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CHEMICAL COMPOSITION OF LEATHER USED FOR TRANSFORMATION ASSORTMENT AND RESEARCH OF PHYSICAL-MECHANICAL PROPERTIES

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Annotatsiya:

Objective. The purpose of this scientific research is to select the type of leather used for the transformation assortment and to select a durable leather for the transformation assortment based on the study of the physical and chemical properties of the selected finished leather.

Methods. The chemical composition, physico-mechanical properties of calf, cow, sheep and goat leather obtained from "GOLD LEATHER EXPORT IMPORT" and "YUKSALISH CHARM SANOAT" LLC enterprises were determined and analyzed for experimental options. Based on the standards, it was researched in the research laboratory of the institute, expressed in tables and histograms.

Results: Physico-mechanical and hygienic properties of test samples were studied in the research laboratory of the institute based on state standards. The obtained experimental results were analyzed and suitable leather was selected for the transformation range.

Conclusion: In conclusion, it can be said that the physical and chemical properties of the test samples were determined and compared. Also, the characteristics of leather obtained from different animal skins for the transformation assortment were studied and useful leather for bags was determined. Conclusions were made based on

the results of the IQ-spectrogram analysis and the production of a transformational assortment was classified based on the analysis of the characteristics of leather products.

Key words: IQ-spectroscopy, IQ-spectrogram, strength, thickness, elongation at break, uniformity, air permeability, water absorption.

Introduction

Currently, the leather industry, which is one of the main branches of the light industry, is undergoing great changes. Until now, our Republic has become a base of raw materials, now leather production has been improved in our Republic, leather is being processed and export products are being produced. Also, the chemical industry is developing proportionally with the leather industry, and new chemicals are being created and used in the leather industry, making a great contribution to improving the leather production process and increasing the economy of our country through the production of export-quality leather [1.2]. Currently, many scientific studies are being conducted in this regard and many successes have been achieved [3,4,5].

Also, all the processes of processing the calf, cow, sheep and goat skins of the trial and testing options for the research were carried out based on the method of the "GOLD LEATHER EXPORT IMPORT" and "YUKSALISH CHARM SANOAT" LLC enterprises. During the research, finished leathers obtained from various animal skins were studied and the chemical composition of the finished product was determined. It is clear that according to the type of raw materials, the method of cooking, the nature of finishing and the composition of the leathers are different. Therefore, leathers obtained from different animal hides were investigated by IQ-spectroscopy and suitable variants were classified for the transformation assortment.

Materials and Methods

Research works are continued based on IQ-spectroscopy, and the elemental composition of cow, calf, sheep and goat leather samples is determined based on electron microphotographs and the elemental composition of experimental samples is compared. Also, the analysis of elemental composition and concentrations of test samples supplemented with chromium and pomegranate tannide is carried out. The choice of leather for the transformation range is to determine whether it meets the standard requirements of DST 940-81, DST 939-94.

Leather obtained from different types of animal skins must meet the requirements of State Standards. Determination of the physical and mechanical properties of the finished leather obtained for the experimental test was carried out according to a known

methodology Experimental studies were conducted on modern equipment installed in the test laboratory of the Namangan Institute of Engineering Technology. The thickness of the leather also depends on the chemical substances in its composition. The more chemical substances are applied to the skin, the more the skin swells, the thicker the leather becomes.

Result and Discussion

Taking into account that IQ-spectroscopy analysis allows to obtain a clear image of the object under investigation, an IQ-spectroscopy analysis was conducted in order to theoretically study the obtained substance and its effect on the structure of the dermis [6]. The identification of IQ-spectra was carried out according to the characteristics of the absorption frequencies of different groups of atoms. The composition of the studied samples, the process of distribution according to the leather structure was observed, the elemental composition and chemical structure of the samples were analyzed, electronic photographs were taken and analyzed (Fig. 1, 2).

