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TECHNOLOGICAL ASPECTS OF OBTAINING AMINOALDEHYDE OLIGOMER MODIFIED WITH CROTONALDEHYDE

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ABSTRACT

Today, there is a growing demand for oligomers containing amino groups in the world, including in woodworking, textile, plastics, as well as in many other industries, such as the fur industry.In our republic, the work aimed at the purposeful use of waste from cocoon processing plants is developing rapidly.The resulting oligomers are used as fillers in the leather-fur industry. Because today, obtaining hydrophilic fillers using local raw materials is one of the urgent problems of science. Taking this into account, in this article oligomers based on croton aldehyde and diethanolamine were obtained from cocoon waste and the extraction technology was explained. Mechanisms of synthesis of oligomers are presented.The sequence and schemes of technological processes are presented.

KEYWORDS: *croton aldehyde, diethanolamine (DEA), sericin, cerine, amino acid, condensation, vacuum chamber, modification, aminoaldehyde*

1. INTRODUCTION

In recent years, the new Uzbekistan has achieved certain results in the localization of the raw material base in all industries and the production of import-substituting materials on their basis [1-5].

The main component of sericin is the amino acid cerin, present in the sewage of silk factories. The Chinese epic links the development of the history of silk and cocoon processing with the most ancient dynasties that existed before 3000 BC. Uzbekistan, located on the Great Silk Road, also has a long history of production of silk and silk products[5-10].

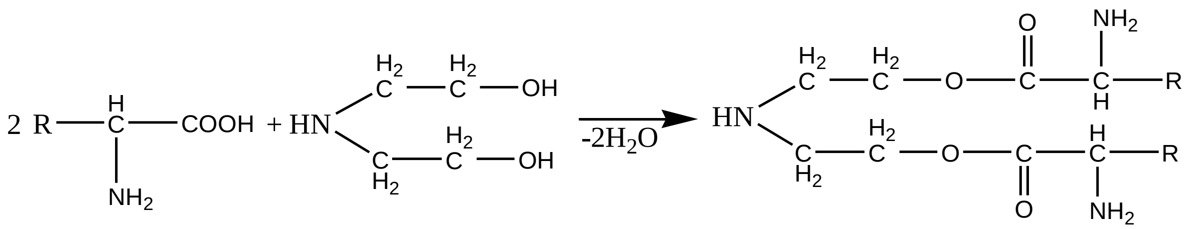
The purpose of this study is to obtain an oligomer based on sericin with the presence of diethanolamine (DEA) in the presence of croton aldehyde from JSC "Navoiyazot" and to evaluate the effect of technological parameters on the oligomerization reaction in the mass. It is known that the mass interaction of aldehydes and amines depends on their structure, concentration and other factors. Consideration of concentration effects in reactions allows in most cases to estimate the effect of reagents on their reactivity[11-14].

2. MATERIAL SAND METHODS

The object of the study is the synthesis of new derivatives of aminoaldehydes before and after filling natural leather samples. The subject of research are cericin, amino acids, monoethanolamine, crotonaldehyde and diethanolamines.The main component of sericin is the amino acid cerine, which is present in the wastewater of cocoons.

In the synthesis of nitrogen- and sulfur-retaining oligomers in the solution, initially, diethanolamine (DEA) reacts with cericin to form a monomer. After the formation of monomers, condensation of croton with aldehyde is carried out, followed by oligomerization of these monomers.

The above-mentioned processes can be generally represented by the following reaction schemes. At the beginning of the reaction, cericin reacts with amino acids in a 2:1 mole ratio with DEA.



