SECTION 25. Technologies of materials for the light and textile industry.

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DEVELOPMENT OF CRITERA FOR IDENTIFICATION OF NATURAL LEATHER AND DIFFERENT KINDS OF FUR

***Abstract**: In the paper actual problems of identification of natural leather and imitation leather as well as natural fur of different animals are considered. The methods of their identification are offered which allow to identify natural leather and fur with great reliability.*

***Key words**: natural leather, imitation leather, identification, fur, organoleptic detecting, microscope analysis, cuticle, top hair.*

In the recent years the production of artificial leather (leatherlike material) has been more perfect and it has become more difficult to distinguish it from natural leather especially for a common consumer. But the imitation leather is known to be less durable, less ecological and have less cost than natural one. Fast and exact identification of natural leather is a very important skill for the custom authority, certification and metrology bodies, wholesalers and consumers. To find the fast and reliable way of natural leather identification is a very actual task for researchers involved in consumer goods study.

Natural leathers are classified according to their functions, kinds of the raw materials, ways of tanning, texture etc. They have unique, artificially irreproducible fibrous structure of animal skin derma consisting of endless interlacement of collagen fibers. For making artificial leathers fabrics, knitting, paper and different nonwoven materials are used. The properties of soft man-made leathers are defined by the basis material: it is the most important constructive element upon which durability, stretching in different directions, folding ability etc. depend. Fibrous bases are treated by polymeric compositions for giving more firmness and density. Then the surface of the fibrous base are coated by melts, solutions and polymeric dispersions using different technological ways and equipment. For finishing different methods are applied: polishing, tumbling, pressing, lacquering, matting, covering with printed pattern and others. The readymade material can imitate the texture of a fabric, natural leather and chamois. There are multicolored leathers and changing their colors (i.e. chameleons), "metallic" and "mother-of-pearl" leathers, those having holographic effect and others.

The intermediate variant between natural and artificial leathers is so called pressed (or composed) one, which is the material produced under the pressure from waste products of natural leather production - cut ends, rags, ,box calf shavings and dust. In the pressed leather

there are also connecting substances which can be made of any synthetic material - polyether, polyamide, polyurethane, polyvinylchloride, polyethylene and other polymers. When heated they melt and stick all the "particles" together.

Natural leathers having endless interlacing collagen fibers aren't able to solve without fibers hydrolysis in any organic or nonorganic solvents. Nowadays there are known ways of collagen dissolution, e.g. in 1M of acetic acid solution after many hours of alkaline-salt processing (for untanned collagen only) , in 15% sulfuric acid solution under 100^0C during 24 hours, though not dissolution of the collagen but its complete hydrolyze down to low-molecular compounds take place. There is known a method of natural leather identification by its burning but this method is characterized by low accuracy since the artificial leather is carbonized in the same way as the natural one. Moreover there is techniques of production of compounds giving artificial leather natural smell.

Development of accurate and reliable method of natural leather and leather imitation materials is an urgent problem.

In previously done works [1, 2] the problem of classification of of natural leather and leather imitation materials was considered. The difficulty of the issue is the absence of clear criteria for unambiguous identification of natural leather.

Different methods, criteria of assessment and classification of leathers are offered. Analysis of chemical composition of leather imitation materials made of garneted collagen or keratin containing waste shows presence of all components which occur in leather and in the same quantities.

Physical and mechanical tests of natural leather and leather imitation materials also don't allow to find out unambiguously weather natural leather is tested leather or its imitation.

Spectrophotometer investigations allow to define well only presence of collagen and other high molecular substances but they don't present the material structure.

The method of burning the probe which is often used also don't answer the question on the material's nature unambiguously. The smell allows to define the presence of proteins or polyamides and no more. Burning abilities of the materials depend on the nature of presented fillings.

All the methods listed above don't give the picture of fibrous unique structure of animal skin derma which can't be reproduced in artificial conditions. The evident demonstration of natural origin of leather can be the method based on its identification with unrepeatable cancellated fibrous derma structure.

The technique of natural leather identification was developed by the authors. It is based on unambiguous detection of the fact that the given material belongs to natural leather. The method gives an objective presentation of the tested material. The offered technique of natural leather identification is rather simple, economically effective, reliable, objective and unambiguous.

