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ON THE BASIS OF DIFFERENT OBJECTS, TECHNOLOGY OF GETTING E-466 FROM PTKTCh AND PAVLONIA AND BANANA CELLULOSES AND ITS PHYSICAL-CHEMICAL, MECHANICAL-STRUCTURAL

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Abstract
A number of practical works have been carried out on the development and research of technology for obtaining E-466 from fibrous waste of ginneries and high-purity cellulose grades obtained on the basis of pavlovnia tree and banana stalks. E-466 cellulose ether, which is the main raw material and secondary product for various industries, is characterized by the fact that it is obtained on the basis of local raw materials.

Keywords: Banana cellulose, extraction process, basic substance content, cotton lint, polymerization rate, pentosan, alkali sediment, brittleness, ash content, moisture, cellulose, concentration, parameter, optimal conditions, destruction

Introduction

Carboxymethylcellulose, sodium carboxymethylcellulose (food additive E-466) is a colorless amorphous substance, a weak acid, due to its chemical nature it is a highly polymeric ionic electrolyte. Carboxymethylcellulose is obtained from the reaction of monochloroacetic acid with alkylcellulose, which in turn is obtained from cellulose and caustic soda. Carboxymethylcellulose can be genetically modified. It dissolves well in water, is odorless and not toxic at all. Carboxymethylcellulose does not decompose under the influence of bright light and is insoluble in vegetable and animal fats.

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It is known that if the technical process is not followed (e.g. when the dose is exceeded), carboxymethylcellulose (food supplement E-466) can lead to digestive disorders. There are no official scientific data on toxicity when used in the cosmetics industry. There is unconfirmed evidence in some animal studies that carboxymethylcellulose can increase cholesterol levels and lead to tumors and cancer. The food supplement E-466 is used as a strength stabilizer, thickener, capsule. The main feature of carboxymethylcellulose is its ability to form a highly viscous colloidal solution that does not lose its properties over a long period of time. As a thickener in the production of ice cream, cottage cheese mass, mayonnaise; sweets, jelly, cream and as a strength regulator in pastes; used in shells for fish, meat, confectionery.

Other uses of carboxymethylcellulose:

- In medicine, for the production of laxatives;
- In The production of household chemicals and cosmetics (shampoos, lubricants, hair care products, etc.).

The technology of obtaining E-466 from PTKTCh (fiber pulp of textile enterprises) and peacock and banana celluloses and its physicochemical, mechanical and structural properties were studied on the basis of various objects.

Comparison and physicochemical performance of some quality indicators of Na-KMTs obtained from cellulose PTKTCh (fiber pulp of textile enterprises) with the requirements given in Tsh-88.2-12-2005 and Tsh-2231-001-5353-5770-01.

TABLE- 1

№	Indicators	PTKTCh, Na-KMTs	1Tsh	2Tsh 85/600	Pavlonia, Na-KMTs	1Tsh	2Tsh 85/600	Banana, Na-KMTs	1Tsh
1	The degree of polymerization, no less	1400	500	650	920	500	500	650	500
2	Degree of substitution with carboxyl groups.	85	80-100	85	85	80-100	65-85	85	80-100
3	Amount of base substance, %	50	50	53	55	50	48	55	50
4	The dynamic viscosity of a 2% aqueous solution, mPas	124,0	100	215,8	115,2	100	90-150	111,8	100
5	Water solubility, %	98,4	97	98,8	99,2	97	98	98,9	97
6	Environment, pH	11	8-12	9	11	8-12	8-12	11	8-12

