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Distinguishing Several Brands of High Purity Cellulose From Fiber Waste of Cotton Ginning Industries

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ABSTRACT

Recently, the technology of extracting cellulose from annual plants and fiber waste of cotton ginning industry and textile enterprises is developing in China, India, Holland, Spain, France, USA (southern states) and Latin American countries, where wood resources are scarce and plants are rich.

Synthesis of several grades of cellulose with high purity from cotton wool - CW (lint) separated from cotton gins, mixed waste of cotton gins – CG (ulyuk) and cotton short wool – CSW (pux) - obtained as a result of studies on the influence of parameters the analysis of optimal conditions has been widely studied.

Introduction

In the world, the demand for organic substances and modified composite polymer materials based on them is increasing day by day. Today, the share of organic substances and products based on them as the main raw materials is rapidly increasing in various branches of industry, including pharmaceuticals, perfumery, food, construction, oil and gas industry, mining metallurgy, mining of precious ores, textiles.

The use of cellulose alone and its simple and complex ethers in large quantities in the above-mentioned industrial sectors is showing promising results. This, in turn, requires the creation of large innovative technologies for these industries in the production of cellulose and organic substances based on it, simple and complex ethers, oriented towards export and import substitution, and the introduction of modified composite polymer materials into industrial production, as well as the production of positive results.

Recently, the technology of extracting cellulose from annual plants and fiber waste of

cotton ginning industry and textile enterprises is developing in China, India, Netherlands, Spain, France, USA (southern states) and Latin American countries where wood resources are scarce and plants are rich.

However, these technologies, in one way or another, consist of copying the technology of extracting cellulose from wood with all its disadvantages. Taking into account the above, in this department it was possible to obtain several brands of cellulose with high purity based on PTKTCh (cellulose from fibrous wastes of textile enterprises).

Cotton processing industries occupy one of the important places in further increasing export potential of our republic. Special attention is paid to the development of cotton ginning industry in our republic. At present, the consumers of the world cotton fiber market are making serious demands on the quality of cotton fiber.

If we compare Uzbekistan with other countries with developed agriculture, but with approximately the same natural conditions, we can come to the following firm conclusion: the possibility of increasing the productivity of the agricultural sector in Uzbekistan is extremely large. We have many opportunities in this regard. They require adherence to the globally established and widely used agrotechnical standards, rules, and rational organization of farming culture and agricultural production. As a result of regular cultivation of cotton, mankind created new species and varieties from these groups. In particular, new types of cotton were created by interspecies hybridization. During the past period, the nature of cotton was changed to such an extent that eventually it grew not only in the tropical region, but also in subtropical and finally continental climates with less heat and a shorter growing season and high yield. In the tropical region, the first boll ripens in 7-9 months in woody types of cotton, while in one-year cotton it ripens easily in 6 months. According to scientific data, there are 35 types of cotton on earth, of which 5 are considered cultivated. Gossypium hirsutum takes the first place in terms of the size of the cultivated area. It is called Mexican cotton because it is native to the Central American country of Mexico. We have made some changes in the nature of this type and it is called medium fiber cotton. The productivity of this species is higher than that of others, but the fiber quality is slightly lower. Nevertheless, cotton is cultivated on 5 continents. Gossypium arboreum ranks second in terms of the size of the cultivated area. Its original homeland is Indo-China. That is why it is called Indo-Chinese cotton.

Research has been conducted on the chemical processing of fibrous waste, these studies mainly use cotton wool-CW (lint), CG wastes of cotton ginning enterprises are mixed - CG (ulyuk) and was carried out on cotton short wood- CSW (pux) mixed waste.

Recycling cotton gin waste into high-quality cotton cellulose, which is a raw material of the chemical, light and textile industries, increasing the productivity of cotton industry enterprises and improving their environmental impact, based on the high advantage of existing technologies in the process of extracting cellulose, and deciduous and coniferous trees. It differs from the physico-chemical and mechanical properties of received sulfated, sulfide, bisulfide celluloses. In the technology, the synthesis of cellulose products obtained on the basis of the waste of cotton ginning enterprises into assortments according to different fields is also envisaged. The technology envisaged to be created on the basis of the project has its simplicity and high-precision control of its modes according to the required quality parameters, that is, by changing the concentration, time, temperature, obtaining the desired yield, degree of polymerization and cellulose with α-cellulose, and cellulose simple esters with high quality parameters. It is distinguished by the fact that it gives the opportunity.

