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DEVELOPMENT OF TECHNOLOGY FOR PRODUCTION OF CELLULOSE FROM PLANTS OF TISSUE AND RECEIVING Na-CARBOXYMETHYLCELLULOSE ON ITS BASIS

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ABSTRACT:

Cellulose, as the most widely spread natural polymer material, is one of the most important semi-finished products used in the paper, textile and chemical industries.

The main plant raw material for the production of cellulose is coniferous wood, hardwood and cotton lint. Cellulose can also be obtained from non-wood plant species such as flax, stems of cotton (cotton wood), hemp, jute, kenaf, and others.

KEYWORD: carboxymethyl cellulose, cellulose, cellulose ethers, degree of polymerization, degree of substitution, ash content, temperature, humidity, mercerization, natural polymer material, non-woody plant species such as flax, cotton stalks (cottonwood), hemp, jute, kenaf.

INTRODUCTION:

Cellulose, as the most widely spread natural polymer material, is one of the most important semi-finished products used in the paper, textile and chemical industries.

The main plant raw material for the production of cellulose is coniferous wood, hardwood and cotton lint. Cellulose can also be obtained from non-wood plant species such as flax, stems of cotton (cotton wood), hemp, jute, kenaf, and others.

However, in the past 20-30 years, annual plants are also widely spread: straws of rye, barley, wheat, rice and reeds. Abroad, cellulose is also produced from bamboo and bagasse.

But despite the presence of a significant raw material base, recently researchers and technologists are actively searching for new types of cellulose-containing raw materials for the production of cellulose and on its basis paper and paper products [1-2]. Preliminary studies have shown that about 50% of the pulp is present in the stalk of castor oil. Therefore, carrying out research work on the development of technology for the production of cellulose from a castor plant suitable for further chemical processing is a topical problem in the science of the present period.

The main types of cellulose-containing raw materials are wood of deciduous and

coniferous species, as well as annual plants. In this case, the practical content of cellulose in them is the same (38-43%). Whereas, the lignin content in wood is 2.5-3 times higher than in annual plants, and the content of hemicelluloses predominates in annual plants [3-4].

With a view to obtaining cellulose, studies were carried out on the alkaline cooking of crushed stems of tongs with different amounts of NaOH in the cooking liquor, and the main characteristics of the products obtained are summarized in Table 1.

From Table 1, it can be seen that at a temperature of 140 0C and an alkali concentration of up to 20 g / l in the cooking liquor, the dissolution of non-cellulose components of the feedstock does not occur or dissolves very little, which indicates a lack of alkali for the dissolution of non-cellulose substances.

When the concentration of alkali increases to 60 g / l, the yield of cellulose decreases to 40%, which can be explained by an increase in the rate of the hydrolysis reaction of macromolecules of cellulose. At the same time, the content of a-cellulose falls by 1%, and the degree of polymerization is up to 970, the cellulose moisture increases to 3.8%, which is indicative of a partial loosening of the supramolecular structure of cellulose (Table 1).

Table 1 Effect of the concentration of NaOH in the cooking liquor on the main characteristics of cellulose

№	NaOH, г/л	temperature, ^{0}C	τ, hour	Exit, %	Humidity, %	slush, %	α-cellulose, %	PP
1.	40	140	5	20	-	-	-	-
2.	45	140	5	25	3,0	1,2	87,0	1150
3.	50	140	5	40	3,6	1,0	90,1	1020
4.	55	140	5	53	3,8	1,1	92,0	970
5.	60	140	5	60	4,0	0,95	92,4	850

When the concentration of alkali increases to 60 g / l, the yield of cellulose decreases to 40%, which can be explained by an increase in the rate of the hydrolysis reaction of macromolecules of cellulose. At the same time, the content of a-cellulose falls by 1%, and the degree of polymerization is up to 970, the cellulose humidity increases to 3.8%, which is indicative of a partial loosening of the supramolecular structure of cellulose.

An increase in the concentration of NaOH promotes an increase in the solubility of ashes of inorganic origin. Therefore, the ash content is reduced to 1.1%.

A further increase in the concentration of alkali leads to a fall in the ash content of the cellulose, but the yield, SP and the content of α-cellulose are sharply reduced.

Consequently, an increase in the alkali concentration of more than 40-45 g / l is not advisable, at the same time the consumption of alkali increases and the qualitative indices of the resulting cellulose deteriorate. Based on the data obtained, we can assume that the optimal concentration of NaOH in the digester is 55 g / l, at a temperature of 1400C and a cooking time of 5 hours.

In order to expand the assortment of raw materials for the production of various cellulose ethers, in the future we obtained simple esters based on cellulose derived from castor oil.

