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Modification Of Collagen With Halogens

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Abstract: The article presents research on the modification of collagen with halogens. In this work, quality improvement has been studied by the effective interaction of halogens with collagen. In order to elucidate the nature of the interaction of modified collagen with the constituent components of high-molecular impregnants by the method of IR spectroscopy, studies were carried out.

Key words: collagen, modification, tanning, substantive, collagen products, collagen preparation.

Introduction

Collagen modification research is still limited to elucidating the nature of the transformation of protein tissue into a practically usable material. Naturally, such a limited research goal leads to gaps in the science of collagen and does not allow a deep study of the nature of their chemical reactions with other substances.

The purpose of the work is to substantiate the conditions of a controlled method for obtaining modified collagen systems with halogens and use in leather tanning. Determine theoretically and experimental conditions for the targeted production of modified collagen products with desired properties and the use of these drugs in production.

Our research object was a dry collagen preparation. The treatments were carried out according to a new technique, wool and fat were first removed from the samples under study, and ground to pieces with a size of 30 × 30 mm. Further, the samples were treated with aqueous solutions of low and medium concentrations, organic acrylic, acetic, oxalic, lemon, for comparison, in alkali (CaOH). Liquid coefficient -2.0. Room temperature (18-20 ° C). The resulting collagen solution was dehydrated with acetone.

Collagen modification technique.

1. The modification was carried out in a liquid medium
2. The halogen solution was added with stirring to the solution with halogen for 1 hour.
3. The reaction mixture was kept in a vessel 24. Ch.
4. Purification of modified collagen was carried out in acetone.

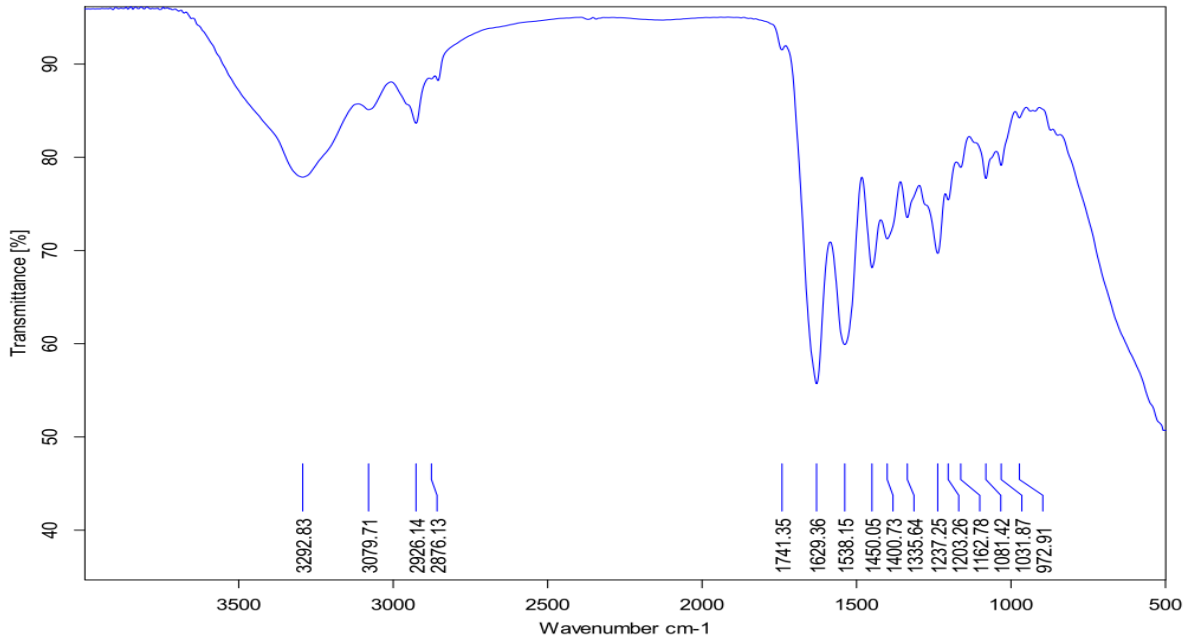
Comprehensive assessment of physicochemical, rheological, functional and technological properties, physiological functionality of purified modified collagen systems. Rational directions of the use of modified collagen in the form of dispersions in private technologies have been used in leather finishing and obtaining good results.

