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Distribution of Hydrophobic Composition in the Structure of Leather and Use of the Composition Possibilities Study

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Annotation: In the context of intensified competition in the global shoe markets, the domestic footwear industry is faced with the task of developing and producing competitive leather waterproof shoes with improved consumer and performance properties. The desire to create comfortable, lightweight shoes that would bring pleasure from walking and improve the quality of life of people is the "philosophy" of the modern shoe industry, and genuine leather, which most fully meets the operational, hygienic and aesthetic requirements for shoes , will remain the main one for a long time. Material in its production. During wear, shoes are exposed to all kinds of atmospheric, mechanical and chemical influences, which worsens their operational and aesthetic properties. Maintaining the quality of the product during operation is another equally important task. The use of various shoe care products (water-repellent emulsions and creams) makes it possible to make the materials of the external parts of the shoe upper temporarily waterproof. The question of the effectiveness and principle of choosing "cosmetics for shoes" with a satisfactory price-quality ratio remains open to date.

Keywords: hydrophobized compositions, swelling of fibers, bakhtarma, water resistance, water permeability, fixation, vapor permeability, tensile strength.

The description of the distribution of hydrophobic drugs in the structure of leather and their effect on the hygienic properties of leather was studied.

Chromium-enhanced leathers for the upper part of shoes (test samples treated with PVEDGOXS and polyethylhydrosiloxane-based hydrophobic compositions) were studied according to the methodology presented in [1-2]. Control leather samples were processed according to the standard method without using hydrophobizers. [3-4]

Physico-mechanical testing of leather samples was carried out in accordance with the accepted regulatory and technical documentation.

The depth of penetration of hydrophobic drugs was determined by microscopic examination of vertical sections of leather dyed with oil-soluble dark red dye and measured with an ocular micrometer. The follow-up results are presented in Table 1.

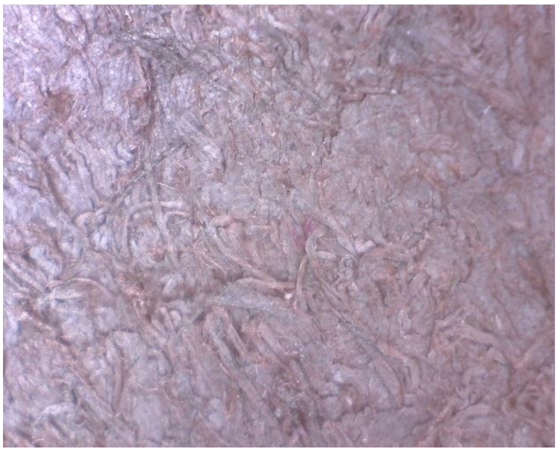
Table 1 Depth of absorption of hydrophobic preparations

Hydrophobic _	Depth of penetration , %	
	By the surface of the surface	By the surface of Bakhtarma
Based on P olivinyldihydroxychloro-silane	18	32
Polyethylhydrosiloxane	18	32

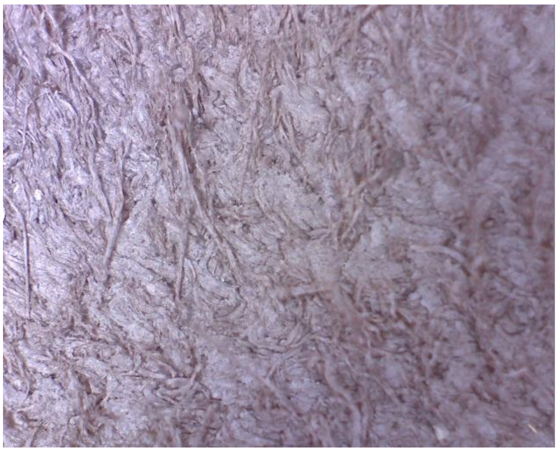
1 , the reactivity to leather When treated with a hydrophobic composition based on PVEDGOXS with a high concentration, its bonding occurs much faster.

most of the polyethylhydrosiloxane was absorbed by the leather and accumulated in its surface layer, the surface of the leather became sticky and spots appeared on it .

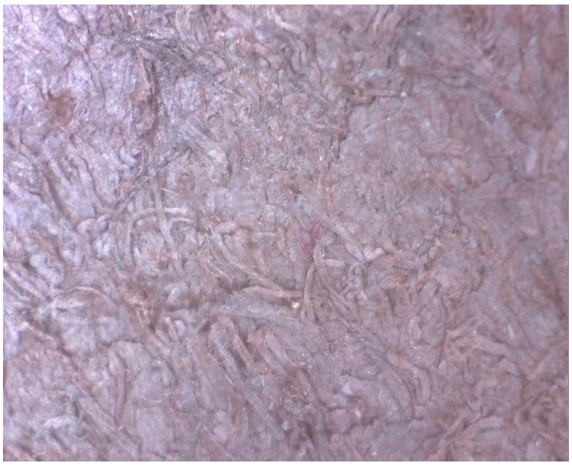
The description of the distribution of hydrophobic drugs in the structure of the leather is of crucial importance in maintaining the hygienic properties of natural leather. This process was studied in the ISN-2 scanning electron microscope. [5-8]



