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THE STUDY OF THE REACTION BETWEEN CHITOSAN AND MELAMINE DERIVATIVE

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The reaction between urea and melamine was studied. The reaction resulted in tris-carbamide derivative of melamine. During the reaction between the melamine derivative and the glycoside group of chitosan the sim-triazine functional groups were formed, which are included in the structure of synthesized derivative of chitosan. The synthesized derivative of chitosan was tested. It is recommended to use this chitosan derivative as an absorbent for the separation of heavy metal ions such as Cd²⁺, Hg¹⁺, Hg²⁺, Co²⁺, Ag¹⁺, As³⁺, As⁵⁺, etc. from the aqueous solutions of salts.

Keywords: chitosan, melamine, carbamide, absorbent.

Introduction. There is practically no information available in the published literature that relates to sim-triazine hydrocycles containing chitosan (CTS) derivatives. These compounds present significant interest due to their suitability for use as a basis for the development of heavy metals absorbents and their further separation during blood and other physiological solutions dialysis, for example Cd^{2+} , Hg^{1+} , Hg^{2+} , Co^{2+} , Ag^{1+} , As^{3+} , As^{5+} , etc.

Experimental Part. IR-spectra were obtained by using NICOLET/FT-IR NEXUS spectrophotometer. Chitosan used was FG (Food Grade) with molecular weight of 80 *kDa* and manufactured according to Technical Conditions 90289-067-004 at Biocombinat, Shchelkovo, Moskow Region. Melanine synthesis was performed according to [1].

In order to perform a chemical reaction between CTS and (I) in bulk at $130-140^{\circ}$, $2.33 \, g$ of CTS, $2.55 \, g$ of compound (I) (see Scheme) and $5 \, mL$ of dimethyl formamide are placed into the reactor. The mixture is acetone and chloroform. The formed composition is dried under the vacuum at $1.5-2 \, mm$ Hg at $75-80^{\circ}C$ to constant weight.

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Results and Discussion. The results of previously synthesized composition of modified CTS [1] are described in this presentation. The final composition obtained by condensation of melamine with urea (pH 10.5) is presented below:

$$\begin{array}{c} NH_2 \\ NH$$

The reaction of (I) and CTS with an average molecular weight of 80 kDa was performed. According to [2], the structure of CTS can be presented as follows:

$$-O \longrightarrow \begin{array}{c} CH_2OH \\ CH_2OH \\$$

where n, m, l are the number of corresponding units in CTS: n=0.47, m=0.08, l=0.45. The formed copolymer structure after melamine radical is attached to CTS can be presented:

$$\begin{array}{c} \text{CH,OH} \\ \text{I+II} \rightarrow \text{O} \\ \text{H} \\ \text{NH}_{2} \\ \text{H} \\ \text{NH}_{2} \\ \text{NH}_{2} \\ \text{NH}_{3} \\ \text{NH}_{2} \\ \text{CH,OH} \\ \text{NH}_{3} \\ \text{NH}_{4} \\ \text{CH,OH} \\ \text{NH}_{3} \\ \text{O} \\ \text{CH,OH} \\ \text{NH}_{4} \\ \text{NH}_{5} \\ \text{O} \\ \text{CH,OH} \\ \text{NH}_{5} \\ \text{O} \\ \text{CH,OH} \\ \text{NH}_{7} \\ \text{CH,OH} \\ \text{NH}_{7} \\ \text{CH,OH} \\ \text{NH}_{7} \\ \text{O} \\ \text{CH,OH} \\ \text{NH}_{7} \\ \text{CH,OH} \\ \text{NH}_{8} \\ \text{CH,OH} \\ \text{NH}_{8} \\ \text{CH,OH} \\ \text{CH,OH} \\ \text{NH}_{8} \\ \text{CH,OH} \\ \text{CH$$

It can be concluded from the above formula that x=0.1. The attached copolymer was evaluated by elemental analysis and IR-spectroscopy. The results of elemental analysis in percentage: C 43.8 (43.91), N 9.7 (9.35), H 5.7 (5.91).

The results of IR-spectroscopy, \bar{v} , cm^{-1} : 1420–1428 \circ 1380, 1570 (sim-triazine cycle), 1695 (C–N), 1557, 1660, 1645–1652 (–C=N–), 3456-3550 (–OH-wide range).

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ՆՍԵՊՎՈՑԺՔԱՍՄԵՍ Վ ՄԵԼԱՄԻՆԻ ԱԾՄՆՑԺԱՆ ՓՈՒԱԶՔՔԱՅԻ ԴԱՄԵՅԱՐԻ ՓՈՒԱԶԻՍՅՈ ՁԺՎՈՏԹՎՈՂՎՄԱՐՄՎՈՍՎ ԳԵՍՎՑԻԱՅԻ

Ամփոփում

Հետազոտվել է միզանյութի և մելամինի փոխազդեցության ռեակցիան։ Արդյունքում ստացված տրիս-կարբամիդիլմելամինի ածանցյալը փոխազդեցության մեջ է դրվել խիտոզանի ամինոգլիկոզիդային ֆունկցիոնալ խմբի հետ, որը բերում է սիմմ-տրիազիդային ֆունկցիոնալ խումբ պարունակող խիտոզանի ածանցյալի։ Վերջինս փորձարկվել և առաջարկվում է օգտագործել որպես աբսորբենտ ծանր մետաղների աղերի ջրային լուծույթներից համապատասխան՝ Cd^{2+} , Hg^{2+} , Hg^{1+} , Co^{2+} , Ag^{1+} , As^{5+} , As^{3+} և այլ իռնների ցազատվելու համար։

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ИЗУЧЕНИЕ РЕАКЦИИ ВЗАИМОДЕЙСТВИЯ МЕЖДУ ХИТОЗАНОМ И ПРОИЗВОДНОЙ МЕЛАМИНА

Резюме

Исследована реакция взаимодействия между мочевиной и меламином. Получена производная меламина — трис-карбамидил, реакция которого с аминогликозидной группой хитозана приводит к образованию симм-триазиновых функциональных групп, входящих в состав молекулы синтезированной производной хитозана. Последняя была апробирована и рекомендуется для использования в качестве абсорбента для разделения ионов тяжелых металлов Cd^{2+} , Hg^{2+} , Hg^{1+} , Co^{2+} , Ag^{1+} , As^{5+} , As^{3+} и др. из водных растворов их солей.