Bio-modification of Polyester Fabrics Using Lipolytic Enzymes

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1. INTRODUCTION

The enzymes that could potentially be applied to the bio-modification of polyester are the lipolytic enzymes such as lipase, cutinase etc. The lipolytic enzymes are an enzyme to hydrolyze the ester bond of the polymer as serin hydrolase that includes commonly serin amino acid in the active sites of enzyme. Cutinase is the enzyme that is structurally excellent in substrate specificity of hydrolysis on bio-polyester, cutin, and expected to be possible in selectively modification the surface of polyester without strength deterioration.

In this study, surface modification of the hydrophobic polyester fabrics has been performed by novel cutinases obtained from new microorganism to improve wettability. Each enzymatic treatment effects on polyester fabrics were investigated by evaluating the effects of lipolytic enzymes on hydrolytic activity, moisture regain, wettability and tensile strength.

2. EXPERIMENTAL

2.1 Specimens

100% polyester(75D/36f x 75/72f, 187g/yd) has been scoured at 95℃ for 30 minutes.

2.2 Enzymes

Novel cutinase(EST1) obtained from new microorganism was used for this study.

2.3 Enzymatic treatment

All enzymatic treatments on PET fabrics were performed in phosphate buffer solution, depending on pH, temperature, enzyme concentration, and treatment time. Samples of PET fabrics were treated at 150rpm using shaking incubator (JSSI-300C, JS Research inc.). Finally, samples are thoroughly washed with water and dried at room temperature.

2.4 Moisture regain and wettability

Moisture regain was evaluated according to ASTM D2654 and Wettability was evaluated according to AATCC test method 79-1992.

2.5 Characteristics of enzymes-treated PET

Surface modification of enzymes-treated PET fabrics was analyzed using SEM(JSM 6380LV, Jeol). Tensile strength was determined by the strip method according to KS K 0520.

3. RESULTS

Fig.1 shows the effect of treatment time on moisture regain and wettability of enzymes-treated PET fabrics. The moisture regain of PET fabrics increased with increasing treatment time up to 9 hours. Increasing treatment time has increased water absorbency.

Fig.2 shows the image of wetting effect on the PET fabrics treated by EST1. Water absorption of enzyme-treated the PET fabrics was much faster than untreated fabrics. The wetting and absorbing properties were improved by lipolytic Enzymes as well as surface hydrophilicity.

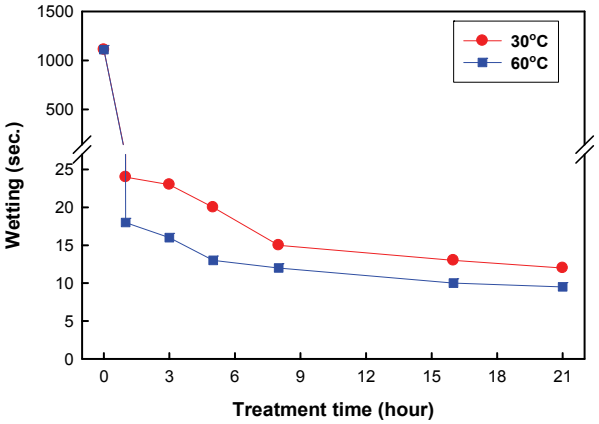
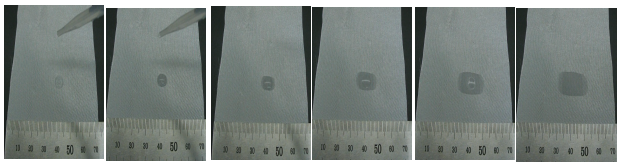


Fig.1. Effect of treatment time on moisture regain and wettability of EST1-treated PET fabrics.

EST1 treated polyester(60℃) (sec.)



0.1 2.1 5.0 7.2 8.7 9.3

Fig. 2. Image of wetting effect on the polyester fabrics untreated and treated by EST1.

4. DISCUSSION

In this study, surface modification of the hydrophobic polyester fabrics was performed by novel lipolytic enzyme(EST1) treatment to improve wettability and moisture regain. The wettability and moisture regain of PET fabrics were greatly improved by enzymatic treatment using novel lipolytic enzyme (EST1). In this regard, the PET surface was assumed to be modified by lipolytic enzymes.

5. REFERENCES

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