This method is widely used in chemistry to determine functional groups in the initial objects of research and the formation of chemical bonds as a result of their interaction [1].

In the studies, the infrared spectra of the films were recorded using Inventio-S IR Fourier, and the spectra were recorded in the range of 4000-400 cm-1. 1 The assignment of the characteristic bands of the spectra of the initial substances and the products of their interaction was carried out in accordance with the recommendations given in [2].

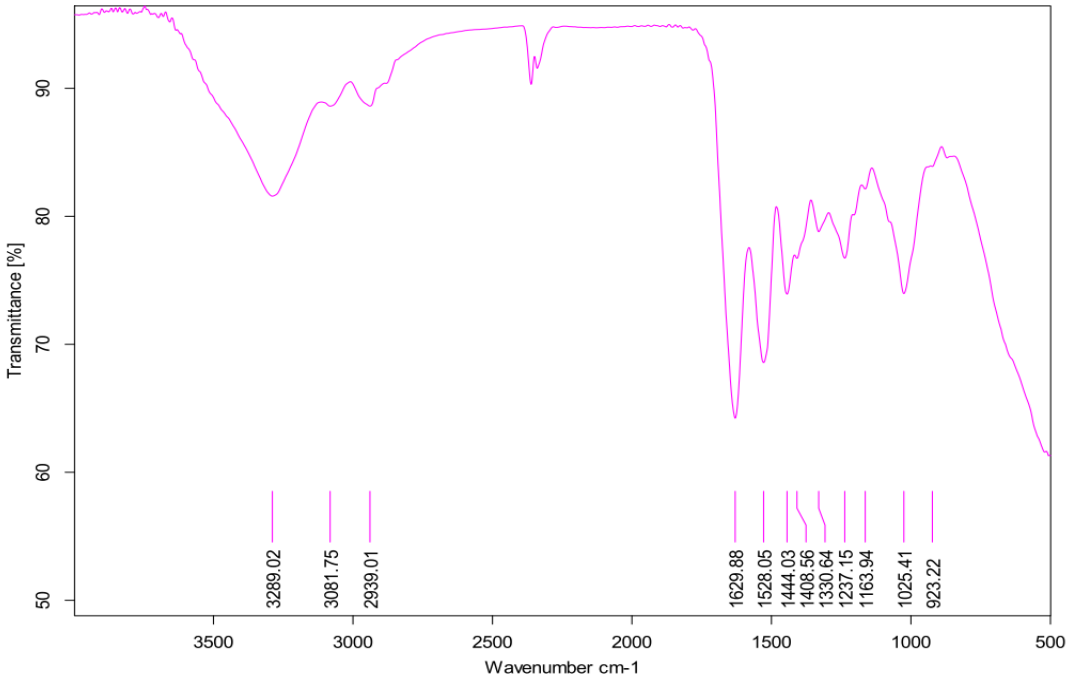
In order to remove unfixed modifiers adsorbed on the surface of the films, they were thoroughly washed in acetone and then dried. Modifications were obtained by combining the original components in sequence. The films were formed at a temperature of 20 ° C and for 24 hours. The thickness of the films was 10.0 ± 2.0 µm.

To clarify and compare the degree and depth of the purity of the collagen structure and its derivatives, collagen spectra were taken.



Picture. 1. IR spectrum of collagen.

