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Development Of Effective Compositions Based on Local and Secondary Raw Materials For

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Annotation: This article provides the development of effective compositions based on local and secondary raw materials for tanning and leather finishing. The use of reactive water-soluble polymers of local importance for the processes of tanning and finishing the leathers of the upper and lower parts of footwear is shown. The optimal options for the composition of the composition for the process of applying pigmented soil, containing hydrolyzed reactive water-soluble preparations K-4 under various conditions, and their distribution in the skin layers were determined.

Key words: Tanned Semi-Finished Product, Reactive Water-Soluble Polymers, Composition, Hydrolyzed Polyacrylonitrile, Leather Primer.

One of the urgent problems of our time is the creation of local natural and chemical substances based on industrial waste that can replace expensive chemicals imported from abroad to meet the population's need for natural leather. Their use is closely related to the increase in the economic efficiency of the leather industry and the expansion of the range of leathers produced, as well as the creation of new chemical composite materials in technological processes.

Conducting research and finding the possibilities of using reactive water-soluble synthetic polymers and secondary products of production produced at the enterprises of our republic in the production of natural leather is an urgent problem [1].

Below is a detailed analysis of the existing chemical compositions used in tanning technology and leather finishing. Aqueous dispersions of polymers are mainly used to improve the properties of chrome-tanned leather, in particular, to make them water-resistant, increase resistance to evaporation, and even out the thickness along topographical areas. These dispersions are not tanning agents and naturally have no tanning effect.

The use of aqueous dispersions mainly for chrome-tanned leathers is explained by the fact that polymer dispersions currently produced by the industry are usually anions. Therefore, they do not give the desired effect when trying to tannide tanned leather, due to the fact that the dispersion particle and the leather fibers have the same charges. This disadvantage is eliminated by the selection of an appropriate emulsifier in order to obtain dispersions with positively charged particles [2].

When treated with monomers or polymerization intermediates and then polymerized on the fiber, an amount of polymer can be introduced into the skin or skin due to the small particle size of the monomers used. Due to this, they quickly penetrate the skin and the resulting polymers are evenly distributed over the layers of the dermis. The polymerization process in the leather fiber depends on the type of leather being treated and especially on its preparedness. For example, the polymerization reaction of monomers in syntan tanned leathers is more positive, because tannins prevent the inhibitory effect on the monomer, as well as the decomposition of oxide-type initiators in the presence of syntans.

Studies show that after the introduction of aqueous emulsions of polymerizable monomers such as acrylic, vinyl and others into the softened skin, the tanning effect is achieved. The result is soft leather, with a welding temperature of more than 339 K.

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Pre-treatment of a hide or a chromium-plated semi-finished product with surfactants, in particular syntan NK, sulfite cellulose extract, a charge of resin particles, provides better sorption of the resin by skin fibers and deeper penetration into the structure of the dermis.

It is especially important that when processing a tanned semi-finished product with dicyandiamide resins, the thickness and density of the peripheral areas of the skin are equalized in comparison with these indicators in the spinal part. The finished skin has no fragrance, thanks to the strong bonding of the papillary layer with the mesh layer.

Aqueous dispersions of polymers are mainly used to improve the properties of chrome-tanned leather, in particular, to make them water-resistant, increase resistance to evaporation, and even out the thickness along topographical areas.

When developing a technology for obtaining effective compositions, we previously studied the sequential introduction of compositions containing a water-soluble polymer K-4 at various stages of the production process of leather for the bottom of shoes: before chromium plating of the pickled outsole; after chromium plating of semi-finished leather product; in the process of fatliquoring a leather semi-finished product. Before chromium plating of the pickled hide, the study attempted to replace the pickling with K-4 treatment and studied the effect of this treatment on the thickness yield of the hides.

As an object of study from the production batch, a completely deashed bovine hide was taken, which had passed all the soaking-ash operations according to the approved methodology. After deashing, the naked was cheprakovali. For experiments, saddles were cut, as shown in Fig. 4.10. applied control points (H and O), made thickness measurements. The control semi-finished product was further processed according to the standard method.

