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# Innovative Technology of Producing High Purity Carboxymethyl Cellulose Based on Cellulose of Pavlonia Tree

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**ABSTRACT**

*Purified Na CMC (Carboxymethyl cellulose) is a product in powder form or fiber form, and its color varies from white yellow to clear brown depending on the brand of the product. Purified Na CMC are well soluble in aqueous solution of 40% ethanol and acetone. Insoluble in other types of organic solvents. All quality parameters of refined Na CMC must meet the requirements of State standard 6,05-386-80. At the initial stage of scientific work, Na CMC were obtained on the basis of cellulose of wheat straw and cellulose of cotton. The scientific essence is that the cellulose is first soaked in isopropyl alcohol and the etching process is carried out in a caustic alkali (NaON) solution. Then, a certain amount of monochloroacetic acid is added to the alkaline cellulose, and the alkylation process is carried out. then the alkylation process is carried out by adding a certain amount of monochloroacetic acid to the alkaline cellulose. The resulting carboxymethyl cellulose is directed to purification Na CMC with a moisture content of 38.40% is calculated into 53% ethyl alcohol, and the extraction process is carried out.*

Measures are being taken to increase economic efficiency by producing import-substituting and export-oriented finished products. On July 16, 2020 President Shavkat Mirziyoyev got acquainted with the presentation of new projects in the oil and gas chemistry, electrical engineering and pharmaceutical industries, as well as reports on the development of these industries via video link [1].

In today's conditions, where the global pandemic has a serious negative impact on the world economy, the sustainable development of industry in our country is being continued consistently. Our country is on the way to deep processing of raw resources and their monetization. In other words, measures are being taken to increase economic efficiency by producing import-substituting and export-oriented finished products.

The presentation provided information on such new projects in the oil and gas chemistry industry.

Last year, on December 28, the production complex of Polyvinyl chloride, caustic soda and methanol was put into operation at the "Navoiyazot" joint-stock company. Today, its second stage is being designed. The cost of this project is estimated to be around 440 million dollars. It is planned that 650 people will be employed, and products worth 132 million dollars will be produced annually. Also, a large amount of natural gas is saved as a result of the installation of modern technologies.

The next project worth 25 million dollars is intended for the production of hydrogen peroxide. This substance with cleaning-disinfecting properties is widely used in pharmaceuticals, medicine, textiles and domestic life. As a result of the project, 50 jobs will be created, and about 20 million dollars worth of products will be produced annually. It is planned to launch this enterprise in September 2021 in Navoi region.

"Navoiyazot" JSC is launching another project worth more than 18 million dollars - the production of urea formaldehyde concentrate. The construction of this enterprise started in March of this year, and it is planned to put it into operation in March of next year. Here, 9 million dollars worth of import-substituting goods are produced, 1 million dollars worth of exports are made, and 50 jobs are created.

The $12 million project to produce reagents based on carboxymethylcellulose is important for construction, drilling, the food industry, and medicine. In March of this year, its first stage was launched in the Yukori Chirchik district. By 2023, when all four stages are completed, $9 million worth of import-substituting and $13 million worth of exportable goods will be produced. 100 jobs will be established.

Currently, the amount of cellulose produced in the Republic satisfies only 5-8% of the demand of cellulose products manufacturing enterprises. In order for enterprises to work at full capacity, these raw materials are imported from countries with a developed cellulose industry (Russia, Belgium, Norway, Finland, Poland, China...) for a large amount of foreign currency. However, in addition to cotton lint, there are opportunities to provide cellulose obtained on the basis of lint, "ugar", "ulyuk", and cyclone cotton wastes of the cotton ginning industry. The amount of fibrous waste of the cotton cleaning industry is 20 thousand tons per year (statistics of 2010)[2-3].