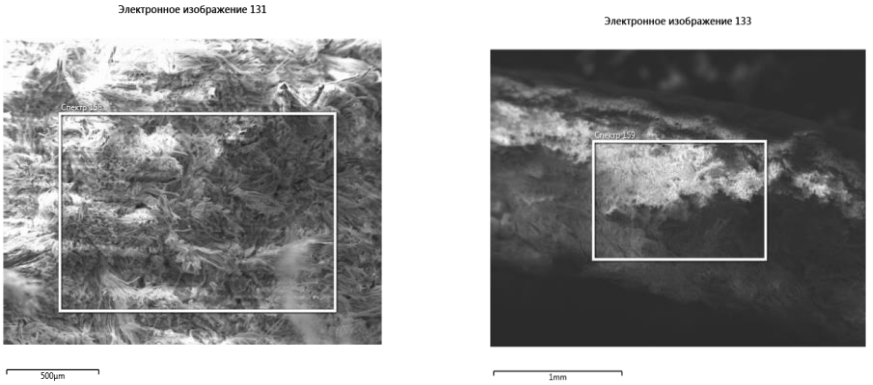

FIGURE 1. Cross-sectional electron micrograph of a cow and calf leather sample.

According to Figure 1, it is possible to observe uneven, scattered fibers of cow leather structure, including porous areas in the upper and intermediate parts. There is no intermediate balance in the micro and macro pores, which affects the volume of the leather. Even if the calf leather is uneven and scattered, the surface and edge parts are densely located, and there are no pores in the intermediate parts. This indicates that additives have changed the structure of the leather according to its purpose and formed its desired properties.

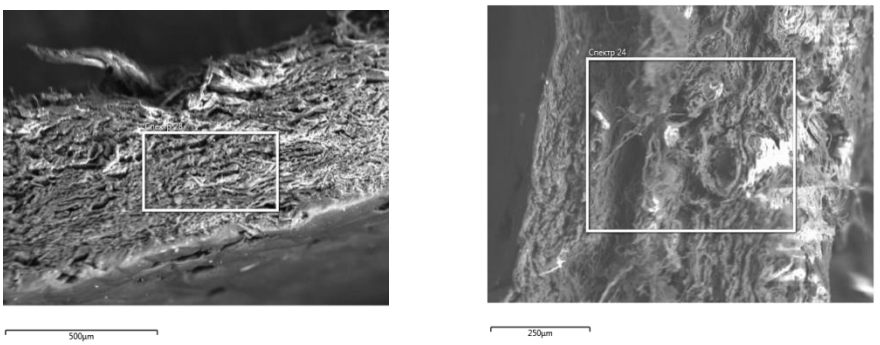

FIGURE 2. Cross-sectional electron micrograph of a sheep and goat leather sample.

As you can see from the 2nd picture, the sheepskin stands out with its density and fullness. It is possible to see that the ingredients are evenly distributed across the layers of the dermis. The shine can also be due to the addition of additives and lubricants. According to the structure of goat leather, its fibers are uneven, scattered, porous parts can be observed in the upper and intermediate parts. The dermal collagen bundles are also unevenly spaced.

The thickness of the leather was determined based on the GOST 939-2021 standard. The thickness of leather is about 0.6-2.3 mm.

Tensile strength is especially important in the manufacture of leather goods, as the goods are exposed to significant mechanical influences. Mechanical properties include tensile strength, elongation at break, work done at break, relative tensile strength, etc. [7]. These features are used to show the maximum mechanical ability and quality of the leather. In order to determine them, a rectangular sample was prepared from the gasses on the cutting device DW1111 [8], 50 mm wide and 250 mm long, i.e. 50x250 mm. The tests were conducted on a YG026T cutting machine. The distance between the clamps of the machine was equal to 150 mm for experimental samples. A high index of breaking strength indicates the strength of the leather, Table 1 shows the results of the experiments.

TABLE 1. Elongation indicators of the material at break

№	**Sample**	Indicators				
		Force **(N)**	Elongation **(mm)**	Elongation **(%)**	Work **(J)**	Downtime **(s)**
1	Cow leather	1009	38,4	19,20	17,3	15,53

2	Calf leather	1025	52,4	26,20	18.5	20,95
3	Sheepskin	461	42,3	21,65	21,7	21,41
4	Goat leather	630	51,9	25,95	7,47	12,58

Tensile strength is defined as the force required to break a specimen when it is stretched at a given size and speed. Breaking force is expressed in newtons. The tensile strength and elongation at break of leather were determined. It was found that the higher the force of the leather, the stronger it is (Figure 3)

