OPTIMIZATION OF CHAMOIS OXIDATION PROCESS OF LEATHER USING BENZOYL PER OXIDE AS OXIDIZING AGENT

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Abstract. Chamois leathers are basically oil tanned leathers, usually requires 10 to 15 days to process from raw skins. In chamois making, air oxidation plays a major role, free radicals initiate the oxidation process in oil, which oxidizes the double bond of the fatty acid and then the oxidized oil interacts with collagen to stabilize the skin by coating the fibers. In the present study an attempt has been made to reduce the time for chamois leather processing. A common oxidizing agent (Benzoyl peroxide (BPO) was utilized to enhance the oxidation of oil and reduce the time duration. It has been observed that the oxidation of oil in the presence of benzoyl peroxide has significantly reduced the duration of process from 15 to 4 days. Strength properties such as tensile and percentage elongation were found to be on par with control leather. The water absorption values of the experimental leathers improved by 1-26 %, compared with control leather.

1 Introduction

Tanning is where skin or shroud protein cooperates with tanning materials, for example, metal or vegetable tannoids or oil to change over it into leather. In metal tanning, fundamental chromium sulfate is utilized which at higher pH convert into poly chromium buildings which cross-connected with amino acids of collagen to tanned them.[1] In vegetable tanning, polyphenol astringent synthetic concoctions, got from normal sources like bark and leaves of plants, rejoins with amino acids of collagen to shape leather. In contrast to metal and vegetable tanning, chamois leathers are made utilizing oils.[2] Chamois leathers are commonly utilized for cleaning, because of their capacity to retain huge measure of water, oils and astounding soil expulsion abilities. These leathers additionally locate some top of the line applications, for example, filtration of fuel, cleaning optical instruments, glass windows, in making gloves, pieces of clothing, and footwear.[3-5]

Oil is principally connected on the outside of skin and are presented it to the environment for oxidation, the procedure is tedious and as a rule takes around nine to fourteen days.[6-8] The way toward making chamois is tedious. There are not many literary works answering to diminish the time required for oil tanning utilizing some oxidation quickening agents, for example, hydrogen peroxide, sodium per carbonate and ozone.[9-14] However, treatment of these materials needs care because of their solid oxidizing capacity and destructive nature. Thus there is a requirement for option oxidizing agents which needs negligible consideration in taking care of and successful oxidation.

In the present examination, Benzoyl peroxide was utilized as an oxidizing specialist and utilized for the streamlining for chamois leathers preparing with fish oil.

2 Materials and Methods

2.1 Materials

Indian sheep skins were procured from the local slaughter house, Chennai, India. Glutaraldehyde (**BASF**, Chennai), Benzoyl peroxide (BPO) (Himedia, Chennai), Fish oil (Chennai) and all other leather chemicals were of commercial grade.

2.2 Oil Tanning Using Fish Oil

Partially pickled skins were pre tanned using glutaraldehyde. Mixture of fish oil (20%), soda ash (0.5%) and benzoyl peroxide (X %) for experimental process were pre mixed in a beaker and the mixture was applied on the leather in a rotating drum so that the oil is distributed throughout the surface. The process was carried out for 90 min continuously. The skins were hanged up for oxidation in open drying stands. The completion of oil tanning was visually judged by the colour of the skins turning to golden yellow. Then, the leathers were washed with water (100%), soda ash (1%) and wetting agent (1%) for the complete removal of unfixed oil. Final leathers were dried and subjected to staking, buffing and milling. Control chamois leather was made in the similar manner as explained above without the use of benzoyl peroxide. Detail description of leather processing is seen in Table 1.

Table 1. Detail description of process for making chamois leather.

