

Effect of Water-Soluble Organic Substances in the Initial Chemical Treatment of Cotton Fiber

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Abstract:

In this article, experiments were conducted with KMTs-based surfactants and water-soluble organic matter emulsions in combination with water and non-ionic emulsifier OP-10.

Keywords: sulfonol, Na-Carboxymethylcellulose, Na-KMTs, glitserin.

In the world, scientific and research work is being carried out aimed at obtaining emulsions, which are widely used in chemical processing of natural and synthetic fibers, based on water-soluble organic substances. In this regard, reducing the negative impact of light, moisture and microorganisms on the mechanical properties of cotton fiber during the collection, transportation, packaging, preliminary processing, and subsequent technological processing of cotton fiber, the use of emulsions based on the sodium salt of carboxymethylcellulose, local raw materials, to improve the physical, mechanical and operational properties of cotton fiber products, their consumption and textile properties, to protect them from the effects of physical, biochemical and mechanical factors, has a positive effect on the properties of cotton fiber.

The moistening operation, which is carried out after separating the cotton fiber from the edge and before pressing, aims to bring the moisture content of the fiber to the norms of UzDST 604-2016. According to the standard requirements, if the moisture content of cotton fiber is less than 5%, it is considered necessary to increase the moisture content artificially. As a result of wetting with water-soluble organic substances, cotton fibers become more flexible, stretchable, and their mechanical strength is also improved. This simplifies the pressing process and saves on threshing, packing and transportation costs. In addition, cotton fiber is delivered to the spinning factories in a strong and free form of unnecessary dust.

Choosing a water-soluble polymer ($[\text{C}_6\text{H}_7\text{O}_2(\text{OH})_{3-m}(\text{OCH}_2\text{COONa})_m]_n$) and preparing an emulsion based on it is not only a theoretical but also a practical problem, as the requirements for such emulsions are multifaceted. For example, the polymer should be not only chemically, but also stereochemically miscible, and should have the ability to interact with cellulose at the level of hydrogen bonding between molecules, in addition, the emulsion should be non-flammable, non-toxic, odorless and corrosion-resistant, meeting technological requirements, high should be electrically conductive and, most importantly, cheap.

Experimental part. According to the results of experiments with KMTs-based surfactants and water-soluble organic matter emulsions of medium cotton fiber with water and non-ionic emulsifier OP-10.

Effect of water-soluble polymer concentration on the properties of different emulsions (containing OP-10- 0.5%, glycerol-5%).

Table 1

Emulsion content, %		Relative viscosity	Surface tension, 10 ⁻³ P/M ²	density, g/cm ³	Electrical conductivity, 10 ⁻¹ Om ⁻¹
Polymer	Water				
Na- KMTs					
0,03	94,47	1,47	35,40	1,0104	0,87
0,05	94,49	1,86	36,04	1,0115	1,78
0,25	94,25	7,28	28,80	1,0121	3,17
0,50	94,00	15,40	25,24	1,0135	7,24

Increasing the polymer concentration in the emulsion (Table 1) increases the viscosity of the solution, which can reduce the absorbency of the fiber. Other indicators do not change significantly.

Effect of concentration of surfactants on emulsion indicators (glycerin -5%, Na-KMTs - 0.03%). Table 2

Emulsion content, %		Relative viscosity	Surface tension, 10^{-3}P/M^2	density, g/cm^3	Electrical conductivity, 10^{-1}OM^{-1}
OP-10	Water				
0,3	93	1,3	36,08	1,0141	0,432
0,5	93	1,4	32,67	1,0146	0,363
0,7	92	1,4	34,08	1,0151	0,506
1,0	92	1,5	32,99	1,0156	0,769

Since increasing the wettability of cotton fiber with the help of surfactants is one of the most important tasks of research, Figure 1 shows the effect of surfactant concentration on the degree of water absorption by cotton fiber.

In the cotton ginning factories using the ginning process, PUVT type devices were used to moisten the fiber before pressing it in the technological chain. We can give our emulsion prepared using this device without changing the technological process.

Effect of polymer concentration on mechanical properties of cotton fiber Table 3

C, %	Nis. Gov.	Mus. gr. power	Choz. %	Coefficient of variation %		Stability, cycles	
				Mus.	Choz.	Multiple stretches	Multiple bends
I. Na- Carboxymethylcellulose							
0,01	4.10	4.0	13.1	28.9	20.0	9400	9900
0,02	6.40	4.0	12.9	28.8	19.9	-	-
0,03	10.4	4.1	13.1	28.5	20.2	9600	10100
0,04	13.8	4.2	13.3	29.6	21.5	-	-
0,05	15.5	4.0	13.0	30.5	22.4	9500	10000
0,1	43.5	4.0	13.5	30.9	22.5	-	-

When processing cotton fiber with Na-KMTs solution, the strength of the fiber is 0.2-0.3 g.s. was observed to grow steadily.