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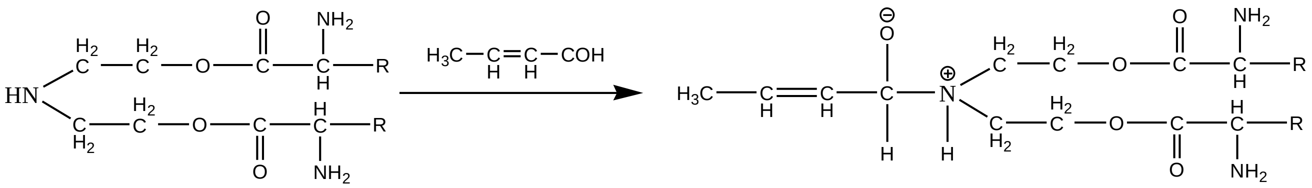
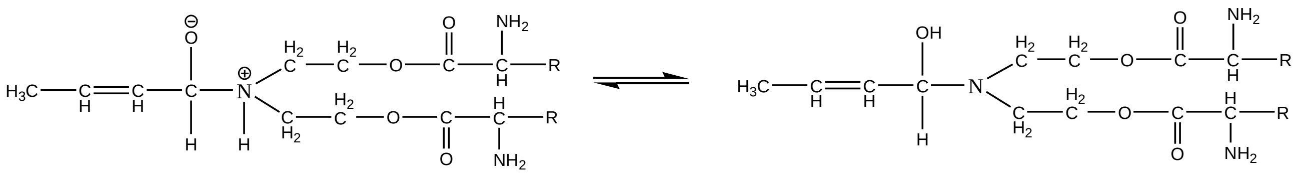
The resulting ester undergoes a Mannich reaction with secondary amines, and the intermediate form is represented by the following form.

Secondary amines are more reactive than primary amines in the Mannich reaction.



The intermediate form regroups to form a monomer containing a double bond.



The reaction product has the following properties: brown solid, non-volatile, the content of the main composition is 96.5%, additives - 3.5%.

At a constant ratio of reagents, the percentage of oligomer increases when the reaction temperature increases from 323 to 343 K, the further increase in temperature increases the homogeneity of the oligomer, and also causes an increase in its molecular mass (by cryoscopy) from 3200 to 4958. These identified properties are probably due to the formation of biradicals of unsaturated groups in croton aldehyde during heating and the increase in the degree of polymerization due to the double bond.

3. RESULTS

The complete prevention of the formation of intermediate states is of particular importance in obtaining the modified aminoaldehyde oligomer. Oligomers are modified with them or aldehydes in order to ensure their solubility in organic solvents, their good penetration with glue and enamels in leather finishing, and to increase their resistance to water.

The difference in the proposed technological processes is mainly due to factors such as the amount of reactants, temperature, duration of the process and ratio of reagents. The technology includes the following steps:

1) obtaining oligomer;

2) modification;

3) separation of residues while controlling the temperature and amount of reagents.

Based on the results of the research conducted in this way, the technology of obtaining aminoaldehyde oligomers, and then applying it to leather filling, was developed. Figure 1 shows the principle technological scheme for obtaining a modified aminoaldehyde oligomer.