Preliminary experiments made it possible to develop the following scheme of experimental technological processing. Water was poured into the tanning drum at a temperature of 303-308 K with F.K.=0.6, after which 5% water-soluble polymer K-4, taken from the weight of the deashed hide, was added there, and the semi-finished product was loaded. After the first hour of rotation, potassium alum was added to the drum - 1% of the weight of the deashed hide.

After chromium plating of the leather semi-finished product, the experiment was carried out during the processing of the semi-finished product with polymer K-4 before tannin tanning. Based on the previously obtained results, we applied the following processing technique [3].

The introduction of the polymer K-4 in the chrome-plated hide was carried out at F.K.=1, a temperature of 308 K. The consumption of the polymer K-4 in all cases was 5% by weight of the chrome-plated skin. The processing time is 2 hours. Next, the spent solution was drained and tannin tanning was carried out. After tanning, a thorough washing followed at F.C. = 2.5, a temperature of 308 K. Duration 1 hour. Control samples were washed under the same conditions after tanning.

The filling and greasing of the control leathers was carried out in the same way as tanning according to the standard method, and the experimental one was as follows: the experimental half-shoes were fattened, and the filling was carried out together with the control half-shoes; the second group of experimental leathers were fattened and filled with polymer K-4, according to the method indicated in the first case, which was used during processing before tannin tanning. The polymer consumption was 4% by weight of the chromium-plated semi-finished product. Further operations were carried out in accordance with the method of leather for the bottom of the shoe.

The inspection of the processed samples gave the following results: there was no difference between the control and experimental samples in appearance, color, and durability.

Chemical and physical-mechanical tests were carried out according to a known method. The tanning effect was characterized by the welding temperature. It has been organoleptically and instrumentally established that when the water-soluble polymer K-4 is introduced into the semi-finished leather product, its thickness increases in comparison with the control leather semi-finished products.

It has been established that the experimental samples contain significantly more fatty substances than the control samples. The latter is explained by the fact that, apparently, the interaction of the water-soluble polymer K-4 deposited in the skin with fatty substances and interaction with functionally active groups of fatty acids.

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The water resistance of the prototypes did not differ significantly from the control, and complied with the requirements of GOST.

A slight decrease in the two-hour moisture capacity compared to the control samples indicates a stronger formation of the dermis volume during treatment with polymer K-4. Wear resistance to wet friction of prototypes differs slightly from these indicators of control samples.

The introduction of compositions containing water-soluble polymer K-4, in the process of fatliquoring a semi-finished leather product, water-soluble polymer K-4 was introduced into the composition for processing together with the fat mixture. The object of the study of the properties of the composition was a semi-finished bovine skin of cattle after tanning, washing and pressing. All previous operations, including tanning, were carried out according to the standard method.

The use of water-soluble polymers in leather finishing processes, in particular in the process of priming leather, is of great interest due to the fact that the study of the distribution of the primer polymer over the layers of the skin showed that, in general, reactive water-soluble polymers are deposited in the upper layers of the dermis. An increase in the content of water-soluble polymers K-4 in the soil composition increases the penetration depth of other film formers, however, its content in the lower layers of the skin is insignificant.

The study was carried out on samples from the black part of chrome-tanned leather produced according to the method, completed using the asymmetric fringe method. The soil was applied 1 time. Soil consumption was 65 g/m2.

The study of the structure of the skin surface was carried out by electron microscopic method. To prepare objects for scanning electron microscopy EM-7 at an accelerating voltage of 200 kV, the method of sputtering with metal (chromium) with a layer thickness of 300 A^0 was used.

The deposition of polymers mainly in the uppermost layer of the dermis with an insufficient content of hydrolyzed polyacrylonitrile and polyacrylamide in the soil can lead to a sharp increase in the rigidity of the facial layer and even the fragrance of finished leathers.