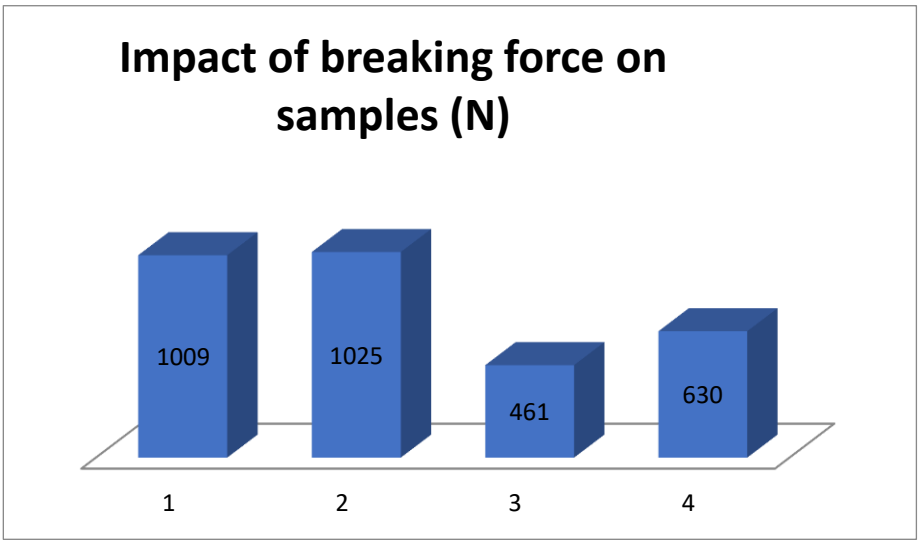

FIGURE 3. Effects of tensile strength on samples.

The analysis of the breaking force shows that the hardest sample is option II, its indicator is equal to 1025 N, and it is known that it is 2.1 times higher than options III and IV. Elongation at break due to the force applied to the samples was higher in option I than in options III and IV, but the elongation at break was not high, it was found to be higher in options II and IV, it can be seen that option II of the sample elongation at break is high, calf leather is stronger than cow, sheep and goat leather (Figure 4).

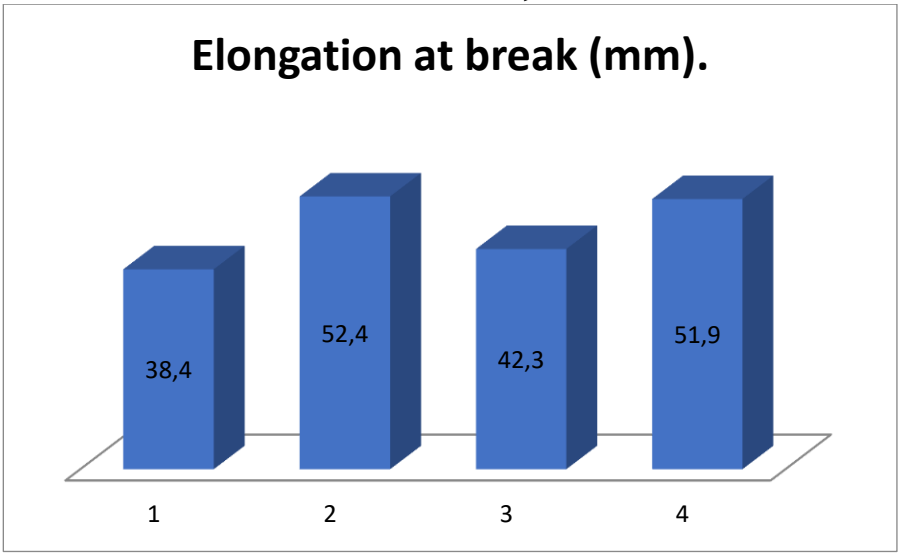

FIGURE 4. Elongation of samples at break (mm).

Elongation at break due to the force applied to the samples was 38.4 mm in option I, even though it was subjected to a higher force than options III and IV, the elongation at break was not higher. Elongation in options II and IV was 52.4 mm and 51.9 mm, it can be seen that the elongation at break of the II option sample is higher, and it was determined that calf leather is stronger than cow, sheep and goat leather (4 - picture).

Another indicator of the durability of leather is its hardness. The uniqueness of the leather was determined in a special YT-TDY500 device. To determine the uniformity, a sample was prepared according to the size specified in GB2679*3 (sample length 70mm, width 38mm), each sample was tested three times and the average was taken.