Thewater-soluble carboxymethyl cellulose (Na-CMC) is obtained by the action on

alkaline cellulose monochloroacetic acid according to the following reaction:

$$[C_6H_7O_2(OH)_3NaOH]_n+nCH_2ClCOONa\rightarrow [C_6H_7O_2(OH)_2\ OCH_2COONa]_n+n\ NaCl+n\ H_2O$$

For the synthesis of Na-CMC, a cellulose sample was obtained from Jerusalem artichoke with the following qualitative indices (Table 2):
Degree of polymerization (PP) - 970
Humidity,% - 3,8
α-cellulose,% - 92
ash,% 1.1

Table 2 Influence on the main indices of Na-carboxymethylcellulose obtained from pulp pulp, concentration of hydroxide sodium and the molar flow of Na-MHC

Consumption of components		Indicators of carboxymethylcellulose			
Concentration, NaOH г/л	Cellulose: Na-MHUK, mole	Concentration, NaOH г/л	Cellulose: Na-MHUK, mole	Concentration, NaOH г/л	Cellulose: Na-MHUK, mole
220	1,0	42,0	0,64	800	98,2
	1,5	42,0	0,67	770	98,0
	1,6	44,3	0,72	750	98,2
	1,8	47,5	0,75	710	98,5
240	1,0	48,4	0,75	780	97,2
	1,5	48,9	0,75	760	97,0
	1,6	48,2	0,77	750	97,3
	1,8	49,7	0,76	710	97,6
260	1,0	48,0	0,78	590	97,9
	1,5	50,2	0,78	580	98,4
	1,6	51,6	0,80	540	98,6
	1,8	51,8	0,81	510	98,2

It is known that the process of Na-CMC production consists of several stages, including alkaline mercerization, alkylation, pre-ripening, and drying. Obtained Na-CMC on the basis of the above stages, undergoes various destructive effects for the entire technological path, which leads to mechanical, thermal, and chemical degradation. In this case, the breaking of the elementary links in the chain of the fiber macromolecules adversely affects the qualitative indices of the Na-CMC obtained (Table 3).

Table 3. The condition for obtaining Na-CMC from pulp pulp and the industrial condition for obtaining Na-CMC of their cotton linters

№ п/п	Name of conditions	Prototype	The industrial grade of carboxymethylcellulose 85/600 produced from CC and DC at Namangan chemical plant according to OST 605-386-80
1	The temperature of the mercerization process, ^{0}C	18-20	26
2	The duration of the mercerization process, min	15-20	60
3	Extraction degree of cellulose from excess alkali	2,7	2,6
4	The content of sodium hydroxide in alkaline cellulose, %	17	13
5	The duration of crushing of alkaline cellulose, h	0,5	2
6	The esterification temperature,^{0}C	35-40	25-33
7	The duration of mixing alkaline cellulose with NaMKhUK, min	50	120

As can be seen from Table 2, the condition for obtaining Na-CMC prototypes from castor pulp is practically the same as production.

Qualitative indices of Na-CMC, obtained from pulp pulp, we were compared with Na-CMC samples obtained from other sources of raw materials of HC, DC and existing in production (Table 4).

Table 4 Physicochemical parameters of prototypes Na- carboxymethylcellulose and a production brand, manufactured according to TU - 88.2 - 12-2005

№	Indicators	Samples of carboxymethylcellulose			
		Cellulose from safflower	Cellulose from poplar wood	Cellulose from safflower	TU - 88.2 - 12-2005
1	Power polymerization (PP)	800	760	930	500
2	The content of the main substance,%	65	58	53	50
3	The viscosity of a 2% aqueous solution, cPs	142,0	135,0	140,0	100
4	Solubility in water,%	98,2	98,4	98,8	97
5	Power polymerization (PP)	60	58	59	45

As can be seen from the data in Table 4, Na-CMC, obtained from pulp pulp pulp, is almost as good as Na-CMC obtained from other types of raw materials, it meets the

requirements of technical specifications and it is quite possible to use it in the same industries that they are used for.

REFERENCES:

1) M. Murodov, A. Lysenko. "Effective Technology of Obtaining The Carboxymethyl Cellulose From Annual Plants" // Materials science and engineering an introduction. – Switzerland, 2012. –pp 541-543.
2) M. M. Murodov, M. M. Khalikov at al. "Endurance of High Molecular Weight Carboxymethyl Cellulose in Corrosive Environments" // 6th INTERNATIONAL CONFERENCE ON TIMES OF POLYMERS (TOP) AND COMPOSITES. American Institute of Physics Conf. Proc. 1459, pp 309-311, 2012.
3) Муродов М. М. Новая технология получения Na-карбоксиметилцеллюлозы на основе целлюлозы древесины тополя // Кимё ва кимё технологияси журнали. – Ташкент, 2007. -№4. – С. 38-42.
4) Г. Р., Муродов М. М. Получение целлюлозы из древесины тополя Центрально-Азиатского региона пригодной для производства пластических масс // Кимё ва кимё технологияси журнали. – Ташкент, 2008. -№1. -С. 61-63.