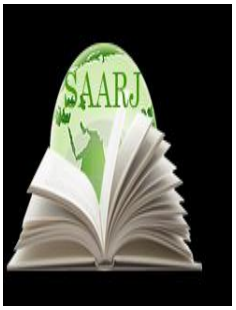

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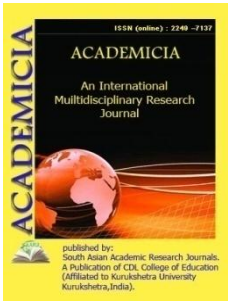

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OBTAINATION OF CARBOXYMETHYLCHITOSAN FROM INANIMATE BEES AND STUDY OF ITS PROPERTIES BY CONDUCTOMETRY, UV-SPECTROSCOPY

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ABSTRACT

This article presents the preparation of carboxymethylchitosan from a new promising source - dry dead bee chitosan. The issue of rational use of natural resources in Uzbekistan is one of the priorities of state policy. Such a statement of the task imposes tasks on many scientists involved in this object. Our country has a large number of reserves of biopolymers, the expansion of their application and in-depth study of the fundamental is of great scientific and practical importance. The physicochemical properties of carboxymethylchitosan obtained from the extinct apiary Apis Milliferra, in particular the degree of deacetylation, were studied by conductometric analysis and UV spectroscopy. In the study, for the first time on the basis of chitosan obtained from inanimate bees of local raw materials, its product carboxymethylchitosan was synthesized and its properties were studied.

KEYWORDS: *Dead Bee, Chitin, Chitosan, Carboxymethylchitosan, Conductometry, Biopolymer, Cellulose, UB Spectroscopy, Monochloroacetic Acid.*

INTRODUCTION

Currently, the practical application of natural biopolymers and their various derivatives is expanding. Cellulose and chitosan-type polysaccharides are being extensively studied in the textile, food, and medical fields. Today, they are the subject of research by many scientists.

It is known that chitosan (ChS) and its derivatives are widely used in the field of medicine, agriculture, etc. Chitosan derivatives, in particular, carboxymethyl chitosan (CMC), which has a high biological activity and pronounced antibacterial and anticoagulant properties, attract particular attention of researchers [1]. CMCS possessing minimal toxicity and stability is widely used in almost all areas, such as medicine, food industry, agriculture, nuclear energy and textile industry [2-4].

The identification of such characteristics determines the comparative study of the structural morphology of the chitosan and CMCSsamples. In this regard, water-soluble samples of CMCS were synthesized and studied by conductometric analysis [5].

In terms of prevalence in nature, chitosan is second only to cellulose and is obtained from products that are completely regenerated in nature. Chitosan is widely used in medicine, agriculture, textile industry, fabric dyeing, and floral printing [6].In the world, much attention is paid to chitosan derivatives obtained by chemical, physical or enzymatic modification of chitosan [7-9].

The main part

In connection with the widespread use of water-soluble derivatives of the chemical modification of chitin (CT), the synthesis of carboxymethylchitin (CMCT) is of great interest, a feature of which is that this polymer can be equally useful and non-toxic both for humans and for the environment. Of particular importance is the development of the most effective methods for modifying CMHT for the development of approaches and methods for the preparation of water-soluble derivatives of CT, which contain both elements of the parent structure and new functional groups [10-11].

Today, the development of experimental methods makes it possible to obtain water-soluble, hydrophilic, biologically active, environmentally friendly, harmless and other drugs with special properties. One of the most important tasks is to obtain samples of carboxymethylchitosan (CMCS) with different levels of deacetylation and water solubility based on chitosan on a global scale, as well as to expand their application and scope [9].

Recently, we obtained chitosan from the dead bees ApisMellifera and determined the chemical composition of the natural dry dead bees [12].

In our study, we measured 0,25 g of chitosan synthesized from the dead ApisMellifera bees collected and dried in spring. Isopropyl alcohol was mixed with water in a 1:1 ratio, measured in a volume of 20 ml, placed on chitosan, and stirred for 0.5 h in a magnetic stirrer at room temperature. Then a beaker was filled with 10 ml of 20% NaOH solution and stirred at 28 ° C for 1 hour. Measured 0,28 g of monochloroacetic acid (MCA), slowly adding to the glass and stirring at 65 ° C for 2.5–3 hours.

The mixture was left for 8-9 hours. Then it was neutralized with 1,5 ml of glacial acetic acid, washed thoroughly with absolute alcohol and filtered on a Buchner funnel. After drying at room temperature, was measured. Took 0,26 g of carboxymethylchitosan with a yield of 79%.

Carboxymethylchitosan, obtained by this method from the chitosan of the dead bees, is an odorless, yellowish powdery substance.

In the second method, 0,25 g of chitosan was measured and mixed in 12,5 ml of isopropyl alcohol (1:50). The resulting suspension was stirred in a mixer for 0.5 hours. Then add 10 ml of 30% NaOH solution to the beaker and stir for 1 h.

We added 0,28 g of MCHAA to the suspension little by little and stirred at 650C for 3-4 hours. The reaction mixture was left for 9–10 h.

Ice was neutralized in acetic acid until pH = 7 (2ml). Absolutely washed in alcohol, filtered in a Büchner funnel and dried at room temperature, yield 65%.

0,05 g of CMCS -1 was dissolved in 25 ml of 0,02 N NaOH. It was then titrated with 0,1 n NaOH to determine electrical conductivity values every 30 s. From the graph, it is possible to determine the degree of its exchange from the volume of alkali used for the titration of the carboxyl group in the CMCS molecule.