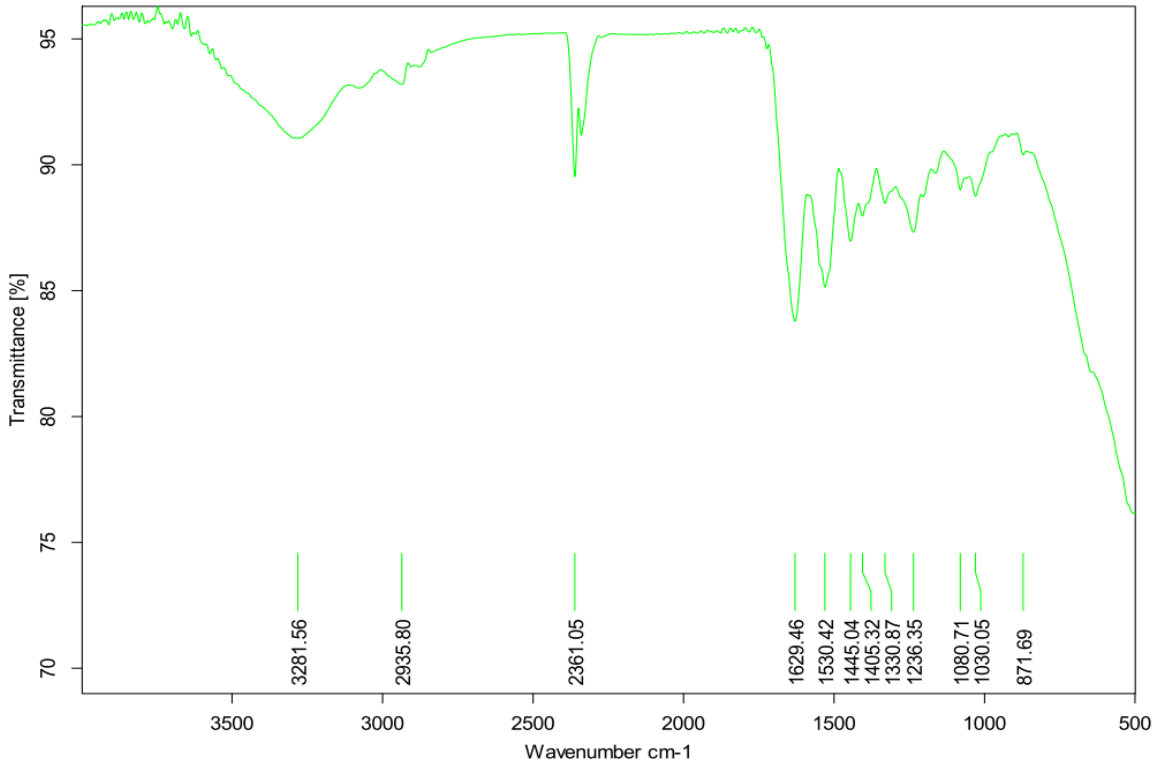
In the collagen sample, in the region of 3500-3000 cm-1, a broad blurred band is observed. It is explained by the presence of intra and intermolecular hydrogen bonds. When studying the spectra of the samples, one can observe the presence of strong intermolecular hydrogen bonds 2380; 2340-2380, 2000 cm-1.



Picture 2. IR spectrum of collagen modified with iodine

The appearance of an unsaturated C = O bond in the collagen sample (Fig. 1) in the region of 1025 cm-1 is traced, in the spectra of collagen modified with iodine in these regions the vibration frequencies completely disappear (Fig. 2).

