

ABSTRACT – *Enzymatic treatment of polyester for improving recyclability and hydrophilicity*

Irina Singer¹

¹ Niederrhein University of Applied Sciences, Mönchengladbach, Germany, e-mail: Irina.singer@hs-niederrhein.de

Abstract: Besides all its benefits, the textile industry is also responsible for a large proportion of environmental pollution. Textile finishing in particular plays a major role due to the high consumption of water, chemicals and energy [1]. A large quantity of chemicals is also used in the finishing of polyester. But the alternative use of enzymes can also improve its properties. Additionally, biodegradation of the synthetic polymer is possible and thus offers a more sustainable alternative to conventional methods [2]. The development of 2nd generation polyesters enables a more efficient cleavage of ester bonds [3].

During this talk, the optimal conditions for the enzymatic treatment of polyester fibres and textiles are presented. Also, the interdependence between biochemical reaction parameters and the degree of crystallization of the fibre are explained. A change in the surface roughness was observed after an enzymatic treatment. The degree of crystallization of the fibre, which is related to the stretching of the yarn, played a major role here. A commercially available enzyme was able to degrade a non-stretched polyester fibre within seven days, whereas new generation enzymes were able to achieve the same in the course of 24 hours. Utilizing same enzymes, a surface modification of stretched and non-stretched yarn could be accomplished. In conclusion, new, more efficient enzymes have been developed, which are opening up new possibilities for polyester recycling.

Keywords: enzymatic treatment, polyester, biotechnology.

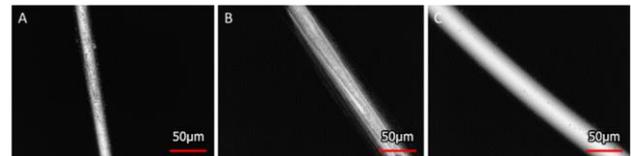


Figure 1 : changed surface structure of a stretched yarn (A) and a non-stretched polyester yarn (B) after enzymatic treatment, compared to control sample (C) without enzymatic treatment

REFERENCES

- [1] Slater, K.: *Environmental impact of textiles . Production, processes and protection*. UK, 2003
- [2] Kumar et al.: Application of enzymes for an eco-friendly approach to textile processing, in *Environmental Science and Pollution Research*, 2021
- [3] Welzel, K.: Influence of the chemical structure on the enzymatic hydrolysis of polyester nanoparticles [Original title: Einfluss der chemischen Struktur auf die enzymatische Hydrolyse von Polyester-Nanopartikeln]. Braunschweig, 2003.