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SUPERMOLECULAR STRUCTURE OF COTTON CELLULOSE TREATED WITH LIQUID AMMONIA AND INCLUDED WITH ALCOHOLS

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ABSTRACT

The article studies the reactivity of cellulose is closely related to the packing density, ordering or availability of cellulose macromolecules. To determine the above indicators, various methods are used, such as X-ray, electron microscopy, etc. To obtain results comparable to the cellulose esterification rate, it is necessary to determine the availability under conditions as close as possible to the esterification conditions.

KEYWORDS: ***cellulose, ammonia, sorption, X-ray diffraction, esterification, system, crystalline, chemical.***

INTRODUCTION

Among fibrous materials, there is no material with such significant values as for cellulose, values of sorption (8-14% at a relative humidity of 65%) and swelling (60-130%). Basalt fiber filters are widely used for cleaning the dusty air of metallurgical and chemical plants with an operating temperature of 300-650oC. Filtering materials made of basalt fibers with a diameter of 17-25 microns are quite strong, permeable, brittle and flexible.

Although the main factor determining the sorption capacity of cellulose is undoubtedly the presence of OH groups, the physical structure of cellulose also plays a significant role. A developed capillary-porous system, including the intrafibrillar structure of cellulose, irregularities in packing less than 1.5 nm in size, interfibrillar voids (pores) 1.5-10 nm in size, pores resulting from the swelling of hydrated cellulose (in particular, viscose) fibers, several tens of nanometers, as well as channels and macropores in natural cellulose fibers with a diameter of several micrometers cause not only true sorption (adsorption), but also capillary condensation of water vapor. Fine sulphite pulp (bleached) and asbestos fiber filters are used in the production of wine and cognac. Depending on the amount of asbestos added to the cellulose, filter materials are of different brands: YaK-1, YaK-2 and YaK-3. Depending on the viscosity of the filtered mass, the appropriate filter grade is selected. For example, YAK-3 is used to filter medium-strength wines and dessert wines. Taking into account the above considerations, a filter material was obtained from cotton pulp and basalt fiber (coarse and ultra) and its quality indicators were studied.

METHODS AND RESULTS

The morphological and supramolecular structure of cellulose determines its reactivity to various esterification reactions, and form the properties of the resulting products based on it.

The results are presented in the tables below. Cellulose is used as the main raw material in many industries. Simple cellulose Na-CMC is produced by a number of enterprises in the country, including UzneftMakhsul LLC "CARBONAM" (production capacity of 30,000 tons per year) and other enterprises. Several high quality brands are produced, including Tashkent Paper LLC (production capacity 45,000 tons per year), Namangan Paper LLC (production capacity 18,000 tons per year) and ANGREN PACK with foreign investments. such as JSCs (production capacity 100,000 tons per year) produce paper and paper products. Most of the above enterprises are not operating at full capacity due to lack of pulp. Only LLC "CARBONAM" currently produces 200-500 tons of Na-CMC per year instead of 30,000 tons. This figure does not cover even one tenth of the republic's need for Na-KMC. Cellulose fibers are strong due to the ordered arrangement of cellulose macromolecules in the fibers. Such strong fibers are widely used in many industries and in everyday life. The aforementioned properties of cellulose make it possible to synthesize a wide range of cellulose-based ethers and esters.

Due to the low reactivity of cotton cellulose, in order to chemically process it (esterification) and modify its properties (graft copolymerization, crosslinking, etc.), preliminary activation treatments are carried out. In this regard, some treatment of cellulose samples with various chemical reagents is

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often carried out, as a result of which certain changes in the supramolecular structure take place, which improve the access of the reagents to the hydroxyl groups of cellulose macromolecules. The reactivity of cellulose is closely related to the packing density, ordering, or availability of cellulose macromolecules. Various methods are used to determine the above indicators, such as X-ray, IR spectroscopy, electron microscopy, water vapor sorption and density determination.

It is known that gaseous ammonia and concentrated, aqueous solutions of ammonia do not cause significant chemical or physicochemical changes in cellulose. Noticeable changes occur only under the action of liquid ammonia at temperatures of - 350C and below.

We have investigated the effect of processing cotton cellulose with liquid ammonia and then included with a homologous series of alcohols on the supramolecular structure of 133 cellulose by IR spectroscopy, X-ray diffraction and other physicochemical methods. The data obtained are shown in the table:

Table 1
Effect of activation treatments on SC, Sone and cotton cellulose density

№	Samples	SK,%	Sleep, cm^2	Density, g / cm^3	-ΔH, J / g
1	Original cotton cellulose	79	76	1,5545	45,3
2	Also processed with liquid ammonia	58	52	1,5275	54,6
3	Also included amyl alcohol	57	50	1,5200	57,1
4	Also, heptyl alcohol	55	49	1,4850	59,3
5	The same, nonilov alcohol	53	45	1,4825	61,7

From the given data in the table it follows that the treatment with liquid ammonia significantly reduces the degree of crystallinity (SC) of cellulose, which is due to the recrystallization of the crystalline regions of microfibrils. The area of the hydrogen bonded hydroxyl groups (Sone) and the density of the cellulose decrease accordingly. After the inclusion of cellulose with higher alcohols, the value of these indicators decreases significantly. This indicates that the supramolecular structure of cellulose is significantly loosened during these treatments. The integral heats of wetting with water (ΔH) of the above mentioned cellulose samples were determined (table). The table also shows that in all cases there is an increase in the value of the integral heat of wetting, the highest value of the heat of wetting is for cellulose included with nonyl alcohol. The reason for this is the difference in the chemical structure of the solvent molecules.

DISCUSSION

Measurements of the heat of wetting of various cellulose samples showed that this quantitative characteristic depends on the type of cellulose processing and is sensitive to changes in the structural state of cellulose occurring during its activation. The most significant effect on the absolute value of the heat of wetting of cellulose is exerted by its degree of crystallinity, i.e. the smaller the crystalline region of the fiber, the greater its reactivity, which is variably treated with liquid ammonia and subjected to inclusion, becomes more and more pronounced as the volume of the molecule of the inclusion reagent increases.

CONCLUSION

The scientific essence is that first cellulose is immersed in isopropyl alcohol and the mercerization process is carried out in a caustic alkali solution (NaOH). 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 sent for cleaning. Na CMC with a moisture content of 38-40% is washed and dried in 53% ethyl alcohol. In the laboratory, 650 ml of an aqueous solution of 53% ethyl alcohol is taken and placed in a 3000 ml glass vial. To this was added 150 g of Na-CMC and extracted with stirring for 1 hour. Over time, we get various additional compounds in the Na-CMC and convert them into alcohol. The purified CMC is pressed separately and dried at 860 ° C. Under laboratory conditions, on the basis of this method, purified CMC 80/700 grades based on cellulose of

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the Paulownia plant and 85/800 grades of CMC purified based on cellulose of cotton pile were obtained.

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