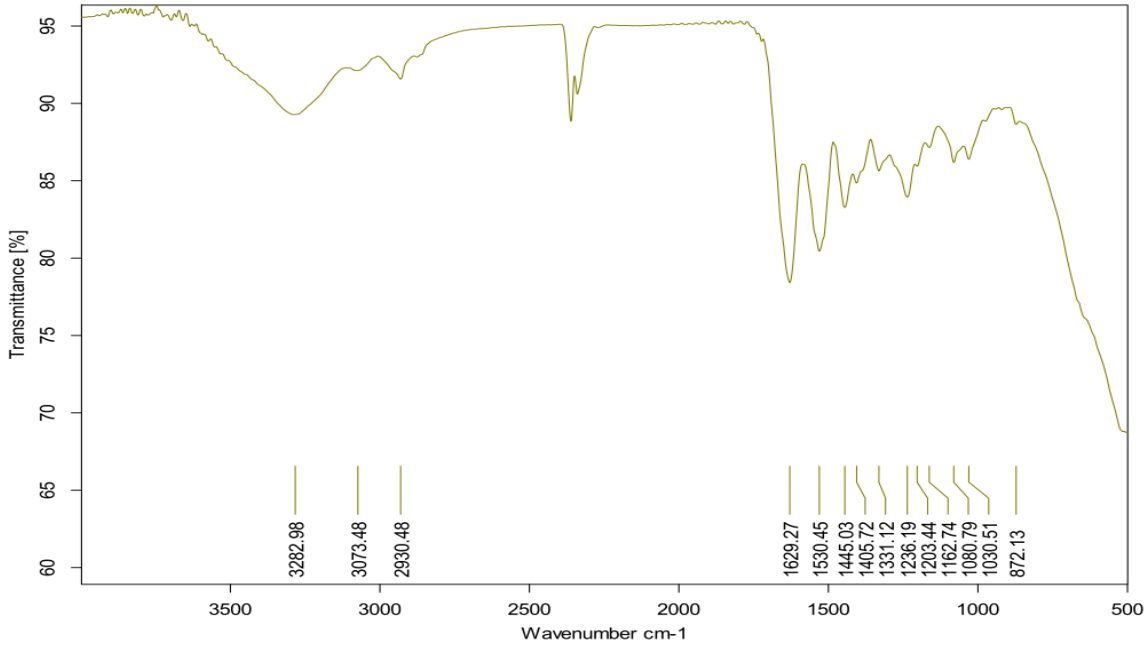
The disappearance of bending vibrations of -CH, in particular of the -CH2 group in the spectra in collagen derivatives (Fig. 1) in the region of 1444.03, 1408.56 cm-1 and a shift on the modified sample in the regions of 1629.66-1000 cm-1 (Fig. 2) can serve as an indication of the appearance of the -CH2-N = group in the formation of a new covalent bond of iodine with collagen.



Picture 3. IR spectrum of collagen modified with iodine in formalin medium.

During the processing of the original collagen with halogen modifiers, the intensity of the absorption bands of the functional groups of collagen changed. The observed difference in the spectra of pure collagen and modified collagen indicates the interaction of collagen with modifiers.

In the spectrum of the product of the interaction of collagen with halogens, a number of changes are observed, which are expressed in a shift of the maxima or a change in the intensity of absorption bands of peptide, ionized carboxyl, amine and imine groups.



Picture 4. IR spectrum of collagen modified with bromine in formalin medium.

In the spectra of a sample of collagen modified with bromine in a formalin medium, the manifestation of the frequency of stretching vibrations of OH was established, which are in the region of 3450 cm-1 (Fig. 1), 3400 cm-1.

In the modified samples, apparently, the hydroxyl group participates in the formation of hydrogen bonds, and therefore the frequency of its vibrations decreases, and the absorption band is strongly broadened and becomes more intense. The absorption band due to OH groups participating in the intramolecular hydrogen bond usually undergoes less broadening towards the free OH group than the absorption band due to OH groups participating in the intermolecular bond.

CONCLUSIONS

Collagen is a typical polyelectrolyte. Examination of modified collagen samples reveals the states of modified collagen may be associated with different concentrations of halogens. It has been shown that the modification of collagen, the necessary reaction for the conversion of raw materials into a technical product, is also a process of cross-linking. Modifications after the tanning process of the semi-finished product, the rest of the finishing processes and operations were carried out according to the factory method.

The analysis of the obtained research results shows the following: 1. When modifying collagen with halogens, amine and hydroxyl groups are actively involved.

2. Our research has obtained a new collagen-monomer system based on a natural high-molecular compound by modifying it with halogens

3.Based on the studies of collagen-monomer systems, important experimental data were obtained for the development of a very effective technology.

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