The study of the effect of water-soluble polymers and polyatomic alcohol, as well as the concentration and nature of surfactants on the mechanical and non-functional properties of cotton fiber, showed the possibility of using all studied solutions of surfactants up to 0.5% concentration; depending on the nature of water-soluble polymers from 0.1 to 5.0%, polyhydric alcohols up to 5.0%.

Spraying was carried out after separating the cotton raw material from the seed in a diffuser (before feeding it to the press through a mesh drum).

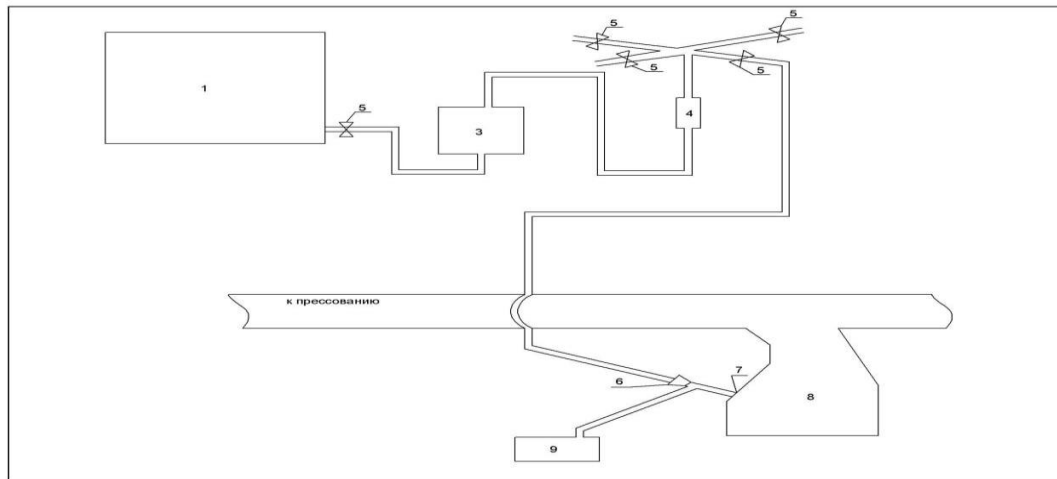


Figure 1. Primary chemical treatment process for cotton fiber.

(1-special container, 2-fiber pipe, 3-filtering equipment, 4-ratometer, 5-distribution valves, 6-distribution valve, 7-connector, 8-humidification chamber, 9-compressor).

If the concentrate is very easily soluble (in the form of a powder) or easily mixed with water (in the form of a solution), then the dissolution of the concentrate can be done directly in the main mixer. For this, the required amount of concentrate is placed in the mixer and the required amount of water is poured. The solution is thoroughly mixed and used to wet the fiber. It should also be noted that cotton and fiber with moderate and severe bacterial-fungal diseases are not subjected to chemical treatment.

When cotton fiber $[(C_6H_7O_2(OH)_{3-m}(OCH_2COONa)_m)]_n$ was treated with Na-Carboxymethylcellulose, sulfonol, it was observed that the mechanical properties of the fiber increased.

Effect of Na-Carboxymethylcellulose concentration on mechanical properties of cotton before ginning. Table 4

Sample characteristics	Elongation, mm	Mus. gr. power	Choz.%	Coefficient of variation %	
				Multiple stretches	Multiple bends
Not processed	31.8	4.2	7.5	26.1	19.5
0.02 % Na- KMTs	32.0	4.4	8.0	25.8	19.1
0.03 % Na- KMTs	32.8	4.7	9.0	20.9	16.5
0.05 % Na- KMTs	32.7	4.7	9.0	21.1	16.7
0.1 % Na- KMTs	32.8	4.6	9.0	21.0	16.5

Table 4 showed that an increase in strength properties was observed with water-soluble polymer concentration up to 0.03%. In this case, the strength is 4.7 gr. strength and increasing the concentration does not lead to an increase in strength properties.

Practical significance of the work.

1. Optimum conditions for obtaining an aqueous emulsion of glycerin and Na-KMTs (water-soluble polymer) substances were determined to improve fiber properties by primary chemical treatment of cotton fiber.
2. During the chemical treatment of cotton fiber with Na-KMTs solution, the strength of the fiber is 0.2-0.3 g.s. was observed to grow steadily.
3. It was determined that it is desirable to give the emulsion after separating the cotton raw material from the seed by spraying (before feeding it to the press through a mesh drum).
4. Water-soluble polymer concentration of 0.03% increased strength properties. In this case, the strength is 4.7 gr. strength organized the.

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