Option I

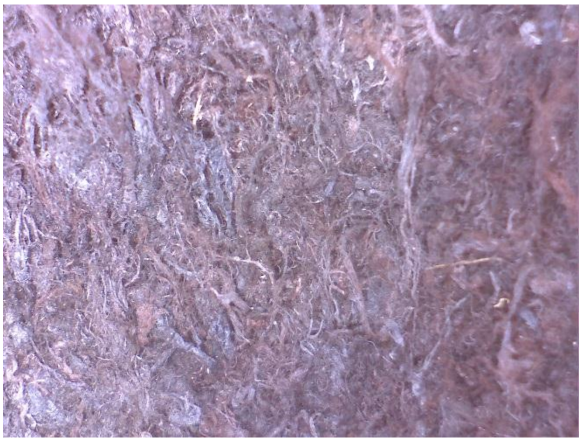


Option II



Option III

Option IV



V - option

Option VI

Figure 1 . I - I V test options, V - control option, VI - untreated leather option. Microscope photos of leather samples

As can be seen from Figure 1, hydrophobing of leather with the studied preparations leads to discrete distribution of hydrophobic particles in leather fibers or coating of the surface of structural elements with a film of the preparation. In particular, previous assumptions about the formation of a thin smooth film of PVEDGOXS on the surface of leather fibers during hydrophobization of silicon in the form of an emulsion organic liquid were confirmed.

A dense porous film is well felt in the control samples processed according to the model leather method.

Taking into account the significant decrease in moisture absorption and water permeability of leather when treated with a hydrophobic composition based on polyvinyl ethynyl dihydroxychlorosilane, it is necessary to recognize the validity of this idea, that in order to achieve a sufficient effect of hydrophobization, it is necessary to achieve a uniform distribution of the hydrophobilator on a part of the inner surface of the leather [9- 10].

It is known that the description of the distribution of porosity in terms of effective diameters, in combination with the general porosity and the chemical nature of the hydrophobic composition, has a significant effect on the hygienic properties of leather, in particular, on vapor and air permeability, which is confirmed by the data presented in Table 2.

Table 2

Indicator	Leather samples					
	Test , processed					Control
	PVEDGXS water repellent				Polyethylhydrosiloxane	
	I	II	III	IV		
Porosity , %*	42	42	44	4 4	42	54
Air permeability, cm ^{3} /(cm ^{2} ·ch)	368	374	387	381	248	415
Vapor permeability , %	77.1	77.9	78.6	78.1	70	73.7

Reminder . Credibility intervals of the obtained results : porosity ±2.2; air permeability ±2.3; vapor permeability ±1.6.

Using kerosene, the scale pyknometer was determined in k ways .

From the data in Table 2, it follows that the porosity of the test leather samples and, accordingly, their air permeability after hydrophobization, in comparison with the control samples, decreases. For example, when leather is treated with a hydrophobic composition based on polyvinylethynylidyhydroxychlorosilane, which accumulates on the surface of structural elements, the air permeability decreases, which is characterized by a lower porosity of the samples. When hydrophobes are discretely distributed in the structure of the leather, air permeability changes imperceptibly. [11] . The vapor permeability of the test leather samples is in some cases higher than these parameters of the control samples, which is explained by the alternation of hydrophilic and hydrophobic parts in the micro-, meso- and macroporosity, and this finely dispersed structure is one of the conditions of the vapor permeability .

The stability of the hydrophobicity effect in leather treated with the investigated compositions confirms the fact that repeated cycles of wetting and drying of leather hardly change the wettability indicators, and in some cases reduce the ability of leather to absorb water (Table 3)

Table 3 The stability of the hydrophobicity effect in leather treated with the ingredients, the changes in wettability indicators after repeated cycles of wetting and drying of the leather

Wettability 2 hours , %*		Leather samples					
		Test , processed					control
		I	II	III	IV	V.Polyethylhydrosiloxane _ _	
Primary		43	41.6	41.6	41.8	42.8	78.7
After a cycle of watering and drying							
Cycles _	1-	40,6 _	40.9	39.9	40.6	41	76.5
	2-	39	38.9	38.6	39	40.1	75
	3-	37.7	37.6	37.3	37.7	39.2	73.5
	4-	37	36.8	36.4	37	38.3	72.4

*** Confidence interval of results ±2 %.**

the fact that after several times of treatment along with washing some of the hydrophilic components with lubricating emulsion, fixation of hydrophobic drugs occurs in the leather.

