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Study Of the Influence of the Cross-Linking Agent Urea-Formaldehyde on Hide Glue on the Heat Resistance of the Synthesized Adhesive

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ABSTRACT: In the article with different amounts of the cross-linking agent urea-formaldehyde on the hide glue as experimental ones. Then gluing and testing of the glued shoe materials for heat resistance were carried out.

KEY WORDS: flesh glue, urea oligomer, ammonium chloride, shoe material, adhesion, heat resistance, synthesis

I.INTRODUCTION

As is known, to increase heat resistance, structuring substances, for example isocyanates, ferric chloride, etc., should be added to the adhesive. However, for polychloroprene adhesives with a large amount of resins containing hydroxyl groups, isocyanates are ineffective [1-3].

II.EXPERIMENTAL PART

A. Methods and means of research

Glue fleshy (GOST 3252). Glue is obtained by boiling hides, split ends, parchment trims of skins, heads, paws and trimmings of raw skins and other types of glue-producing skins with water, followed by thickening the resulting solution and drying. Fleshy glue is produced in tiles, crushed and in flakes. Hide glue is divided into five grades: extra, highest, first, second and third. The moisture content in solid glue of all grades should be no more than 17%. The adhesive capacity in kgf/cm2 must be at least 100 for extra grade glue; 75 – for highest and first grades; 60 – for second and third grades. The methods for preparing flesh glue and bone glue are similar. The viability of hide glue is up to 2 days. Fungus resistance of the glue is low. The glue is harmless [4-5]

Glue based on urea aldehyde oligomers. This type of adhesive is primarily a condensate of urea and formaldehyde, which when cured form brittle, hard polymers that break down in the presence of moisture and are prone to cracking and shrinkage. This type of adhesive hardens in the presence of oxalic, orthophosphoric, citric and other acids. Depending on the type of these additives and their amount, the glue can cure from two hours to a day. Due to the instability of the qualities of this type of glue and its poor survivability, wood flour and starch are necessarily introduced into its composition [6-7].

Table 1
Curing time of urea resins

Temperature, °C	Curing time of urea resins with 1% hardener "ammonium chloride"				
	MFS-1	MF-17	M-4	Umakol S	KS-11
20	24 h.	8 h	6 h	10 minutes	1 h

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					10 minutes
30	5 ч h.	5 h	3 h	6 minutes 22 sek	30 minutes
40	1 h. 30 minutes	1 h 30 minutes	1 h	2 minutes 36 sek	11 minutes
50	30 minutes	45 minutes	25 minutes	1 minutes 45 sek	4 minutes 50 sek
60	13 minutes	25 minutes	15 minutes 15 sek	1 minutes 08 sek	1 minutes 45 sek
70	5 minutes 25 sek	10 minutes 30 sek	6 minutes	58 sek	1 minutes 42 sek
80	2 minutes 55 sek	5 minutes	3 minutes	45 sek	1 minutes 26 sek
90	1 minutes 52 sek	2 minutes 30 sek	1 minutes 30 sek	39 sek	1 minutes
100	60-65 sek	1 minutes 20 sek	45-60 sek	31 sek	45 sek

In Table 2. modes of gluing with urea resins are presented.

Table 2
Bonding modes with urea resins KS-11

Mode elements	Warm	Hot
Substrate humidity, %	until 6-10	6-10
Liquid glue consumption, g/m^2	110-150	110-150
Dry glue consumption, g/m^2	60-80	60-80
Press loading time, min	until 3	1,5-2,0
Press temperature, ºC	60-90	110-130
Specific pressure, kg/cm^2	5-10	8-12
Pressing time	5 min + 1 min for each mm of thickness of the part to be glued	4 min + by, 5 min for each mm of thickness of the part to be glued

The research used urea-formaldehyde resin grade KS-11 from the production company “Prom Smola” in the Sergeli district of Tashkent.

