



Progress in biotechnological modification and functionalization of bast fibers for advanced applications

V.A. Nierstrasz*, L. Van Langenhove and P. Kiekens

*Department of Textiles, Ghent University, Technologiepark 907,
9052 Zwijnaarde (Ghent), Belgium.*

Paper presented at: NATO workshop "Textile Composites" May 18-21, 2009 in Kiev, Ukraine.

Abstract

The paper discusses the recent progress and new developments in enzymatic modification of bast fibers for advanced applications such as composites. In this paper the focus is on, pectinases, laccases and xyloglucan endo-transglycosylases for the modification and functionalization of bast fibers in order to demonstrate the potential of enzyme technology and natural fibers in this area. Research on the enzymatic modification of bast fibers for advanced applications contributes to bio-based economy through the development of novel processes for specific properties and through the development of enzyme technology.

Key words: *Natural fibers, Flax, Cellulose, Lignin, Pectate lyase, Laccase, Xyloglucan, Xyloglucan endo-transglycosylase*

1. Introduction

Natural fiber reinforced composites with applications in vehicles are gaining importance. Existing applications range from door-panels, car roofs, and spare-wheel covers to noise absorbing panels. Today the scientific focus is on the development of constructive parts; even the application of natural fibers as reinforcement in composites for bike frames is currently explored.

Natural fibers such as flax and hemp offer excellent opportunities as reinforcement materials in composites with good mechanical properties i.e. their

low density, high tensile strength and Young's modulus. The adhesion of the reinforcing fiber and the matrix as well as moisture adsorption play an important role in the overall performance of the composite. There has been quite some progress in the improvement of adhesion via surface modification of flax fibers using e.g. propyltrimethoxysilanes, phenyliso-cyanates or maleic acid anhydrides (Van de Velde and Kiekens, 2001, 2002; 2003a; 2003b; Van de Weyenberg, 2005; Panaitescu *et al.*, 2008).

Modern biotechnology will drive the renaissance of bast fibers (flax, hemp, nettle) in Europe. The application of bast fibers in composites helps to reduce the ecological