Conclusions and feedback.

The degree of deacetylation of carboxymethylchitosan has been determined by conductometric titration. Take an analytical weighed sample of carboxymethylchitosan 0,05 g. A standard solution of 0,1 M HCl has been prepared from a fixed channel. The normality of the alkali solution has been determined using a standard solution of hydrochloric acid. The sample has been transferred to a beaker and dissolved in 0,1 N 25 ml HCl. To plot the titration curve, 100 µl of pre-titrated alkali (0,1 N NaOH) has been added every 30 seconds.

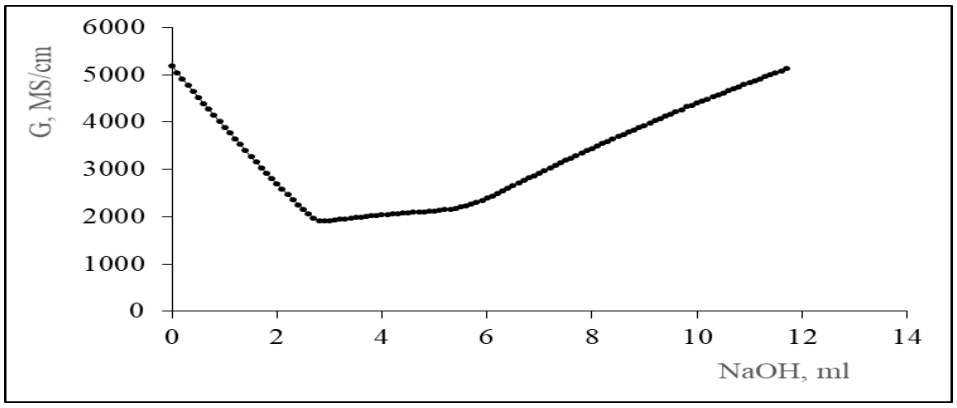


Figure 1. Conductometric titration curves

solution CMCS.

The conductometric titration curve of carboxymethylchitosan obtained at a temperature of 65 ° C, a reaction time of 4 hours and a XZ / CMHZ ratio of 1: 1 is described as a dashed line corresponding to a certain range of titrant consumption (Figure).

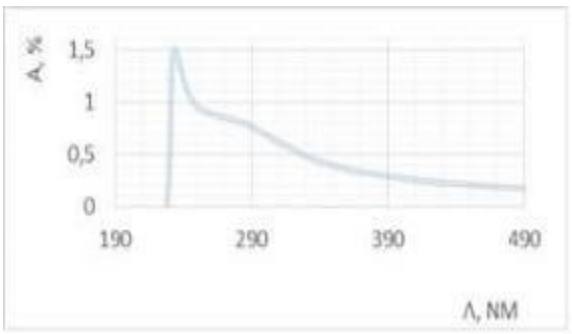
$$x = N1 \cdot V1 - N2 \cdot V2,$$

$$СД = \frac{x}{x + \frac{m \cdot 0.9 - x \cdot 161}{203}} \cdot 100\%,$$

where V1 is the volume of acid, ml; V2 is the volume of alkali required for titration, ml; N1 - acid normality, mol-eq / ml; N2 - alkali normality, moleq / ml; m is the mass of carboxymethylchitosan, mg.

At the initial stage of titration of CMHZ with NaOH solution, the interval from 0 to V1 corresponds to the volume of the base added to neutralize the strong acid (H3O +) present in the solution (Figure-1). Further, characteristic segments (V1-V2) are observed, which correspond to the titration of carboxymethyl groups (CH_2COOH). Titration required for neutralization (NH_3^+; $^+NH_2R$; + NHR_2; where R – CH_2COOH) corresponds to the volume of the base (NaOH). During subsequent titration, an increase in the electrical conductivity Gsm is observed, which characterizes the excess of a strong electrolyte (NaOH) [13].

The difference in the structure of chitosan and carboxymethylchitosan polymer chains is also reflected in their UV spectroscopy values (Figure 2).



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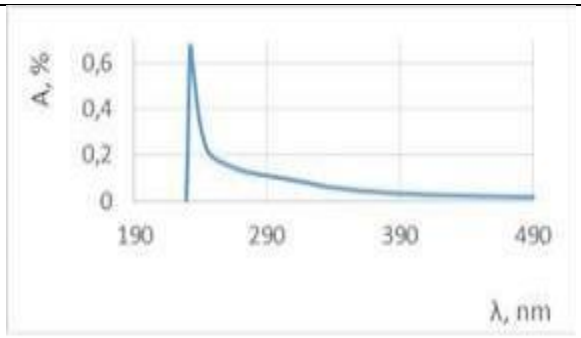

b

Figure 2. UV spectroscopy of chitosan and carboxymethylchitosan

a- Chitosan b -CMCS;

CONCLUSION

In summary, the natural biopolymer carboxymethylchitosan has synthesized from inanimate bees in a new way and it has been studied by conductometry, UV methods. During the carboxymethylation of chitosan, the concentration of the alkaline solution, the temperature, the duration of the carboxymethylation reaction and the amount of monochloroacetic acid (MHCC) have been controlled by selecting the ratio XZ: MHSK. When the NaOH concentration has been increased from 20% to 30%, the solubility of the chitosan sample obtained by alkaline treatment increased from 70-75% to 85%.

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