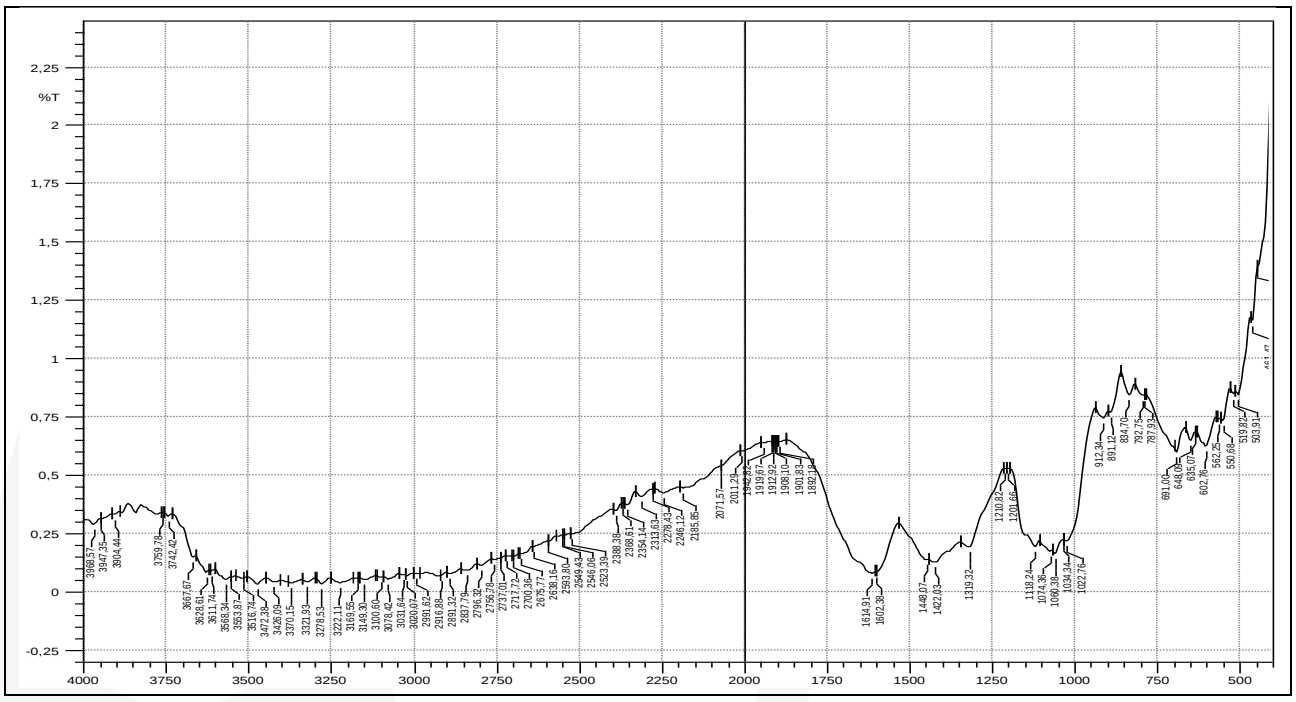
***1Tsh-88.2-12-2005**

***2Tsh-2231-001-5353-5770-01**

As can be seen from the table, several brands of Na-KMTs were obtained that meet the requirements of the technical specifications with some quality indicators.

It was determined that the obtained KMTs (carboxymethylcellulose) meet the requirements of technical specifications Tsh-88.2-12-2005 and Tsh-2231-001-5353-5770-01, which contain various indicators of water solubility, dynamic viscosity, degree of polymerization, exchange rate, amount of base substance and so on.

Various brands of Na-KMTs derived from PTKTCh (fiber pulp of textile enterprises), pavloniya tree and banana stem cellulose are widely used in the oil and gas industry and in geology as a drilling reagent (85/500), in the production of varnishes and matches, and as an adhesive in various industries.