Calculation formula:

$$S = n \cdot R(mN * m)$$

In the formula: n is the division value corresponding to the number of twists;
R is the actual number of factors from 0 to 100.

$$S_1 = n \cdot R(mN * m) = 0{,}20 \cdot 16{,}5 = 3{,}3mN * m$$
$$S_2 = n \cdot R(mN * m) = 0{,}20 \cdot 21{,}5 = 4{,}3mN * m$$
$$S_3 = n \cdot R(mN * m) = 0{,}20 \cdot 21 = 4{,}2mN * m$$
$$S_4 = n \cdot R(mN * m) = 0{,}20 \cdot 21{,}9 = 4{,}38mN * m$$

Using the following formula, the uniformity indicators of the test samples were determined (Table 2).

TABLE 2. Uniformity indicators of experimental samples.

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№	Indicators	Cow leather	Calf leather	Sheepskin	Goat leather
		1- Sample	2- Sample	3- Sample	4- Sample
1.	Singularity (mN*m)	3,3	4,3	4,2	4,38

The lowest level of uniformity was found in sample I of 3.3mN*m, and the highest level of uniformity was found in samples II and IV of 4.3 and 4.383mN*m (Figure. 5).

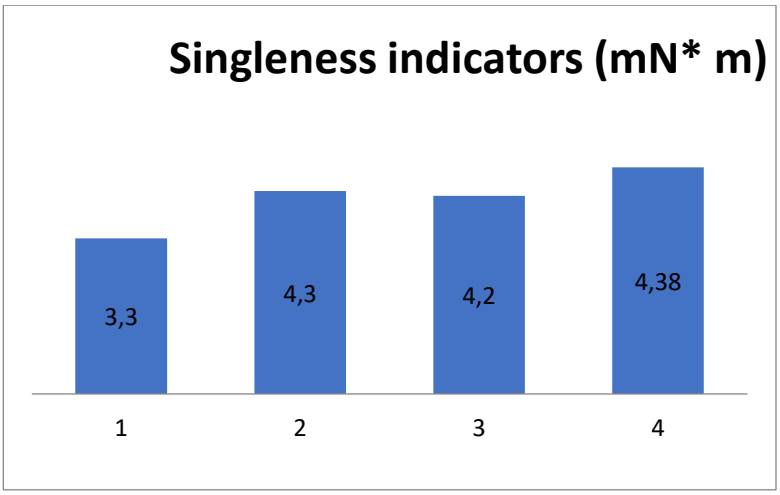

FIGURE 5. Unity of experience samples.

Among such indicators of hardness, it was found that samples II, IV, calf and goat leather have high hardness, and they can maintain their condition for a long time under the influence of a certain force.

The skin has the ability to absorb various substances in liquid, gas or vapor state. In this case, the mass, dimensions, strength, uniqueness and other properties of the leather will change. Based on the GOST 938.21-71, GOST 938.22-71 standards, it was determined to what extent the skin is wetted by water and water permeability when the surface is wet.

TABLE 3. Water permeability indicators of the samples.

№	Test samples	Water permeability mm/sm^{2}soat	Soaking in water, soaking in 2.5 ml of water, per minute

1.	I-Sample	0,18	45
2.	II-Sample	0,21	45
3.	III-Sample	0,25	45
4.	IV-Sample	0,36	36

In the results of the research, the water permeability of sample I was 0.18 mm/cm2h, sample II was 0.21 mm/cm2h, sample III was 0.25 mm/cm2h, and sample IV was 0.36 mm/cm2h. cow and calf skins have low water permeability, and cow and calf skins are resistant to rain and water.

Conclusion.

From the above analysis, we concluded the following. The chemical composition, physical and mechanical properties of calf, cow, sheep and goat leather obtained from "GOLD LEATHER EXPORT IMPORT" and "YUKSALISH CHARM SANOAT" LLC enterprises were determined and analyzed. It should be noted that leathers made from all animal species differ in the way they are cooked, the nature of the finishing, and the composition, depending on the type of raw material. IQ-spectroscopy, the chemical composition of the studied samples was observed, the process of distribution according to the leather structure was observed, the elemental composition, chemical composition of the samples, electronic photographs were taken and analyzed. Also, the properties of different leathers for the transformation range were researched and useful leathers were identified for the bag. The experimental results obtained in the given tables show that the physico-mechanical properties of calf leather for bags: resistance to external influences, durability, deformation, stiffness, heat and cold resistance were determined, and calf leather was recommended for transformation sum. It was determined that the strength, air permeability, naturalness and other properties of calf skin meet the requirements of our transformation bag, and its physical-mechanical and hygienic indicators fully meet the consumer's requirements in all parameters.

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