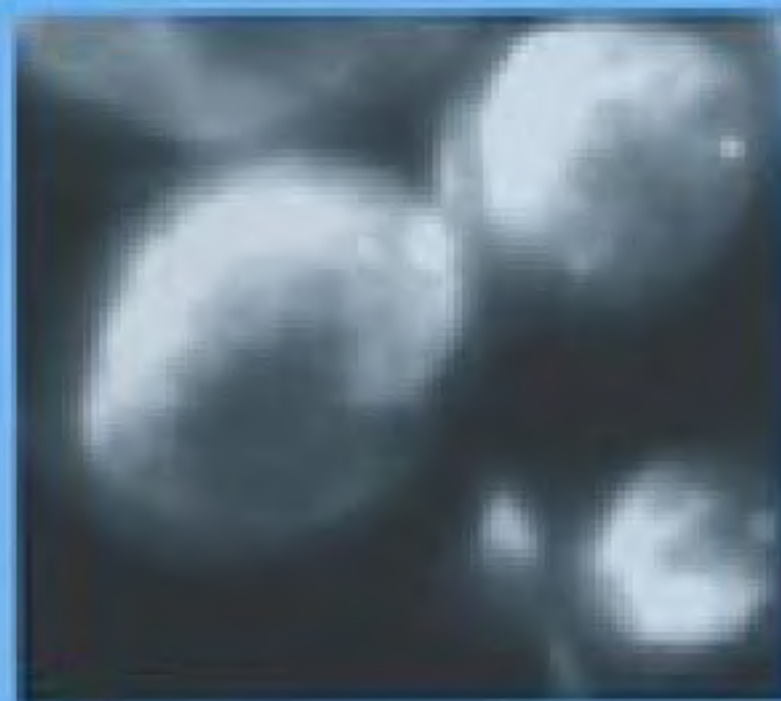


# Textile processing with enzymes



Edited by  
**A. Cavaco-Paulo**  
and **G. M. Gübitz**



The Textile Institute

**WP**

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## Preface

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and

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The first use of enzymes in textile processing was reported in 1857 when starch-sized cloth was soaked with liquor containing barley. Later, in 1900, this process was slightly improved using malt extract, but only in 1912 with the use of animal and bacterial amylases was the process of enzymatic desizing introduced into many textile factories. Interestingly, amylases remained the only enzymes applied in textile wet processing for almost 70 years. In the late 1980s, cellulases were introduced with great success for depilling and defuzzing cellulose-based fabrics as well as to age garments made from materials like denim to obtain the stone-washed look. Since the early 1990s, catalases have been introduced to destroy hydrogen peroxide after bleaching, reducing the consumption of water. Pectin degrading enzyme products have been commercialised for cotton processing to replace traditional alkaline scouring. Intense investigations are being conducted on new enzyme applications for almost all cotton processing steps and for modification of cellulosic, proteic and synthetic fibres. Textile processing with enzymes is therefore a new emerging and multidisciplinary area. Engineers with knowledge and basic understanding in both textile technology and enzymology will help to introduce these environmentally-friendly processes more extensively to the industry. However, only little information about enzymes for textile processing can be found in educational programmes or in the literature.

This book was put together to generate a basic understanding of enzymes, textile materials and process engineering. It can serve as a textbook for everyone interested in the subject; students, scientists and engineers alike with a basic background in either textiles, biotechnology, chemistry or engineering. The book covers all relevant aspects of textile processing with enzymes, from the chemical constitution and properties of textile materials as potential substrates for enzymes, to processing of these materials, and

from basic biochemistry and enzymology to industrial application of these biocatalysts.

Chapter 1 deals with the fundamental aspects of enzymes determining catalytic properties. It is intended to provide a basis for the understanding of many aspects related to the application of enzymes considered in subsequent chapters. Chapter 2 gives an overview of non-fibrous and fibrous materials as substrates for enzymes. Included is a discussion on dyes, sizes, textile fibres and textile auxiliaries that might influence enzymatic reactions. Chapter 3, about catalysis and processing, gives an overview about the function and application of enzymes used in textile processing. Basic thermodynamics and enzyme kinetics, function of textile-processing enzymes, homogenous and heterogeneous catalysis and important applications of enzymes in textile wet processing are addressed. Chapter 4 gives insights into process engineering and describes major problems in the industrial applications of enzymes in textiles. Important facts about the influence of mass transfer are described. Chapter 5 discusses practical aspects of handling enzymes, like enzyme activity. Operational and storage stabilities are discussed in detail as well as health and safety issues. The last chapter, Chapter 6, deals with effluent treatment and the potential use of enzymes therein.

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