Dyeing Properties of Atmospheric Pressure Plasma Treated Leathers

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1. Introduction

Plasma is called fourth state of matter, and contains ions, electrons, photons, excited atoms or molecules, radicals, and metastable atoms, neutral atoms or molecules. Plasma process makes modifications to the surface of the material without disturbing its basic properties. (Uygun et al. 2011) The aim of this study was to give a surface activation feature to the chrome tanned crust leather by plasma application and increase the dye uptake of the leather by increasing its hydrophilicity.

2. Material and Methods

The leathers were subjected to atmospheric pressure plasma with argon gas for different durations of time (0, 2.14, 4.28 and 6.42 sec/cm^2) duration of plasma under constant power and gas flow. Following the plasma process, the leathers were subjected to a dyeing process with acid dye (Acid Black 210), and 1:1 metal complex dye (Acid Black 172). At the end of the dyeing process, the dye consumption (Shimadzu UV–Visible 1601 spectrophotometer), dyeing fastness (Konica Minolta CM-508D,8mm Diameter) and hydrophilicity (IUP/420) of the leathers were given.

3. Results

In leathers dyed with both metal complex dye and acid dye, the best concentration values (14 ppm and 33 ppm respectively) were obtained with 6.42 sec/cm^2 plasma. The decrease in the leathers' water droplet absorption time with an increase in the plasma period applied to the leathers shows that the hydrophilicity of the leathers improved. the negative L value (lightness) of leathers show that Darkness increased and the a value of the leathers increased (the redness of leather) parallel to increased plasma treatment duration in plasma treated leathers dyed with both metal complex and acid dyestuff. However the positive b value of leathers with acid dye was decreased (yellowness); the negative b values of leathers with metal complex dyestuff was decreased (blueness)

4. Conclusion

Based on these results, plasma technology not only gives functional properties to leather, but also presents alternative possibilities for the leather production process. if the system is designed appropriately for leather processing and surface applications, the sector can fulfill the expectations of better dyeing properties and environmentally friendly leather processing.

5. References

Uygun, A., Oksuz, L., Yavuz, A. G. and Gulec, A., 2011, Characteristics of Nanocomposite Films Deposited by Atmospheric Pressure Uniform RF Glow Plasma, Current Applied Physics, 11, 250-254.

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