The nature of the distribution of impregnating and preliminary primers, including hydrolyzed polyacrylonitriles of various grades, does not differ significantly from the distribution in leather containing shellac and casein.

In both cases, the polymer composition of the soil, partially enveloping individual collagen fibers, is mainly deposited in the skin in the form of agglomerates, forming fixed fiber bundles. Moreover, the soil is deposited in small and partially in medium-sized pores, it does not reduce the hygienic properties of the treated leather, slightly increasing its rigidity.

Of undoubted interest is the study of the nature of structural changes in the dermis during the distribution of polymer compositions in the process of priming leather [1]. The study was carried out on samples from the black part of chrome-tanned leather produced according to the method, completed using the asymmetric fringe method.

The soil was applied 1 time. Soil consumption was 65 g/m2. The composition includes reactive water-soluble polymers of secondary and local importance of pigmented soils containing various grades of hydrolyzed polyacrylonitrile (GIPAN, K-4). Our studies have established the optimal ratios of various grades of hydrolyzed polyacrylonitrile.

After processing the skins with various options, they were left to lie down for 8 hours at room temperature. Pressing was carried out at a temperature of 363K and a plate pressure of 15 MPa with a holding time of 5 sec. The water resistance of the leather was determined by the indicators of water permeability under dynamic conditions (on the device PVD-2) and two-hour wetness.

The two-hour wetting of skin samples during repeated testing in the drying-bed-wet cycle was determined for 6 cycles. For all leather samples, a decrease in the two-hour wetness index was observed during the first, second and third cycles, and then the index remained practically unchanged.

The physical and mechanical properties of chrome-tanned leather showed that it is expedient to use modified GIPAN under various conditions to improve the physical and mechanical properties of leathers for pigmented ground [3].

From the data obtained, it can be seen that the use of various water-soluble polymers in the composition of the composition instead of casein and shellac improves the physical and mechanical properties of the skin. The above experimental data show that an increase in the amount of water-soluble

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polymers used in the composition gives good filling, high tensile strength and uniform coloration on the skin surface.

The study of the distribution of the soil polymer over the layers of the skin showed that, in general, reactive water-soluble polymers are deposited in the upper layers of the dermis. An increase in the content of water-soluble polymers K-4 in the soil composition increases the penetration depth of other film formers, however, its content in the lower layers of the skin is insignificant.

Based on the work carried out, the optimal variant of the composition was determined, where the distribution of the bulk of the polymer composition in the layers of the skin will make it possible to equalize the rigidity of the dermis in thickness.

As the results of microscopic studies have shown, after priming, the fibrous structure of the dermis becomes denser. In this case, the polymer composition binds the collagen fibers of the papillary and reticular layers in such a way that their position and the nature of the distribution of impregnating and preliminary primers, including hydrolyzed polyacrylonitriles of various brands, does not significantly differ from the distribution in the skin containing shellac and casein.

Such a distribution of the polymer composition of the soil in the skin helps to equalize the stiffness of the reticular and papillary layers of the dermis, increase the elasticity modulus of the latter, which leads to a decrease in the physical and mechanical characteristics of primed skins.

The use of reactive water-soluble polymers for the composition of leather finishing during the application of pigmented primer showed that new compositions containing water-soluble polymer K-4 in their composition have high surface properties that make it possible to control the wetting ability of the primer, contribute to the optimal distribution of film formers in the dermis, which significantly affects elastic and hygienic properties of finished leathers.

Technological schemes and formulations of compositions for tanning and finishing leather based on local and secondary raw materials (hydrolyzed polyacrylonitrile, polyacrylamide, carboxymethyl cellulose and secondary products of oil and fat industries) have been developed. The norms of technological regimes and principal technological schemes for the preparation of compositions for leather finishing have been developed. The developed technology makes it possible to abandon expensive imported components used in compositions for tanning and finishing leather, and provides high quality finished leather without a significant change in the existing technological cycle.

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