Heat resistance of the adhesive joint and adhesive layer. The heat resistance of the adhesive joint was determined by the change in the strength of the skin-skin bond connected by the studied adhesives after keeping the samples in a thermostat at 50 °C for 24 hours. The heat resistance of the sticky layer was determined by the change in stickiness on the dryer at 50 °C. A sample in the form of a strip of leather-leather (split leather, leather-textile) 2×10 cm was kept in a heat chamber at 50 ºC for an hour and then the stickiness of the heated sample was determined.

Frost resistance of the adhesive joint and adhesive layer. The frost resistance of the adhesive joint was determined by the change in the strength of the skin-skin bond connected by the studied adhesives after keeping the samples in a freezer at minus 15 ºC for 24 hours. The frost resistance of the sticky layer was determined by the change in stickiness on the dryer at minus 20 °C. A sample in the form of a strip of leather-leather (split leather, leather-textile) 2x10 cm was kept in a freezer at minus 20 oC for an hour and then the stickiness of the cooled sample was determined.

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RESULTS AND DISCUSSION

Glue samples were made according to Table 3. 50-70 gr. With different amounts of cross-linking agent urea-formaldehyde on hide glue as experimental ones. Then gluing and testing of the glued shoe materials for heat resistance were carried out. The results of the influence of different amounts of the cross-linking agent urea-formaldehyde on the flesh glue as experimental and control options on heat resistance are presented in Fig. 1 and Table 3.

Table 3

The results of the influence of different amounts of urea-formaldehyde crosslinking agent on hide glue as experimental and control options on heat resistance, after 4 hours at different temperatures

Indicators		Experiment options								
		Experienced, ratio (hide glue: modified urea-formaldehyde)					Tests			
		10:90	30:70	50:50	70:30	90:10	Polyurethane	Nairit NT	Glue fleshy	urea-formaldehyde glue
Adhesive ability, N/cm	t, °C	I	II	III	IV	V	VI	VII	VIII	IX
	25	17,1	21,5	23,3	29,1	36,4	38,5	33,2	13,3	9,4
	35	16,7	20,8	22,7	27,6	35,9	38,4	32,7	12,9	8,8
	45	13,8	14,5	18,1	10,1	30,2	33,8	28,4	11,8	6,3
	50	11,4	15,0	16,2	13,2	25,4	30,3	23,2	19,4	7,6
	55	8,6	10,1	13,3	18,3	22,6	23,3	19,5	17,5	5,7
	60	6,2	18,4	10,7	12,5	19,8	18,7	16,1	5,2	4,1

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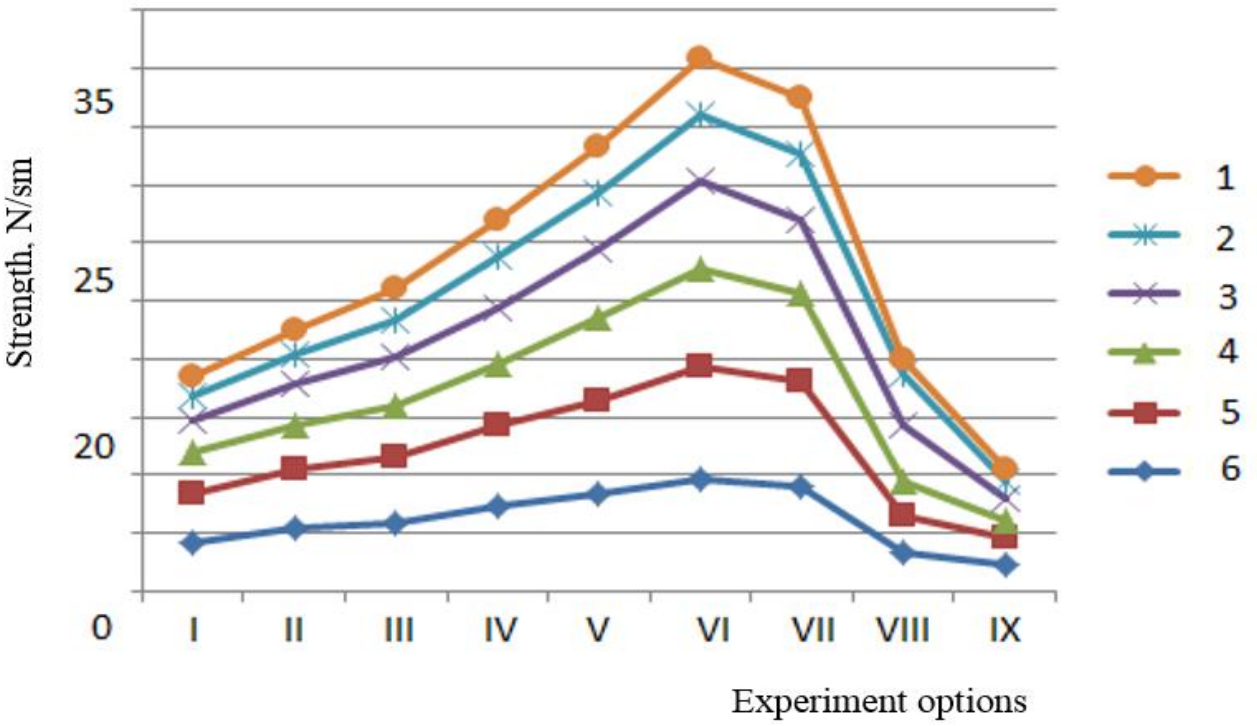

