical properties of the chemicals and collagen textile fabrics to the heat-resistant properties, but as the result of external exposure (fracture, friction) the material is lost in the fabric. It is said that the affected composition does not fall into the fabric and the fabric is exposed to external influences because the composition is drifting on the surface of the fabric after the composition is drawn. In order to eliminate the existing deficiencies, the selected textile fabric was treated with persulfate potassium, sodium hydroxide, sodium sulfate salt, surfactant and chloride acid.

According to a research carried out in a science lab, the proposed composite meets the requirements for fireproof cloths, and when combustion air and the material form a non-combustible film, the persulfate potassium salt is separated from each other.

As we know, the fabric that has been processed can easily freeze the plant and preserve its structure after partial combustion; the selected composition is of course cheaper, the composition is long-lasting, and the composition has a good appearance (the color of tissue material and the absence of any restrictions on the quality of the product).

Based on positive results, it was planned to carry out researches to extend the shelf life of the recommended fabric at the subsequent stages of the research, and the duration of the furnace property and the smoke factor were calculated.

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Table 3

т/р	Tissue type	The effect of the mixture on the surface of the fabric	The duration of the lubricant properties	Fume formation coefficient Dm, m2 / kg
1	sateen	positive	A month	45,9
2	coarse calico	positive	1-2 months	45,6
3	Brezent	positive	20 days	44,6
4	Knitwear	positive	1 month	44,6
5	calico	positive	1-2 months	45,6

Based on the experience gained, the following conclusions can be made:

1. The mixture is well-blotted to the tissue.

2. According to GOST 12.1.044-89 "Explosion Risk of Substances and Materials" and SNCO 2.01.02-04 "Fire Safety of Buildings and Constructions", the smoke factor of textile materials is classified as T1 (with less capacity) (if less than 50 is smaller, it has less capacity). Costs meet fire safety requirements [4].

3. The yarns are oxidized to increase the strength and friction resistance of the fabrics in the body. The chord prevents the chemical composition from being completely penetrated into the fibers, so the fading of the fabric is slowing down.

In order to shake the ingredients into the chromium, it has been set up to work with shampooed solvents. An alkaline bath was used for this purpose and it was found that the composition of the fiber formed in alkaline baths in test specimens was formed. This type of fiber was not burnt at the end of the fever, but when tissue quality control was observed, it was observed that the quality of samples was negatively affected.

Table 4

т/р	**Tissue type**	**The effect of alkali on the surface of the fabric**	**The duration of the lubricant properties,month**
1	sateen	Invalid condition	-
2	coarse calico	The quality of the fiber is broken	4
3	Brezent	There is almost no change	12
4	Knitwear	Invalid condition	-
5	calico	Invalid condition	-

III. CONCLUSION

The alkaline environment of Brezent's fabrics has shown that it is possible to get fire-resistant cloth from the fabric.

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