Process	Chemical	Percentage (%)	Time (min)	Remarks
Washing	Water	100	10	Wash and drain
Deliming	Water	100		
	Ammonium chloride	2	40	
				Check de-liming using phenolphthalein
	Alkaline bate	0.5	30	Drain
Washing	Water	200	10	Wash and drain
Partial pickling	Water	80		
	Salt	8	30	
	Formic Acid	0.5	30	In 1:10 dilution with water
	Sulphuric Acid	0.2		In three feeds with 1:10 dilution with water, adjust pH to 3.5-4
	Glutaraldehyde	1	60	Drain, pile for overnight
Next day				
	Fish oil	20		
	Benzoyl per oxide (experiment)	X		
	Sodium carbonate	0.5		Mix using stirrer, make paste. add to drum along with skin

X= 0.20, 0.40,0.60, 0.80, 1.00

2.3 Shrinkage Temperature Measurement

Aqueous dependability of chamois leather was surveyed so as to comprehend the leather opposition towards warmth. Shrinkage temperature of leather was done according to standard test procedure.[15]

2.4 Estimation of Physical Strength Properties

Physical quality parameters of leather were considered subsequent to testing, rigidity and rate prolongation properties were dissected by the standard procedures.[16,17]

2.5 Water Absorption Analysis

Water ingestion is the leather capacity to ingest water per unit weight of leather and communicated in rate. Estimation of water retention was done according to the standard procedure.[18]

3 Results and Discussion

3.1 Plausible Mechanism of Oil Tanning and the Effect of Oxidizing Agent in Chamois Making

Poly unsaturated fat are exceedingly responsive to oxidation. Unsaturated oils are slanted to autoxidation, which is the prompt reaction of atomic oxygen with hydrocarbons of unsaturated fats of oil. The utilization of benzoyl per oxide improved the convergence of oxygen radical by breaking of inner oxygen-oxygen bond appeared in Fig. 1.

Unsaturated aldehydes produced amid proliferation step with their free aldehyde groups connects with amino groups of amino acids of collagen by means of shiff base arrangement alongside hydrogen bond development with carboxylic acid group of collagen. This give a system of cross connection of oxidized oil with collagen appeared in Fig. 2.

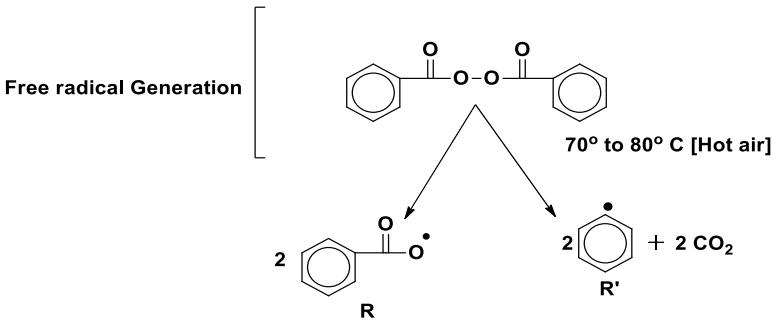

Fig. 1. Benzoyl peroxide free radical generation.