At the first stage the analysis of the tested samples was carried out: the facing surface, grain and samples cuts were examined, organoleptic detecting of plasto-elastic properties and tactile tests were performed.

At the second stage the microscopic analysis of the material structure was carried out detecting presence or absence of fibrous structure of the tested samples.

At the third stage the chemical analysis of the tested samples of leather or imitation laether was carried out.

The offered method is simple for its application, it allows to identify natural leather reliably and unambiguously and can be used in any chemical laboratory with standard equipment. The developed technique is used in Novosibirsk Centre of Standardization and Certification, its application makes it possible to avoid mistakes in detection of nature of the material.

The problem of fur identification is also actual. Fur is a very popular material for making consumer goods so producers often replace expensive kinds of fur by cheaper ones which look very similar to products of high quality. Modern technologies of fur production allow to present cheaper fur of rabbit or masquash as expensive mink, sheepskin can be taken as beaver. Fur is falsified by cutting or plucking out. It impossible for common consumer to differ false fur from the natural one.

The development of the technique of identification of authentic kinds of fur is of great interest and practical importance. In the given research the way of solving the considered problem is offered. The research dealt with the analysis of main fur components - hair and skin- using tool methods and microscopic ones.

For development of the technique the following samples were selected: skins of a mink, a rabbit, a sheep and a beaver. To examine physical and mechanical properties of skin tissue the following tests were carried out for sheep and beaver skins:

1. The durability of the skin tissue was examined with the help of a tearing machine.

2. The density of skin tissue was detected as the volume of the dense substance by diving the chopped sample into liquid which was filling the pores not causing swelling of the skin tissue.

3. Air permeability was tested with the device FF-12 as evaluation of volume of the air passing the sample area unit for the time unit under air pressures difference as 100 mm of water column.

4. Vapor permeability was found out by weighting the water vapours quantity passing the sample area unit for the time unit.

5. Resistance of the skin tissue to sweat impact was tested by treating the samples with special solution imitating sweat as containing salt, ammonium carbonate, milk acid, sodium hydrophosphate, urea.

The carried out examinations allowed to find out the following:

1. The limit of durability in tearing of skin tissue of beaver skins is higher than that of sheepskins.

2. Air permeability of tissue of sheepskins is 20% higher than that of beaver skins.

3. There are no differences of vapor permeability , the results are fromт 2,5 to 3 mg/cm^2 per hour.

4. Porosity of sheepskin tissue is 4% more than that of beaver skins.

5. Sweat impact resistance of sheepskin samples is the lowest.

To study the properties of mink and rabbit skins the following tests were carried out;

1.Elasticity and wearability of hair were examined.

The method of testing hair wearability included the following procedures. The fur sample was exposed to friction with technical felt surface having thickness 5,5 mm under loading of 0,7 kg . The tests were carried out using the device IPK-1. Hair wearability is assessed by decrease in hair mass of the samples after the test.

Elasticity and creasing were detected by changing of hair thickness under different loads.

2. Hair resistance to the impact of acids and alkalis was examined.

For detecting the resistance to the impact of acids and alkalis the solutions of acids and alkalis having concentrations of 4% and 16% were used. As the result of the tests the following conclusions were done:

1. Rabbit hair wears out more than that of mink. Rabbit hair creasing is 34% more than that of mink. Mink hair elasticity is 8% higher comparing with rabbit.

2. Resistance of rabbit hair to the impact of acids and alkalis is stable. Both rabbit hair and mink hair dissolved completely in 16% alkali. Rabbit hair dissolved as 14% and

mink hair dissolved as 10% in 16% acid. The applied methods didn't give the clear criteria for unambiguous detection of animal hair origin.

In the done work the microstructure of top hair of a mink, a rabbit, a beaver and a sheep was also examined. Cuticles of top hair of the considered animals were tested using the method of light microscopy and cuticles marks left on glass [3].