Рис. 1. The results of the influence of different amounts of the cross-linking agent urea-formaldehyde on hide glue as experimental and control options on heat resistance, after 4 hours; At temperature, ºC: 1-25, 2-35, 3-45, 4-50, 5-55 and 6-60

The strength characteristics of individual samples and groups were determined. For this purpose, the arithmetic mean values of the force for the samples per unit width (N/cm) were derived and the arithmetic mean for the groups was calculated. In relation to adhesives, for attaching soles, the standard value for the strength pH of adhesives when assessing the adhesive ability is recommended to be 24-30 N/cm, depending on the mechanical properties and geometric characteristics of the bottom of the shoe. Accordingly, to determine the setting speed, the standard value for strength can be (0.6-0.7) pH, and for the heat resistance of the adhesives mentioned above, the standard value is 0.75 pH, i.e. 18-22.5 N/cm [8].

IV CONCLUSION

In our case, we can conclude that heat resistance in all experimental and control variants (25, 35, 45 and 50 ºC) corresponds to and even exceeds standard values. With an increase in ambient temperature (55 and 60 °C), the strength of the samples is at the normal level and some are higher.

REFERENCES

1. 1. Rayackas V.L. Workshop on technology of leather products. Edited by. M.: “Light and food industry”. 1981. –P.137.
2. Kodirov T.J., Kazakov F.F. Toshev A.Yu. Synthesis of aminoaldehyde oligomers and leather filling technology // Monograph. Under the general ed. T.J. Kodirova. MVISSO RUz, Tashkent Institute of Textile and Light Industry.-Tashkent: Fan.-2016 - 304 P
3. Shoyimov Sh., Kodirov T. Diffusion of Fillers in the Structure of Chrome Leather and the Impact on Their Air and Water Performance // International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume:8 Issue:3, Sep 2019. 2027-2032 pp
4. Vernigorova V.N., Sadenko. S.M. Adhesives and bonding: monograph.– Penza: PGUAS. 2014. – 120 p.
5. Shoyimov Sh.Sh., Kodirov T.J. Degradation, Hydrolysis, Synthesis and Properties of COLLAGEN from Waste of Chrome Tanning of Tanning Industry. International Journal of AdvancedResearch in Science, Engineering and Technology (I JARSET). ISSN: 2350-0328. Vol. 5, Issue 12, December 2018. P. 7459-7463.

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6. A. P. Petrova, G. V. Malysheva Adhesives, adhesive binders and adhesive prepregs: textbook. allowance / under general ed. E. N. Kablova; All-Russian scientific research Institute of Aviation Materials. – M.: VIAM, 2017. – 472 p.
7. US patent N 4270912. Stabilized tanning compositon comprisinga reaction product of (a) polyaldehyde (b) secondary amine and (c) an alcohol and method. William C. Jun. 2, 1981
8. V.L.Rajackas Workshop on the technology of leather products. Edited by. M.: "Light and food industry". 1981. –P.137.