

Enzymatic Treatment on PLA Fabrics

Sohee Lee, and Whasoon Song

Department of Clothing and Textiles, Sookmyung Women's University
52 Hyochangwon-gil, Yongsan-gu, Daegu, 140-742, Korea
E-mail: doccubi@sm.ac.kr

1. INTRODUCTION

According as enlargement of consumer's interest on the ecology or biotechnology fibers is getting attention on the field of textile industry. Polylactic acid (PLA) fibers which has similar with young's module, glass transition temperature, or density of Polyethyleneterephthalate (PET) fibers are focused on to alternate with PET fibers in the garment industry[1-3].

To apply and expand the usage of PLA fibers to garments materials, some manufacturing process are required between the procedure of manufacturing and finishing. However, PLA fibers have been treated by PET processing method until the presents also there is no study of PLA finishing.

Therefore, to obtain higher value-added PLA fiber's competitiveness comparing PET fibers, the proper procedure of the bio-refinery processing of own PLA. For these, we compared the effects of PET and PLA fabrics treated with same processing from desizing to finishing step by step.

2. EXPERIMENTAL

One hundred percent PLA and PET fabrics with 75 denier and 72 filaments of PLA and PET yarn was used for the experiments. As a enzyme, a lipase from *Candida cylindracea* was used. All PLA and PET fabrics desized with four different desizing method and selected proper method based on the weight loss and tensile strength. Enzymatic treatment of PLA fabrics was carried out in shaking water bath (BS-21, Jeio Tech., Korea) depending on enzyme concentration and treatment time at optimum pH and temperature condition.

3. RESULTS AND DISCUSSION

The results of desizing, PLA fabrics had 6.099%, 2.308% of weight loss treated with hydrogen peroxide and Triton X-100, and there were observed the loss of tensile strength. However, there is

0.522% of weight loss when treated with hot water at 80°C. Also, we confirmed that sizing agent was almost removed with hot water. With the alkali treatment, PLA fabrics were degraded with alkali treatment conditions of PET fabrics. At the pH of 8.0, and the temperature of 37°C, PLA fabrics showed the highest weight loss with the lipase concentration of 1000U, and a treatment time of 30 minutes. However, the weight loss has approximately 1.0%.

4. CONCLUSIONS

In this study, we investigated the proper desizing method and enzymatic treatment conditions of PLA fabrics with lipase from *Candida cylindracea*. The results are as follows.

1. PLA fabrics desized with hot water at a temperature of 80°C in 30 minutes. The weight loss is about 0.522%, and there was no loss of tensile strength.
2. PLA fabrics was hydrolyzed at a pH of 8.0, a temperature of 37°C, a lipase concentration of 1000U, and a treatment time of 30 minutes.

5. ACKNOWLEDGEMENT

This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MEST) (2009-0066952).

6. REFERENCES

- [1] S. H. Lee , W. S. Song; "Enzymatic Hydrolysis of PLA Fibers", *The Korean Society of Clothing and Textiles*, 2009
- [2] G. M. Guebitz, A. Cavaco-Paulo; "Enzymes go big: Surface hydrolysis and functionalisation of synthetic polymers", *Trends in Biotechnology*, 26(1), 2007.
- [3] R. E. Drumright, P. R. Gruber, D. E. Henton; "Polylactic acid Technology", *Advanced Materials*, 23(12), 2000.