PROPERTIES OF DEERSKIN LEATHERS TANNED WITH GLUTARALDEHYDE AND BASIC CHROMIUM SULFATE

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ABSTRACT

Deerskin leather tanned with glutaraldehyde and basic chromium sulfate produces glove and garment leather that is strong and has improved perspiration resistance and serviceability. The needle penetration test suggests that leather containing glutaraldehyde is easier to sew than straight chrome leather.

—x—x—

INTRODUCTION

Several years ago a request was received from our Rural Areas Development Staff for deerskin, horsehide, and cattlehide leathers tanned with glutaraldehyde. That group was investigating the feasibility of establishing a sewing center at Fort Peck Indian Reservation in Montana and was especially interested in obtaining leather that would have a minimum of needle-friction during sewing. Chrome-tanned leather is reported to be rather difficult to sew and causes the needle to become dull more rapidly than is desirable. Success in reducing the needle friction during sewing of leather would permit more machine sewing of a garment in lieu of hand sewing. It was postulated that glutaraldehyde in the tannage might produce leather in which the fibers would be more easily separated and pierced than in chrome-tanned leather and this would make sewing easier.

Work was initiated on tanning deerskins with glutaraldehyde alone or in combination with basic chromium sulfate, using procedures described in previous publications (1–5). The properties of the leathers produced, including needle penetration, were compared with those of chrome-tanned leather. This note presents the results of that study.

EXPERIMENTAL

Glutaraldehyde Tannage.—Three deerskins were tanned for 24 hours with 15 percent glutaraldehyde (25 percent aqueous solution). Early in the tannage the pH of the solution was raised with sodium bicarbonate in three steps

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Three skins of commercial deerskin glove leather were obtained for comparison with the experimental leathers.

RESULTS AND DISCUSSION

The physical and chemical data appear in Table I.

The leathers were full, soft, and supple. They were dyed and had a uniform color. They were strong, as evidenced by their tensile, ball burst, and slit tear strengths, and in comparison with the commercial leather.

The elongation of the matched sides was lower, probably owing to a lower fat content.

The pH of these leathers was approximately 4.0 and ranged from 3.8 to 4.2. The commercial leather had a pH of 4.8.

The chromium content of the leathers, analyzed as chromic oxide, was higher on the commercially-tanned chrome leather than on the chrome-glutaraldehyde leathers. The fourth side of the matched-sides test, although tanned with glutaraldehyde alone, showed 0.61 percent Cr_2O_3 by analysis. The chromium was absorbed by the skins while they were being processed into finished leather.

The shrinkage temperatures of these leathers changed slowly with time. The three leathers that were four years old showed a lowering of the T_S as follows: 9°C. on the leather tanned with 15 percent glutaraldehyde, 13°C. on the leather tanned simultaneously with four percent basic chromium sulfate and six percent glutaraldehyde, and 18°C. on the leather tanned with four percent basic chromium sulfate and retanned with ten percent glutaraldehyde. After 14 months, the ΔT_S of the matched sides was only three degrees lower on the three sides tanned with chrome and two degrees lower on the side tanned with 15 percent glutaraldehyde.

The perspiration resistance of the leathers was improved by glutaraldehyde and increased with increasing amounts of tanning agents.

Needle Penetration Test.—It was hoped that the needle penetration test would indicate the comparative ease of sewing the deerskin leathers. The data in Table I indicate that the forces to penetrate the leather using the sharp-sided needle, on the whole skins containing glutaraldehyde, are consistent. They fall in the range of 30 to 34 pounds per inch thickness. The commercial deerskin leather had a needle penetration value in the same range. This was lower than expected and could be accounted for by a number of variables, including the fact that it was tanned with a combination of chrome and formaldehyde. On the matched sides there is correlation between the tannages and the needle penetration values. Considerably less force was needed to penetrate the sides containing glutaraldehyde than was needed to penetrate the chrome-tanned control sides. This was also true when using the larger round needle. It took 146 and 185

pounds per inch thickness for this larger needle to penetrate the chrome-tanned control sides, and 90 and 89 pounds per inch thickness, respectively, to penetrate the matched sides containing glutaraldehyde.

There are several factors, separately or in combination, that may influence the ease with which a needle can be forced through leather, such as the thickness, the amount of fat and oil in the leather, and the tightness of weave of the fibers and the ease with which they may be separated. Most of these factors may be influenced by the tanning agent and conditions of the tannage.

Although the test runs were limited in number, there was consistency in the needle penetration values (30 to 37 pounds per inch thickness) of all the leathers containing glutaraldehyde. It is reasonable to assume that these leathers have better fiber separation than the chrome-tanned leather. It is not known at this time how well this needle test correlates with the actual sewing of leather.

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