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Accelerated Chamois Leather Tanning Process Using Oxidizing Agent

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Abstract. Chamois leather is a well known product, as it has specific uses for gasoline filtration; cleaning and drying optical equipment, spectacles, mirror, and vehicles; orthopedic leather; and garments. A weakness of chamois leather tanning practiced nowadays is its oxidation process taking relatively long time, i.e. up to two weeks. The application of an oxidizing agent may shorten the oxidation process in the chamois leather production. In this study, the uses of oxidizing agents for accelerating the chamois leather tanning were investigated. The experiment was carried out by tanning goat skin pickled pelt with rubber seed oil. In the tanning, oil oxidation process was modified by adding sodium percarbonate and hydrogen peroxide in the rotary drum for 6 hours. Three concentrations of each oxidizing agents were used and the properties of the chamois leathers were tested. This study demonstrates that oxidizing agents, especially hydrogen peroxide, could be applied in the chamois leather production for accelerating oxidation process of the tanning. The properties of the leather met the quality requirements for the chamois leather (SNI 06-1752-1990). Hydrogen peroxide of 6% was the best treatment obtained from the trial. Therefore, the oxidation process of chamois leather tanning could be shortened up to about three days by the application of the oxidation agent.

Keywords: acceleration, chamois leather, hydrogen peroxide, oxidation time, oxidizing agent, sodium percarbonate, tanning

1 Introduction

Production of chamois leather practised nowadays has a weakness, i.e. the oxidation process taking relatively long time, nine days to two weeks [1, 2, 3]. This condition causes the production of chamois leather need a relatively long time, increase the production cost, and decrease the production capacity.

Application of oxidizing agent, such as sodium percarbonate was reported to accelerate the process of oil tanning [1, 3]. Sodium percarbonate contains sodium carbonate and hydrogen peroxide. Sodium percarbonate is relatively expensive, so its use in chamois leather industry will face obstacles of the production cost. Use of hydrogen peroxide might be able to accelerate the tanning. As price of the compound is much lower than that of sodium percarbonate, so it will be profitable if the material can be used in the chamois leather manufacturing.

This study was aimed to investigate the effects of oxidizing agents on the chamois leather quality. Besides that, this study was to obtain the best oxidizing agents to accelerate the oil oxidation in the chamois leather tanning.
2 Materials And Methods

2.1 Materials and Equipment

This study used rubber seed oil, glutaraldehyde (Relugan GT50), goat skin pickled pelt, sodium chloride, sodium carbonate, sodium formate, and degrease 606. Oxidizing agents used were hydrogen peroxide and sodium percarbonate. Equipment used were rotary drum, sammying machine, shaving machine, stacking, toggle drier, buffing machine, thickness gauge, pH meter, shaker, grinder, oven, burner, tensile strength tester (UTM Instron), and Kubelka glass apparatus.

2.2 Methods

2.2.1 Tanning

Oil tanning was conducted by using a modified method of Suparno et al. [4]. The modifications were the additions of oil diffusion process conducted in the rotating drum for 8 hours and oxidation process in the drum for 6 hours. The oxidation process was carried out by using two types of oxidizing agents, i.e. sodium percarbonate and hydrogen peroxide with concentrations of each agent of 2%, 4%, and 6% based on the weight of rubber seed oil applied. Prior to oil tanning, goat skin pickled pelt was pretanned by glutaraldehyde using procedure reported by Suparno et al. [4].

2.2.2 Leather Testing

Water absorption and tear strength and were measured by using SLP 19 and SLP 7, respectively [5]. Tensile strength and elongation at break were measured by using SLP 6. [5]. Organoleptic properties were tested by two experts of chamois leather [4].

3 Results and Discussion

3.1 Water Absorption

One of important parameters of chamois leather quality is its capacity to absorb water. Water absorption relates to its use as filtering, drying, and cleaning agents.

Figure 1 shows that water absorptions for 2 hours duration were in the range of 240.2 to 266.7%. In general, water absorptions of chamois leathers produced in this study met the standard, i.e. minimum of 100% [6].
3.2 Tear Strength

Based on Figure 2, this trials produced the leathers with tear strengths in the range of 74.4 to 93.4 N/mm. The highest value was given by the treatment using 2% sodium percarbonate and the lowest one was obtained from the treatment with 6% sodium percarbonate. Generally, the tear strengths of the leathers fulfilled the standard of SNI 06-1752-1990 [6], i.e. minimum of 15 N/mm.
3.3 Tensile Strength

The highest tensile strength was given by the treatment using 4% hydrogen peroxide, while the lowest one was obtained from the treatment using 4% sodium percarbonate (Figure 3). Tensile strengths of chamois leathers obtained from this experiment were in the range of 28.3 to 32.1 N/mm². Overall, the strengths met the standard [6], i.e. minimum of 7.5 N/mm².

Type of oxidizing agent was not significantly different on the tensile strength of the leather. This indicates that the fixation of oxidised oil in the leather fibers by these two types of oxidizing agents were similar.

![Figure 3](image.png)

Figure 3. The relationship between types and concentrations of oxidizing agents and the tensile strength of chamois leather

3.4 Elongation at Break

Elasticity of the leather is indicated by elongation at break. Leather, which has high elongation at break, allows it to not easily torn or broken during its application.

Form Figure 4, elongations at breaks of the leathers in this trial were in the range of 122.2 to 137.6%. The highest elongation at break was obtained from the treatment using 2% sodium percarbonate and the lowest one was given by the treatment using 6% sodium percarbonate. They met the standard of SNI 06-1752-1990 [6], i.e. minimum of 50%.
3.5 Organoleptic Properties

Important parameters for determining the quality of chamois leather are organoleptic properties. The properties are directly related to the comfort and safety of the leather application. The organoleptic properties of the chamois leather are softness, colour, and odour [6]. The results of the organoleptic properties tests are demonstrated in Figures 5, 6 and 7.
Softness was not influenced by the type and concentration of oxidizing agent, but only influenced by the interaction between the oxidizing agent type and its concentration. The highest value of softness was found in the treatment using 2% sodium percarbonate and the lowest one was given by the treatment using 2% hydrogen peroxide (Figure 5).

The types and concentrations of oxidizing agents as well as their interactions affected the colour of the leather. The best colour which means the lowest colour intensity was given by the treatment using 6% hydrogen peroxide (Figure 6).
A good chamois tanning does not give odour to the leather. The odour of the leather was generally caused by the excess of oil in the product. Figure 7 shows that the treatment produced the highest odour was hydrogen peroxide of 6%.

The best treatment for the oxidation process in the chamois tanning was the treatment using 6% hydrogen peroxide. This treatment gave the highest average values of organoleptic properties, water absorption, and strengths of the leathers.

4 Conclusions

Both oxidizing agents, i.e. sodium percarbonate and hydrogen peroxide can be used to accelerate the oxidation process in the chamois leather tanning. The oxidizing agent type used in this trial significantly affected the shrinkage temperature, ash content, color, odor of the chamois leather, while the oxidizing agent concentration significantly affected the color and odor of the leather.

The best treatment in this trial to produce chamois leather was hydrogen peroxide of 6%, as the treatment resulted in the leather having the best water absorption, strength, and organoleptic properties. The use of that treatment could shorten the oxidation process to about three days.

5 References


6. Acknowledgements

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