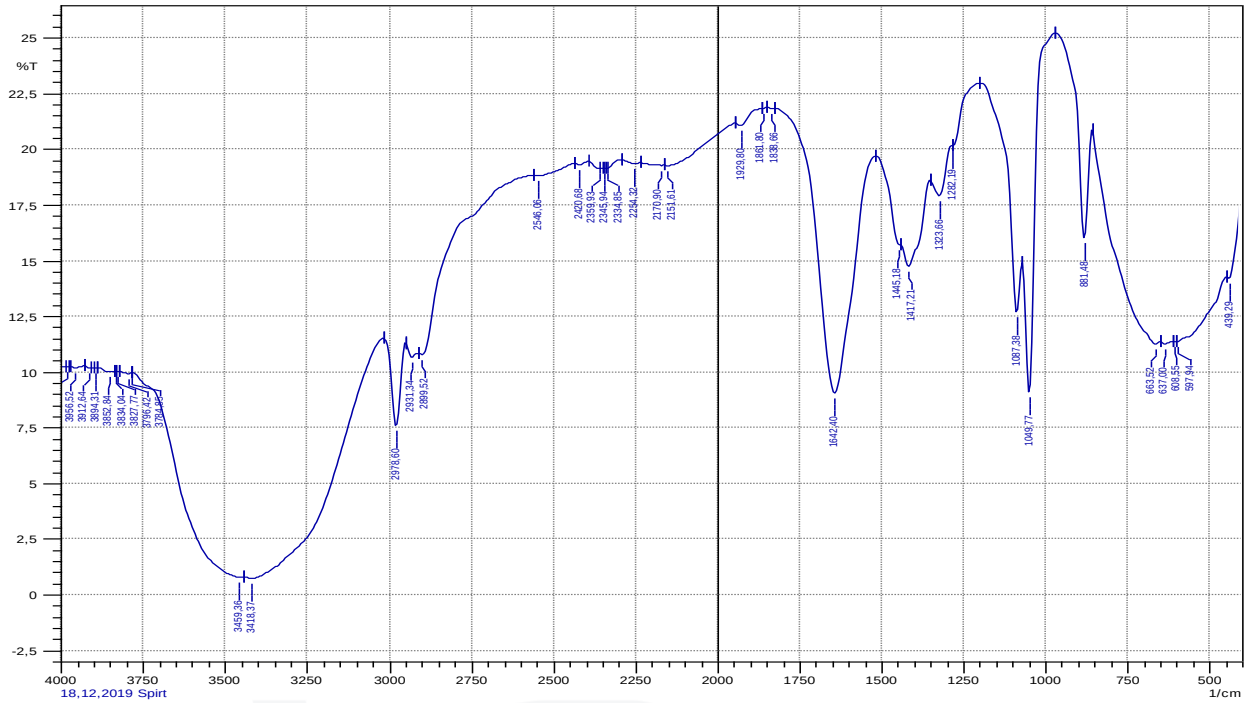
Pic– 2. The IR spectrum of technical KMTs.

The spectra have the following poles, ie 3750, 3500, 3250, 3000, ... 1250, 750, 500 cm^{-1}. It can be seen from these poles that there is a degree of exchange of cellulose to the hydroxyl group through the carbonyl functional group, and the presence of glycolates from the lower poles that do not react in the IR spectral lines that is, it is in the outer phase.

The scientific essence is that the cellulose is first soaked in isopropyl alcohol and mercerization is carried out in a solution of caustic alkali (NaON). Then alkylation is carried out by adding a certain amount of monochloric acetic acid to alkaline cellulose, and then alkylation is carried out by adding a certain amount of monochloric acetic acid to alkaline cellulose. The resulting carboxymethyl cellulose is used for

purification Na-KMTs with a moisture content of 38.40% are converted into 53% ethyl alcohol and the extraction process is carried out.

In the laboratory, 650 ml of an aqueous solution of 53% ethyl alcohol is taken and placed in a glass bottle with a volume of 3000 ml. 150 g of Na-KMTs are added to it and extracted by stirring for 1 hour. Over time, various additional compounds in the Na-KMTs are obtained and converted into alcohol. The purified KMTs (carboxymethylcellulose) are separated, squeezed and dried at 860C.



Pic. – 3. IR spectrum of post-extraction ethyl alcohol.

The spectra have the following poles, i.e. 3500, 3250, 3000, 2500, 1750, 1250, 750, 500 cm^{-1}. It can be observed from these poles and the interceptable poles in their range that the residues of monochloroacetate, cellulose, caustic soda, which did not undergo various reactions after extraction of technical KMTs (carboxymethylcellulose) in ethyl alcohol, i.e. when glycolates are converted to alcohol, it can be observed that the content of the main substance in KMTs (carboxymethylcellulose) increased from 55 to 98%. This will allow the high-purity KMTs (carboxymethylcellulose) drug to be widely used in various fields, including medicine, perfumery and food industry.

In the laboratory, on the basis of the above-mentioned method, 70/500 marks of KMTs (carboxymethylcellulose) purified on the basis of wheat straw cellulose and 85/800 marks of purified KMTs (carboxymethylcellulose) on the basis of cotton cellulose are obtained.

Code E-466 The food supplement is known as the sodium carboxymethylcellulose salt.

To obtain this supplement from plant fibers, they are treated and washed with chloroacetic acid in an alkaline environment. It can also be obtained through genetic modification. Ready-to-use supplement is a white or almost white powder or granules, tasteless and odorless. The physical and chemical properties of this group of compounds may vary slightly depending on their chemical structure. They are usually highly soluble in water and alkalis, in the middle - in glycerin and acids, and insoluble - in vegetable and animal fats and organic solvents.

