LEATHERS FOR MARINE APPLICATIONS: INSTIGATING PHYSICO-CHEMICAL PROPERTIES OF CONVENTIONAL LEATHER

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Abstract. Leather and leather products are known for its durability and luxuries which makes it more unique amongthe other synthetic materials. Breathability and visco-elastic properties make leather unique choice of biomaterial. Utilization of leathers in marine based applications is limited owing to reactivity of leather towards salt and weather conditions. Moreover, the choice of raw materials and chemicals used during leather manufacture has greatly influence the properties of the leather. An attempt has been made to understand the influence of sea conditions on leathers. Conventional chrome tanned and vegetable tanned leathers were incubated in sea water and subsequently processed into post tanning to evaluate the physical properties. To understand, the leaching of chemicals, dyed leathers are incubated at different humidity and saline conditions. Interestingly, chrome tanned leathers found to be friendlier to marine conditions whereas, vegetable tanned leathers lead to leaching of chemicals. Furthermore, leaching of chromium is negligible, and crust leathers resulted in soft leathers. Prolonged exposure of chrome tanned leathers under salt stress leads to more softness. This might be due to saline stress to the skin matrix. Moreover, the compatibility of conventional leather chemicals was also tested using sea water. The research provides a new insight on fine tuning the chemicals to suit marine based applications.

1 Introduction

Leather is a natural material processed from animal skins mainly from goat, sheep, cow and buff. Viscoelastic and breathability are the unique properties of natural leathers which makes it more comfort and luxurious than synthetic materials. Leathers are widely used to manufacture footwear, garments, upholstery and goods. Understanding the physical properties of leathers in marine conditions is less reported. Research is carried out to utilise sea to manufacture leathers. However, the compatibility of conventionally tanned leathers such as chrome and vegetable tanned leather in sea water has not been reported. Leather for marine based application is seems to be challenging because of its major intricate physico-chemical properties like Fading due to weather conditions and salt concentration leading to corrosion (metal tanned leathers). Moreover, the consequences of salt interaction with leather are monitored for its hardness, shape retention, loss in physical strength and loss of moisture leading to fibre drying. Hence, this study is carried out to understand the various basic parameters in order to respond the above mentioned consequences. This study focuses on assessing the influence of sea water on chemical stability and leather characteristics.

2 Material and Methods

Chrome tanned, Vegetable tanned and Crust leathers (Dyed and undyed) of goat origin were used for the study. Sea water from Bay of Bengal was collected and used for the study without any further modification. Commercial and analytical grade chemicals were used for the compatibility testing with sea water and analysis respectively.

3 Results and discussion

In the present work the various parameters are chosen for selecting materials for marine applications are evaluated for their resistance behaviour to corrosion by seawater and by external environment (Humidity and Temperature) over a wide range of operating conditions, Figure 1. It is also monitored for its antifungal activity towards marine bio fouling and their mechanical properties of the material with increased life expectancy. Commercial chrome tanning and vegetable tanning (wattle) agents are mixed with sea water and checked for the stability. Vegetable tannins readily precipitated whereas the stability of chrome tanning agents is evaluated through visual assessment. Similarly, vegetable tanned leathers showed leaching of chemicals in the presence of sea water whereas, chrome tanned leathers showed no leaching of chromium which has been confirmed through Cr estimation in the liquor.

From the physico-chemical parameters it can be inferred that metal complex based tanning system shows much resistant to marine water.

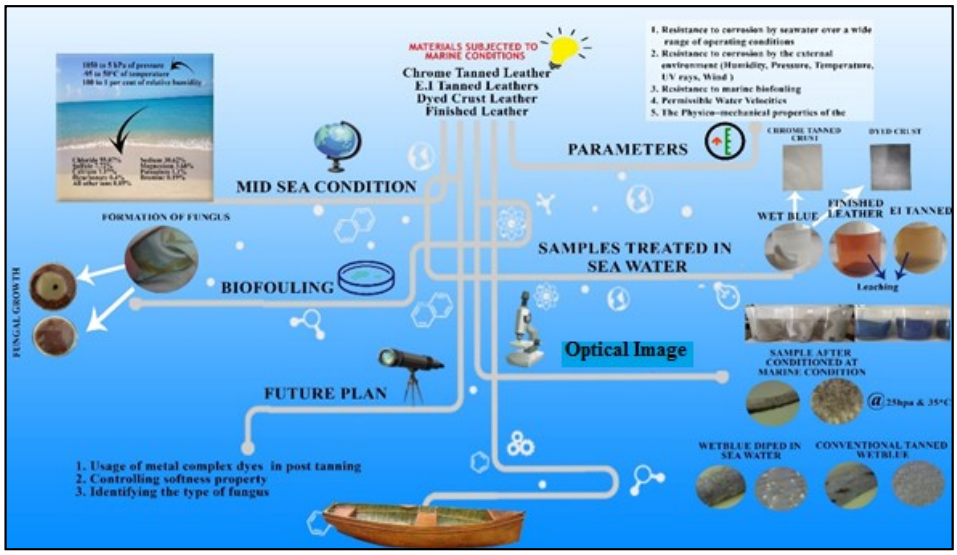

Figure 1. Schematic representation of the results.

This confirms the use of wet blue leathers are best suited for marine application. With the various post tanning chemicals, precipitation behavior has been studied and exhibited better dilution behaviour for fat liquors in marine water. In case of natural tanning system, precipitation occurs mainly due to the salt linkage formation at higher concentration in sea water during the post tanning processes. The crust leather without natural tannins soaked in sea water has been processed and evaluated for their physical strength properties. We observe that it has influenced softness in the white crust leather and leaching of dye seems to be minimal in case of dyed crust leathers. Similarly, in the case of dyeing characteristics, metal complex dyes are stable in marine sea water conditions. In case of marine bio fouling property, they show no fungal growth in the presence of preservatives and slight growth of *Aspergillus* without added preservative has been observed.

4 Conclusion

The present work confirms the wider usage range of chrome tanned leather with properly chosen post tanning chemicals would be a better and an appropriate material for marine based applications like marine boots and marine gloves.

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