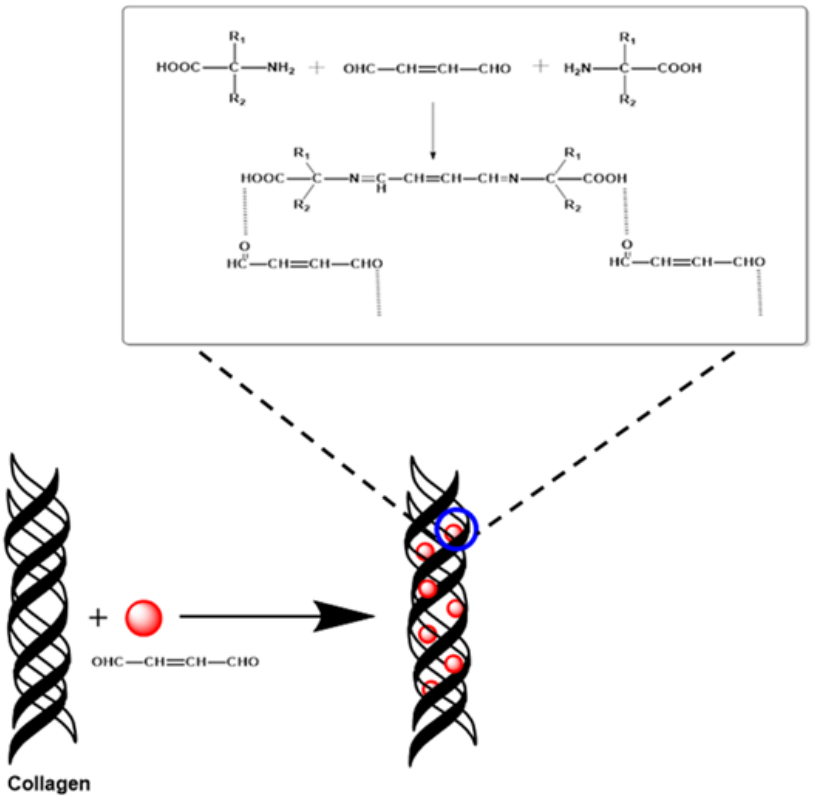

Fig. 2. Plausible interaction of Unsaturated aldehydes, generated from oil oxidation with collagen as a tanning agent.

3.2 Hydrothermal Stability of Chamois Leathers

Shrinkage temperature measurement of chamois leather provides the information about the leather resistance towards load due to hydrothermal shrinkage, which in turn gives the idea of oil tanning occurred due to the treatment of fish oil. From table II, shrinkage temperatures of experimental leathers were in the range of 78-79 °C, which is comparable to conventional oil tanning.

Table 2. Shrinkage temperature measurement of chamois leather.

S No	Sample	Shrinkage temperature (°C)
1	Control	78±1
2	BPO (0.20%)	78±1
3	BPO (0.40%)	78±1
4	BPO (0.60%)	78±1
5	BPO (0.80 %)	79±1
6	BPO (1.00 %)	79±1

3.3 Physical Strength Properties of Chamois Leathers

Chamois leathers were tried for quality and water ingestion capacities. Elasticity of the chamois leathers expanded with increment in benzoyl peroxide rate. This might be a result of the total oxidation of the fish oil and improving the tanning proficiency. The elasticity of the chamois leathers expanded with increment in grouping of the benzoyl peroxide. Rate prolongation of the leathers tests were similar with control leathers. (Table III) Likewise, chamois leathers are known for their water engrossing capacity, water retention test was completed to comprehend the impact of

oxidizing agents in chamois making. Water assimilation by the exploratory leathers expanded in the range 1 to 26 % when contrasted with control. Higher water assimilation by chamois was shown at benzoyl peroxide convergence of 1%.

Table 3. Physical testing data of chamois leathers.

S. No	Sample	Tensile Strength N/mm^2	Elongation (%)	Water Absorption (%)
1	Control	11±0.5	73±2	464±10
2	BPO (0.20%)	12±0.5	70±5	463±10
3	BPO (0.40%)	14±0.5	75±2	501±10
4	BPO (0.60%)	15±0.5	78±2	539±10
5	BPO (0.80%)	17±0.5	76±1	575±10
6	BPO (1.00 %)	18±0.5	72±5	587±10

4 Conclusions

In the present study, we have shown the use of Benzoyl peroxide as an accelerant to oxidize fish oil in chamois making. It was also shown that the time required for making chamois leather was significantly reduced from 15 to 4 days with the use of benzoyl peroxide as oxidation aid. Water absorption capability increased by 1 to 26 % compared to convention chamois leathers. Further, shrinkage temperature of the chamois leathers was comparable with control leathers along with other organoleptic properties such as softness, colour and odour. It can be concluded that the use of benzoyl peroxide in chamois making not only reduces time but also have positive benefits on final quality of leathers.

5 Acknowledgements

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