The E-466 supplement is considered approved in the food industry in Russia and pasteurized cream, various products on TI (see below for hygiene standards) and is used as a thickening stabilizer and carrier in products in children from birth to correct metabolic diseases diet.

Influence on the human body:

Based on numerous studies, carboxymethylcellulose has been approved for use in the territory of the Russian Federation. In the food industry, it is used in a limited way, however, some categories of people should use products containing E-466 supplementation in a limited way because of the possible manifestation of intestinal disorders. The use of products containing E-466 supplement is prohibited for people with gastrointestinal diseases and those suffering from metabolic diseases should treat such foods with caution. Carboxymethylcellulose is not an allergen and does not irritate the skin. The appendix does not have an approved permit for use in the production of baby food.

Supplement E-466 is a completely non-degradable substance, single use of which can result in a laxative effect of more than 5 mg. According to independent expert data, it is believed that it affects the formation of cancer as well as an increase in cholesterol levels. The daily allowable amount of carboxymethylcellulose has not been determined.

Carboxymethylcellulose (CMC) E-466

Carboxymethylcellulose is a powder from white to cream color, without additives and excess odor. It operates over a wide temperature range and a versatile thickening stabilizer with high viscosity. Gelling properties, fluidity, strength and improves stability, prevents the release of excess moisture (syneresis).

Carboxymethylcellulose sodium salt E-466 (KMTs). Technological functions - stabilizer, thickener, carrier, coating, capsule.

No Gmo Sources In Content:

We eat all kinds of food and non-food products, including dairy products, toothpaste-creams, sour cream, cottage cheese and we offer thickeners for others.

Na-KMTs are non-toxic and non-explosive. The world industry produces two types of Na-KMTs: technical and refined. The main contaminants contaminating Na-KMTs are sodium chloride and glycolate, which may also contain sodium hydroxide and sodium bicarbonate. Depending on the methods of obtaining Na-KMTs (carboxymethylcellulose), their content can reach 50%. Depending on the field of application, the content of the main substance in the purified Na-KMTs should be at least 93%. Sodium salt of carboxymethylcellulose is widely used in various industries. Refined brands of Na-KMTs are widely used by the food industry as stabilizers, emulsifiers and thickeners, suspensions and emulsions of multi-component systems, giving them the desired taste properties and product consistency. Na-KMTs are used in the manufacture of dairy products, mayonnaise, cheese equivalents and ice-cream. In the confectionery industry and in the manufacture of bakery products, jelly, mousse, meringue, jam, marmalade, fruit and berry fillings, cream, pasta, baked goods, pasta, as well as sauces, fruit-based products, fruit juices, beverages, aromatic emulsions and diet used in food. Na-KMTs (carboxymethylcellulose) are used as a regulator of the consistency of margarines with different fat content because they are resistant to low temperatures in the product. Purified Na-KMTs do not have harmful effects on the human body and therefore it is a safe food supplement. Refined Na-KMTs protect the skin in the perfumery and cosmetics industry due to their structure-forming properties and emulsions for skin care, facial cleansing, creams for removing wrinkles, shampoos, cosmetic pencils, hair conditioners, lubricating creams and etc. are used for manufacturing. In the pharmaceutical industry it is used in the manufacture of medical soaps, ointments, emulsions, tablets, binders, toothpastes, as the main ingredient in mouthwashes. Na-KMTs are the basis of adhesives for dentures and therapeutic and prophylactic toothpastes. In addition, refined Na-KMTs are used for the production of electrodes, film materials, electric vacuum devices and so on.

A distinctive feature of the technology of production of almost all cellulose esters is the occurrence of side reactions that lead to the formation of mixtures. Depending on the reaction conditions, the proportion of additional products may be more significant. The basic principle of removal of impurities from Na-KMTs is to separate them with solvents that dissolve the additional products and do not dissolve the main

product KMTs (carboxymethylcellulose). Technical solutions for the purification of KMTs 22 are mainly shortened to search for such extractors or to convert KMTs to an insoluble state. The process of obtaining purified Na-KMTs can be divided into several methods. Obtaining purified Na-KMTs by converting Na-KMTs (carboxymethylcellulose) to a water-insoluble form by treatment with strong mineral or organic acids and then separating the impurities by washing it with water. KMTs (carboxymethylcellulose) purified from salts can then be converted to a salt form by treatment with stoichiometric amounts of hydroxides or carbonates of the corresponding metals. The disadvantage of this method is the use of strong acids, high concentration of solutions and temperature is the length of processing time. The high catalytic activity of sulfuric and hydrochloric acids in the hydrolysis processes of cellulose derivatives is the degree of polymerization of the primary polymer and leads to a decrease in product yield. The use of strong acids in the acidification phase of Na-KMTs (carboxymethylcellulose) requires the use of corrosion-resistant equipment.

