LEATHER WITH ELASTANE – AN INNOVATIVE MATERIAL FOR FOOTWEAR

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The material Elastane is termed as visco-elastic and is predominantly used in various products for people. The products of elastane possess greater advantages in terms of functional terms and conditions. An initiative has been attempted to explore the usage of leather with elastane for footwear applications. The specialty this material possesses is that of enhanced stretch and recovery characters and it has been proposed for experimentation to explore as an innovative material for footwear. The foremost objective is to evolve appropriate methods of exploring leather with elastane and its suitability in the process of making footwear. The properties of superior stretch and recovery have impacted a positive sense of consideration for research activity in the field of footwear. The physical test methods have been carried out on this new material to assess the properties feasible for footwear. Primarily, the stretch and recovery properties for leather with elastane and the leathers of animal origins such as cow, goat and pig have been assessed as well as correlated. In experimentation, leather with elastane has been explored for upper fabrication of shoes of various styles. The functional characteristics of this material have been observed during the prototyping of shoe uppers. The principle of Force lasting has been revealed ideal for the construction of shoes thereby maintaining the shape and dimension without loosing the stretch and recoverable behavior. It is observed that the shoe developed with elastane resulting enhanced inside volume for providing added comfort to the consumers. The superior stretch and recovery properties would help reduce the number of sizes as well as eliminate the half sizes in particular. Finally, the outcome of overall exercises on leather with elastane would envisage the advantages in terms of cost reduction incurred in die making due to reduced number of sizes of shoes, enhanced comfort, fit and performance for the consumers due to its meritorious functional features. The material leather with elastane of special characters inspired to explore experimental analysis in the area of development of footwear to look forward of future direction of footwear research.

Keywords: elastane, visco-elastic, stretch, recovery, force lasting.

INTRODUCTION

The leather with elastane (Lycra) has been chosen for scientific study to determine its suitability for footwear applications. Lycra adds comfort and shape recovery for conventional leather end uses such as footwear, garment outwear, and even intimate apparel. The role of its usage in furniture and automotive upholstery application is significant. Despite the fact that leather has a certain degree of stretch characters, the lamination of elastane would offer improved fit, comfort and appearance of the product throughout life cycle. The leather with elastane ensures optimum level of stretch as well as recoverable properties.

The lamination techniques adopted are classified into two types namely: component lamination developed specifically for footwear and full hide’s lamination for upholstery and apparel uses. These technologies are engineered to achieve consistent level of stretch up to 40% in the leather and 10 to 15% recovery to its original form. Additionally, the leather with elastane possesses lightweight, supple and soft properties lead to enhance greater impact across the footwear and apparel spectrum. The latest advancements on technological development of leather with elastane would result to a breakthrough in the footwear and apparel industries in the world. This material has been proposed for scientific investigation to reveal the properties essential for footwear applications.
The main objectives of feasibility study were to conduct experimental studies on leather with elastane as a material of importance in footwear. The scientific assessment procedures were carried out to determine the stretch and recovery properties suitable for the development of comfortable footwear. The initiatives on exploring this material on different methods of manufacturing footwear were attempted in the experimentation.

METHODS

The stretch and recovery test was conducted on the samples at different loading conditions. The sample dimension of 100 mm x 20 mm was subjected to elongation with the loading conditions of 5N, 10N, 15N and 20N respectively. The sample dimension of 100 mm x 20 mm marked on the vamp region of upper has been subjected to forepart lasting and subsequently with continuous flexing and bending movements. From the results on extension values of materials using conventional system, the load applicable for lasting of shoes has been understood.

To determine the heat setting parameter, a small fixture was developed with a fixed and movable jaw for clamping the sample for assessment. The initial stretch obtained would further clamped between the jaws manually and the heat setting was done at 125°C for a period of 2.5 minutes. The specimen was kept for 30 minutes at normal temp and removed from the fixture. The recovery status of the material was observed at the intervals of 30 min, 60 min, 4 hours and 24 hours.

The materials of the following varied compositions have been assessed scientifically to correlate the results in terms of physical properties and finally to conclude the best suited material for footwear. The compositions such as Leather with elastane, Cow softy upper leather, Leather elastane with Cow lining, Goat lining and Pig lining, Cow softy upper with Cow lining Goat lining and Pig lining. The differences on the behaviors of the materials with the application of load have been observed from this study. The stretch and recovery properties of upper and lining materials should be compatible with each other to appropriately meet the requisite parameters for footwear applications.

RESULTS

The stretch and recovery test was carried out on Leather with elastane sample with different loading conditions on across and along directions. The initial extensions obtained on the samples have been tabulated and the recovery status after the intervals of varied durations specified for the analysis have been furnished in the tabular format:

![Figure 1. Experiment 1](image1.png)

![Figure 2. Experiment 2](image2.png)
From the graphical presentation, the material subjected with 20 Newton load, possessed higher degree of stretch of 117 mm and recovery value of 103 mm in across direction and 88% recovery was recorded.

