

폴리프로필렌 직물의 젖음성에 관한 연구

권영아

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The Effect of Oxygen Low Temperature Plasma Treatment on the Wettability of Polypropylene Fabrics

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1. Introduction

Improved wettability and dyeability of Polypropylene(PP) fabrics were obtained using glow discharge plasma by grafting nitrogen-containing active groups on the surface. Few studies of glow discharge plasma on PP fabrics exist. The objective of this study was to give a fabric a good affinity for water.

2. Experiments

Oxygen plasma was treated to PP fabrics in a commercial glow discharge reactor using different RF power, discharge pressure, and reaction time. ESCA was used to determine the ratio of carbon to oxygen at the fiber surface. Contact angle measurement was used to obtain information on the surface energy of the treated fiber surface. The effect of oxygen plasma treatment on the spontaneous water uptake of fabrics was determined by the demand wettability test. To determine the effect of aging on the surface properties of the plasma, all the above measurements of treated samples were carried out after 1, 7, 30, 60, and 150 days.

3. Results and Discussions

The fiber surfaces treated in the oxygen plasma system have a chemical composition that consisted of various oxygen containing polar groups. ESCA of the O1s line before and after plasma treatment suggests that the O1s line moves to a higher energy, possibly due to the formation of new surface species. Consequently, the contact angles of the plasma-treated PP fibers decreased, which affected the fabric wettability. Surface roughness of the PP fiber appears in the SEM photomicrographs. These result from micro etchings on the fiber surface. Surface roughness of the treated PP fiber might affect the fabric wettability as well. Long-term stability of polar groups was important for creating durable water wetting. Wettability decreased and leveled off with aging because the fiber is depolarized with time, and the polar groups stay without reversible reaction.

4. Conclusion

The oxygen plasma treatment is a simple and effective method to increase the initial water uptake rate of PP fabrics. The PP fiber surface chemical composition affects fiber surface wettability because it determines the surface bonding forces with water.

5. Reference

- T. Yasuda, M. Gazicki, and H. Yasuda, "Effects of Glow Discharge on Fibers and Fabrics", *Journal of Applied Polymer science: Applied Polymer symposium* 38, 201 (1984).
- D. T. Clark, Dilks, A. and Shuttleworth, D., "The Application of Plasmas to the Synthesis and Surface Modification of Polymers", Chapter 9, University of Durham (1987).
- P. P. Tsai, L.C. Wadsworth, and J. R. Roth, "Surface Modification of fabric Using a One-Atmosphere Glow Discharge _Plasma to Improve fabric Wettability", *Text. Res. J.* 67(5), 359 (1997).
- A. M. Sarmadi, T. H. Ying, and F. Denes, "Surface Modification of Polypropylene Fabrics by Acrylonitrile Cold Plasma", *Text. Res. J.* 63(12), 697 (1993).
- B. Miller and R. A. Young, *Text. Res. J.*, 45, 359 (1975).
- B. Miller and I. Tyomkin, *Text. Res. J.*, 54, 702 (1984).