Obtaining KMTs (carboxymethylcellulose) in acid form, in which Na-KMTs are dissolved in an aqueous-alcoholic solution, then inorganic calcium and aluminum salts (chlorides, acetates or hydroxides) are introduced simultaneously or separately into a solution, mixed, separated from the product solution and dried. The dried product is treated with an aqueous solution of inorganic acid (sulfur, chloride, nitrogen or phosphorus), mixed and separated from the KMTs (carboxymethylcellulose) solution. Extraction of glycols is carried out with water. The disadvantages of this method are the calcium content of Na-KMTs and the introduction of additional stages of processing with aluminum salts and drying of the product before acid treatment, acid and the need to recover organic solvent from a water-containing solution, the addition of inorganic calcium and aluminum, the salts lead to a decrease in product purity. The resulting product in the form of sodium chloride has an impurity content of 0.09 to 1.2%. The method allows to obtain KMTs (carboxymethylcellulose) in the form of a practically water-insoluble product that can be washed repeatedly with water until a minimum amount of impurities is present. The disadvantage of this method is the use of saturated solutions of acid salts of sulfuric acid, which have high catalytic activity in the processes of destruction of cellulose materials. The rupture of polymer chains as a result of the destruction of cellulose leads, firstly, to a decrease in the degree of polymerization, which determines the quality of the resulting product, and secondly, to the formation of low molecular weight water-soluble fractions, washing water and leads to a decrease in the output of the resulting KMTs (carboxymethylcellulose), high product profitability is especially

important for large-scale production, including the production of KMTs (carboxymethylcellulose) [119].

Synthesis was carried out in 3 stages in 55% - 65% - 80% solutions of ethyl alcohol by extraction. The quality indicators of KMTs (carboxymethylcellulose) and PATs samples obtained with semi-purity and high purity were found to correspond to the requirements given in Ts 22235949-003: 2015 and Ts 22235949-003: 2015.

Comparison of the obtained quality parameters of KMTs (carboxymethylcellulose) and PATs samples with semi-purity and high purity with the requirements of Ts 22235949-003: 2015 and Ts 22235949-003: 2015.

TABLE-4

Description of indicators	**70/600-0**	**85/700-C-O**	**85/700-PO**	**Sample 13.02.2018 *1(85/700-PO)**	**Sample 28.02.2018 *2(70/600-0, 85/700-C-O)**
1. Appearance					
2. The mass fraction of water,% is not much	10	10	10	**3,9**	**4,8**
3. In terms of the degree of exchange of the carboxymethyl group, not less.	0,65	0,7	0,6	**78**	**79**
4. Mass fraction of the amount of the main substance in an absolutely dry product.	97	97	63	**82**	**98,7**
5. Solubility in water,%, not less	98,5	-	97	**99,0**	**99,2**
6. The dynamic viscosity of a 2% aqueous solution at a temperature of 200C, mPa* s, is not less than that of the main substance of KMTs (carboxymethylcellulose).	100	100	100	**-**	**-**
7. Hydrogen index (pH) of an aqueous solution of KMTs (carboxymethylcellulose) with a mass fraction of 1.5%.	7,0±0,5	6,7-10,0	8-10	**8,1**	**7,8**
8. The water recovery rate of KMT soil solution with a mass fraction of 0.75% calculated from the main substance, cm^3 / min, is not much.	4	-	4	**4**	**3,0**
9. The degree of polymerization	600	700	700	**1050**	**820**

*1-Obtained on the basis of TKTChTs (fiber pulp of textile enterprises) N-KMTs

*2- N-KMTs derived from Pavlonia tree cellulose.

In the 55% - 65% - 80% solution of ethyl alcohol by extraction, the synthesis process was carried out in 3 stages. The quality indicators of KMTs (carboxymethylcellulose) and PATs samples obtained with semi-purity and high purity were found to correspond to the requirements given in Ts 22235949-003: 2015 and Ts 22235949-003: 2015. The results were found to be positive and a proposal for implementation in production was put forward.

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