With reference to Experiment-2, the cow softy leather subjected with 20 Newton load possessed the stretch value of 107 mm and recovery value of 103.5 mm in across direction after the period of 24 hours.

With reference to Experiment 3, the leather with elastane laminated with cow lining leather subjected with 20 Newton load possessed the stretch value of 106.4 mm and recovery value of 103.5 mm in across direction after the period of 24 hours.

With reference to Experiment 4, the leather with elastane laminated with goat lining leather subjected with 20 Newton load possessed the stretch value of 109.3 mm and recovery value of 103.5 mm in across direction after the period of 24 hours.

With reference to Experiment 5, the leather with elastane laminated with pig lining leather subjected with 20 Newton load possessed the stretch value of 108.5 mm and recovery value of 104 mm in across direction after the period of 24 hours.

With reference to Experiment 6, the cow softy upper leather subjected with 20 Newton load possessed the stretch value of 108.5 mm and recovery value of 104 mm in across direction after the period of 24 hours.
With reference to Experiment 5, the leather with elastane laminated with pig lining leather subjected with 20 Newton load possessed the stretch value of 109.6 mm and recovery value of 104 mm in across direction after the period of 24 hours.

With reference to Experiment 6, the cow softy leather laminated with cow lining leather subjected with 20 Newton load possessed the stretch value of 104.9 mm and recovery value of 102 mm in across direction after the period of 24 hours.

With reference to Experiment 7, the cow softy leather laminated with goat lining leather subjected with 20 Newton load possessed the stretch value of 105.7 mm and recovery value of 102.5 mm in across direction after the period of 24 hours.

With reference to Experiment 8, the cow softy leather laminated with pig lining leather subjected with 20 Newton load possessed the stretch value of 106.5 mm and recovery value of 103.5 mm in across direction after the period of 24 hours.

**DISCUSSION**

In response of the graphs presented on the stretch and recovery characteristics of leather with elastane and cow softy leather with the compositions of varied animal origins of lining leathers, the comparative analysis has been done in order to understand the fiber characteristics and its physical behaviors. The comparison charts of the following would further help investigate and discuss the factors concerning to stretch and recovery results.
Figure 9. Comparison analysis 1

From the graphical view, the cow leather stretched to 102 mm and recovered to 100.5 mm whereas the Leather with elastane with cow lining produced the extension value of 103.5 mm and recovery of 101.5 mm. The material composition of leather with elastane and cow lining leather possessed higher degree of stretch and lesser value of recovery characters.

Figure 10. Comparison analysis 2

With respect to the comparison chart 2, Leather with elastane possessed higher value of extension of 103.5 mm than the cow material and these materials recovered to almost the original dimension of 100.5 mm of the sample.

Figure 11. Comparison analysis 3
With respect to the comparison chart 3, Leather with elastane possessed higher value of extension of 104 mm than the cow material and these materials recovered to almost the original dimension of 101 mm of the sample.

It is revealed from the above comparison analyses that the material Leather with elastane laminated with Pig lining leather produced the extension value of 104 mm with the recovery value of 101mm. This combination possessed of higher degree stretch with recovery property of 97.11%. The leather with elastane combined of cow and goat lining leathers possessed the recovery values of 98% and 97% respectively with marginal difference of value on extension characters.

CONCLUSION

The stretch and recovery test methods were conducted on Leather with elastane material and cow leather in order to learn and understand the fundamental characters of these materials. The material leather with elastane combined with different animal origins and cow softy leather with these animal origins assessed scientifically and the correlation analyses have been attempted to arrive at the material best suited for footwear applications.

From the experimental studies, The Leather with elastane possessed a greater degree of stretch property due to its visco-elastic nature and also recovered/regained completely to the original shape and dimension. The appearance on the surface of the material has been found to be ineffective in the case of leather with elastane particularly at higher loads during the conventional lasting technique. The visco-elastic material loses its aesthetic appearance, physical and surface characters due to the application of higher forces from mechanical processes.

It has been revealed from the research findings that the laminated visco-elastic material possessed higher degree of stretch and recovery characters than the natural material leather. With regard to various combination of materials experimented, it has been concluded that the Leather with elastane combined with goat as well as pig lining produced good results on stretch and recovery characters due to its physical properties compatible with the properties of visco-elastic nature. It has been revealed that the lower load is applicable and ideal for Leather with elastane for footwear applications. Hence, Force lasting has been felt appropriate construction method especially for Leather with Elastane which requires lower application of load in the process of manufacturing shoes.

REFERENCES

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