Cellulose is used as a basic raw material in many different industries. Na- CMC, a simple ether of cellulose, are produced in our Republic by a number of enterprises, including UzNeftMakhsulot "KARBONAM" LLC (production capacity 30,000 t per year), "THE BEST PRODUCT" LLC (production capacity 1200 t per year), "BARAKA-AAN" BSF (production production capacity of 500 t per year) several brands are produced with high quality, as well as "Tashkent paper" LLC (production capacity 45,000 t per year), "Namangan paper" LLC (production capacity 18,000 t per year), several large enterprises, such as the foreign-invested “ANGREN PACK” thick paper production OJSC (production capacity 100,000 tons per year), produce paper and paper products.

Most of the above-mentioned enterprises are unable to operate at full capacity due to a shortage of cellulose. Only "KARBONAM" LLC currently produces 200-500 tons of Na- CMC instead of 30,000 tons per year. This indicator cannot cover even one tenth of the Republic's need for Na-CMC.

Cellulose fibers are strong due to the dense arrangement of cellulose macromolecules in the fibers. Such durable fibers are widely used in many sectors of the manufacturing industry and in life. The above-mentioned properties of cellulose and its good reactivity allow for the synthesis of various simple and complex ethers based on cellulose on a large scale [4].

For example, the production of Na-CMC is not only for oil and gas and other industries, but its refined types are also widely used in the food and perfume industries.

The technical process of purified CMC includes the following steps: Preparation of products and solutions; Extraction; Squeezing and pinching; Drying purified Na CMC; Grinding; Packaging of the finished product; Cleaning up the used solution.

The main task of the technological process is to clean additional compounds contained in Na CMC by extraction with an aqueous solution of ethyl alcohol, that is, to extract and dry CMC with the help of continuous wicks, and to squeeze the finished product in the equipment used

with the help of a continuous mechanism. Purified Na CMC represents the sodium salt of cellulose glycolic acid.

Purified Na CMC is a product in powder form or fiber form, and its color varies from white yellow to clear brown depending on the brand of the product. Purified Na CMC is well soluble in aqueous solution of 40% ethanol in water and in acetone. Insoluble in other types of organic solvents. All quality parameters of purified Na CMC must meet the requirements of State standard 6.05-386-80. At the initial stage of scientific work, Na CMC was obtained on the basis of wheat straw cellulose and cotton cellulose.

The scientific essence is that the cellulose is first soaked in isopropyl alcohol, and the etching process is carried out in a solution of caustic alkali (NaON). Then, a certain amount of monochloroacetic acid is added to the alkaline cellulose, and the alkylation process is carried out, then the alkylation process is carried out by adding a certain amount of monochloroacetic acid to the alkaline cellulose. The resulting carboxymethyl cellulose is directed to purification 38, 40% Na CMC with a moisture content of 53% ethyl alcohol, and its extraction process is carried out.

In laboratory conditions, 650 ml of the aqueous solution of 53% ethyl alcohol is taken and placed in a 3000 ml glass container. 150 g of Na CMC is added to it and extracted with stirring for 1 hour. Over time, various additional compounds in Na CMC are removed and transferred to the composition of alcohol. The purified CMC is separated, pressed and dried from the $86^0$C.

In laboratory conditions, it is possible to obtain 85/700 grade of purified CMC on the basis of the cellulose of the paulownia balance and 85/800 grade of purified CMC on the basis of cotton cellulose.

**Effect of CMC obtained from Paulownia tree balance cellulose and cotton cellulose on extraction time on main substance content**

**10-table**

| № | **CMC obtained on the basis of Paulownia tree balance cellulose** | | **CMC derived from cotton cellulose** | |
|---|---|---|---|---|
| | Extraction time, min | Amount of main substance | Extraction time, min | Amount of main substance |
| 1 | 10 | 78 | 10 | 58 |
| 2 | 20 | 82 | 20 | 71 |
| 3 | 30 | 85 | 30 | 78 |
| 4 | 40 | 92 | 40 | 86 |
| 5 | 50 | 96 | 50 | 91 |
| 6 | 60 | 98,2 | 60 | 95 |
| 7 | 70 | 99,2 | 60 | 98,2 |

Accordingly, it is possible to observe the extent to which the refined CMC undergoes technological changes during the process obtained from both cellulose-based products.

For example, the table above compares and observes the cleaning time of both cellulose-based purified CMC.

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