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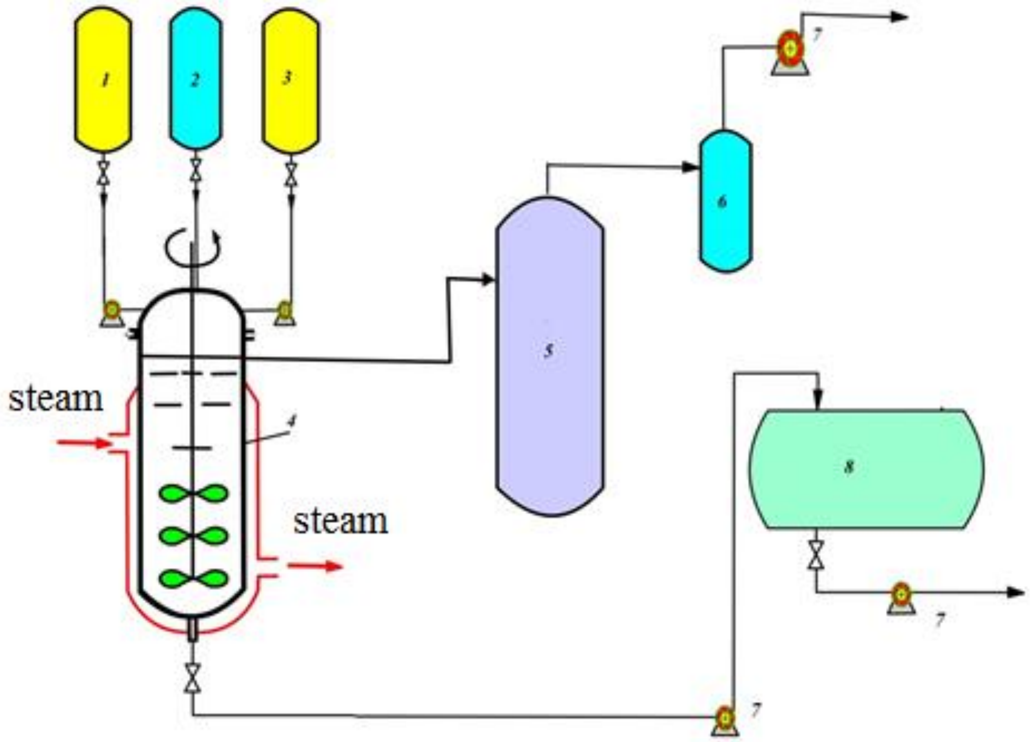

Figure 1. The principle scheme of obtaining aminoaldehyde oligomer modified with croton aldehyde: 1- sericin dosage capacity; 2- dosing capacity for DEA; 3-Dosing capacity for croton aldehyde; 4- reactor for obtaining oligomer; 5- condenser; 6 – vacuum chamber; 7- vacuum pump; 8 – oligomer storage capacity.

For production purposes, it is desirable to obtain the modified oligomer in the form of a powder or a concentrated solution. Attempts to evaporate and dry the modified aminoaldehyde oligomer under various conditions have been unsuccessful. For example, when evaporating a modified aminoaldehyde oligomer at around 100°C, water evaporates very slowly, and the drug loses its solubility.Evaporation of the drug at low temperatures (50-60°C) leads to the formation of a pasty, opaque mass that is poorly soluble in water.Therefore, there is a need to develop a technology for obtaining a concentrated modified aminoaldehyde oligomer that does not require evaporation, and we obtained such oligomers.

Concentrated modified aminoaldehyde oligomers obtained under production conditions can be used even after a month. Only in this case, in order to reduce the viscosity of the solution, it is advisable to dilute the drug with water before use.

When studying the degree of absorption in skin samples treated with the obtained composition, the degree of absorption is also high in accordance with adhesion.

Table 1. The degree of absorption of the material

The composition of the component, mass in%, oligomer	The composition of the component, mass in%, croton aldehyde	Absorption rate%	
		On a surface	By Bakhtarma
10	90	16	32
20	80	18	33
30	70	20	34
40	60	22	38
50	50	21	42
60	40	23	47
70	30	19	41
80	20	15	33

Skins (experimental samples) treated with croton aldehyde, synthesized oligomers and their compositions were studied.As it was found above, when acroton aldehyde is introduced into the composition, the most optimal and acceptable concentration is 40:60%.

4. CONCLUSIONS

The data obtained show that the maximum yield corresponds to a ratio of 1:1, and the dependence of the oligomer yield on the ratio of the initial substances also has a high index property.Improved compositions of croton aldehyde with an oligomer in the upper layer of ether films of the finishing coating are obtained, which improve the water resistance of polymer coatings, as well as the adhesion and thermal stability of film formers.

It has also been found that the degree of absorption and adhesion of the synthesized oligomer to the material improves without prejudice to other properties of the material, and it was found expedient to use it as a filler in leather and fur production.

5. ACKNOWLEDGEMENTS

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