A decrease in the wettability of leather treated with a composition based on PVEDGOXS may occur as a result of additional polymerization of low molecular fractions of PVEDGOXS. [14-15]

Thus, based on the results of the conducted research, it can be concluded that in order to fully preserve the hygienic properties of leather during hydrophobing, it is necessary to achieve an even distribution of hydrophobes in the structure of leather.

Study of the possibility of using a composition for hydrophobizing leathers after finishing with continued experiments .

can be increased by treatment with polyethylhydrosiloxane or hydrophobic compounds after finishing operations .

The improvement of the water resistance of shoe upper leathers has been investigated using PVEDGOXS-based hydrophobizing composition treatment of finished, fully finished chrome-plated leathers.

Compared to other hydrophobic preparations, for example, polyethylhydrosiloxane, the hydrophobic composition based on PVEDGOXS has a number of advantages:

- forms a strong chemical bond with the functional groups of collagen, which ensures the stability of the hydrophobic effect over time and does not cause a significant deterioration of physical-mechanical and physical-hygienic properties;

- reduces the fire safety of the hydrophobic treatment process;
- the technology of applying the drug to the material is simple and can be performed on existing equipment;
- In Uzbekistan, there are opportunities to increase the volume of production of water-repellent compositions based on PVEDGOXS. [1 2]

GOST 939-94 "Yalovka" leather was chosen as the research object .

Finished, fully finished leathers were treated, because hydrophobizing leathers with hydrophobizing compositions based on PVEDGOXS during the finishing operations of shoe production leads to a positive result, but in a few cases , the water resistance effect obtained in laboratory conditions was not confirmed by the data of wearing the shoes as a test. In addition, at the semi-finished stage, hydrophobized leather has a lower bond strength with a surface coating based on hydrophilic polymers [1 3-14] The recipe of the hydrophobizer was made based on the recipe of the solutions.

Table 4 Treatment of test and control hydrophobized leather samples

Descriptions under investigation	Test (wt.%)				Control sample
	I	II	III	IV	
The composition of the solution	%	%	%	%	%
Polyvinylethylenedihydroxychloro - silane , 80%	1	3	5	8	-
Hydrolyzed _ polyacrylamide	20	24	25	26	-
Methacrylic emulsion , 20 %	33	35	34	35	-
Emulsified hydrocarbon, IA - 12	43	32	30	25	-
Penetrator	6	6	6	6	-
Control polyethylhydrosiloxane i	-	-	-	-	70
Butanol	-	-	-	-	30
Drug consumption , ml/dm ^{2}	5.25	5.25	5.25	5.25	5.25
The temperature of the solution , °C	22	22	22	22	20
Drying temperature , °C	20	20	20	20	30
Duration of drying , min .	1 5	1 5	1 5	1 5	30

The leather was controlled by the degree of fading

Four treatment options for cow " ya lovka" leather (Table 4) and one control treatment option were considered. Hydrophobic applied to the leather surface and sprayed.

After standing for 24 hours, the physical and mechanical properties of leather were determined according to standard methods. The results are presented in Table 5 .

Table 5 Water resistance of "Chrome Yalovka" leather

Description under investigation		Control sample 5V	Processed			
			1V	2V	3V	4V
tensile strength under dynamic conditions , min.		48	54	76	103	82
Water permeability in dynamic conditions , g		0, 75	0.63	0.57	0.24	0.36
Water permeability in static conditions , cm ^{3}						
	two hours	3 , 24	3.06	2.64	1.52	2.12
	four hours	6.72	5.18	4.57	3.14	3.46
Two-hour moisture content , %		54.3	37.8	28.3	31.5	54.3
Two-hour moisture content , %		86.4	74.3	52.3	62.4	86.4

Relative vapor permeability , %	0.19	0.21	0.23	0.28	0.25
Absolute vapor permeability, (mg/cm ^{2} ·hours) ·10 $^{-4}$	3.2	4.1	5.8	7.8	6.3
Two-hour hygroscopicity , %	1.8	2.5	3.2	5.6	4.8
Vapor capacity , %	12.4	13.1	15.8	19.6	17.3

The analysis of the results was carried out in the following sequence. For the control and test samples, water permeability and wet traction were compared under dynamic and static conditions, and other physico-hygienic properties were studied.

Otherwise, further studies were discontinued. Then, the properties of leather before processing and after processing were analyzed in order to choose the technological method of hydrophobing, which provides the optimal combination of properties of water protection and comfort of shoes. [1 5]

Hydrophobizing compositions based on PVEDGOXS have achieved a significant effect in hydrophobizing leather.

Compared to the control samples, the water permeability of the test samples decreased by 1.5-2.0 times in statics and 2.0 times in dynamics. Hygroscopicity (two hours) increased by 13.8-65%, vapor permeability did not change noticeably.

Thus, we can talk about the feasibility and effectiveness of using new hydrophobizing compositions based on PVEDGOXS for hydrophobizing finished, fully finished leathers for the upper part of shoes.

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