While testing the hair of animals mentioned above it was found out that the pattern of top hair cuticle is different for various animals.(Fig. 1-4)

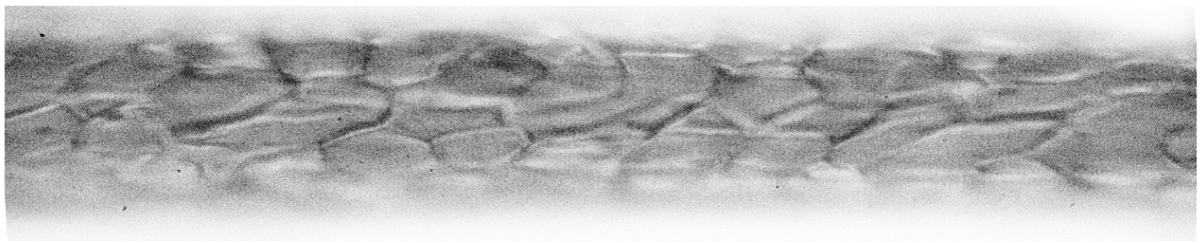

Fig. 1 - Cuticle of sheepskin top hair.

Fig.2 - Cuticle of mink top hair.

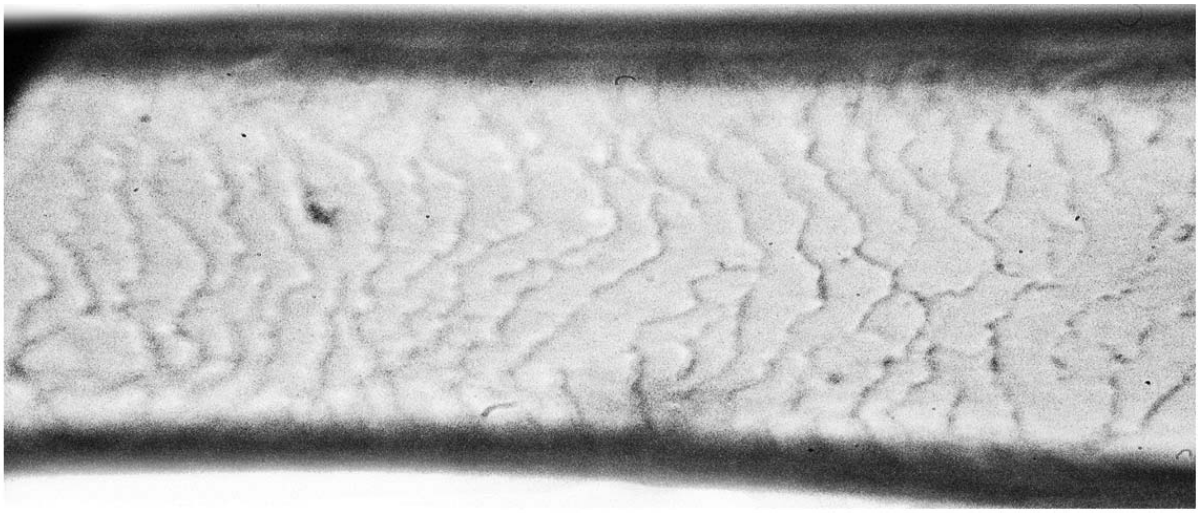

Fig.3 - Cuticle of beaver top hair.

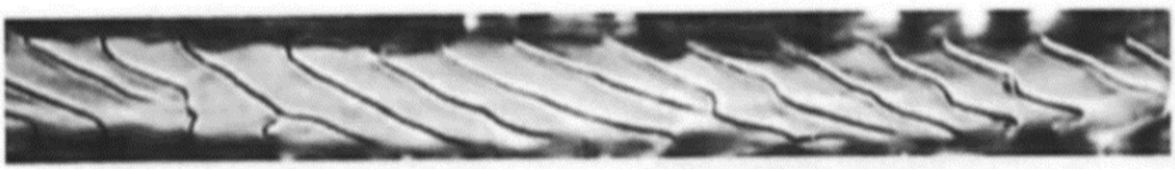

Fig. 4 - Cuticle of rabbit top hair.

In the conclusion it can be said that the offered method of examination is an universal one. The main advantage of the microscopic examination is that it doesn't need the destruction of a sample or a whole product.

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