Table 1

Below are some indicators of PTKTCh (cellulose from fibrous wastes of textile enterprises):

Types of PTKTCh	Pollution level, %	Amount of cellulose, %	Degree of polymerization	Amount of ash, %
CW (lint)	27,2	74,8	-	-
CG (ulyuk)	34	52	-	-
cotton short wood-CSW (pux)	42	48	-	-

It can be seen from the table that PTKTCh (cellulose from fibrous wastes of textile enterprises) is considered to be highly contaminated. The low amount of cellulose in it is characterized by the percentage of various additional impurities in the content. Enrichment processes are required to remove impurities from the fiber content and to increase the cellulose content. In this regard, several stages of processes were implemented.

First, the process of mechanical cleaning of the fiber from waste was carried out, then the process of boiling in different solutions of alkali (NaOH) was carried out. The influence of different parameters during fiber cooking was studied in parallel. Among these parameters, alkali concentration, boiling time and boiling temperatures were studied. Below are some quality indicators of cellulose obtained during chemical processing after mechanical cleaning of PTKTCh (cellulose from fibrous wastes of textile enterprises).

Some quality indicators of cellulose obtained during chemical processing after mechanical cleaning of PTKTCh (under the influence of alkali concentration)

Table 2

NaOH concentration, g/l	Time of boiling, min	Boiling temperature	Cellulose product, %	α-cellulose, %	PD	The amount of ash, %	High swelling, %
Cotton wood- CW (lint)							
10	120	98-100	82	86,3	1550	1,7	70
20	120	98-100	91	93,1	1460	1,0	124
30	**120**	**98-100**	**94**	**97,7**	**1280**	**0,2**	**155**
40	120	98-100	96	97,6	1180	0,2	150
Ulyuk is involved - CG (ulyuk) waste							
10	120	98-100	72	86,3	720	2,5	90
20	**120**	**98-100**	**93**	**93,1**	**710**	**1,2**	**150**
30	120	98-100	94	95,7	510	0,6	152
40	120	98-100	93	97,2	470	0,3	150
cotton short wood- CSW (pux) is a mixed waste							
10	**120**	**98-100**	**94**	**92,8**	**770**	**0,7**	**90**
20	120	98-100	91	93,0	660	0,6	124
30	120	98-100	87	92,9	540	0,4	141
40	120	98-100	86	93,2	490	0,5	152

It can be observed from the table that certain properties of cellulose produced under the influence of different alkali concentrations have different indicators, and based on the results of the research, the optimal value of alkali concentration was determined for each of PTKTCh (cellulose from fibrous wastes of textile enterprises). An increase in the concentration of alkali leads to the breakdown of the elementary links in the macromolecule, that is, destruction.

On the contrary, it indicates a tendency to increase the amount of α-cellulose. According to this, the NaOH concentration with a concentration of 30g/l for cotton lint- CW (lint), 20g/l for mixed CG (ulyuk) waste, and 10g/l for mixed cotton lint- CSW (pux) waste was optimized.

Below is a study of the time of fiber waste in alkaline boiling.

Some quality parameters of cellulose obtained during chemical processing after mechanical cleaning of PTKTCh (effect of boiling time)

Table 3

***NaOH* concentration, g/l**	**Time of boiling, min**	**Boiling temperature**	**Cellulose product, %**	**α-cellulose, %**	**PD**	**The amount of ash, %**	**High swelling, %**
Cotton wood- CW (lint)							
30	60	98-100	82	86,3	1550	1,7	70
30	120	98-100	91	93,1	1460	1,0	124
30	**180**	**98-100**	**94**	**97,7**	**1280**	**0,2**	**155**
30	240	98-100	96	97,6	1180	0,2	150
Ulyuk is involved - CG (ulyuk) waste							
20	60	98-100	72	86,3	720	2,5	145
20	**120**	**98-100**	**93**	**93,1**	**710**	**1,2**	**150**
20	180	98-100	94	95,7	510	0,6	152
20	240	98-100	93	97,2	470	0,3	150
cotton short wood- CSW (pux) is a mixed waste							
10	**60**	**98-100**	**94**	**92,8**	**770**	**0,7**	**150**
10	120	98-100	91	93,0	660	0,6	152
10	180	98-100	87	92,9	540	0,4	155
10	240	98-100	86	93,2	490	0,5	150

It can be observed from the table that the influence of different boiling time on the process, some properties of the resulting cellulose have different indicators, and based on the results of the research, the optimal value of the boiling time was determined for each of the PTKTCh (cellulose from fibrous wastes of textile enterprises). Increasing the boiling time caused various destructive conditions, including a negative effect on the degree of polymerization of cellulose, and a positive effect on its ash content and the degree of swelling. Accordingly, the boiling time for cotton fluff- CW (lint)is 180 minutes, the boiling time is 120 minutes for the waste mixed with lint - CG (ulyuk), and the boiling time is 60 minutes for the waste mixed with short lint - CSW (pux) the optimal concentration was obtained.

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