UNIVERSITEIT
GENT

TRICEL 97

PROGRAM SCHEDULE and LECTURE / POSTER ABSTRACTS

CARBOHYDRASES from TRICHODERMA REESEI and other MICROORGANISMS

STRUCTURES/BIOCHEMISTRY GENETICS/APPLICATIONS

GHENT-BELGIUM, AUGUST 28-30, 1997

PRELIMINARY STUDIES ON ENZYMATIC APPLICATIONS IN THE PAPER INDUSTRY

Pala, H.; Gama, F.M.; Trancoso, D.*; Amaral-Collaço, M.T.; Marques, S.**; Gírio, F.M.**; Mota, M.**

Dept. Engenharia Biológica, Universidade do Minho, Campus de Gualtar, 4709 Braga Codex, Portugal

** Portucel Viana, Lugar de Gandra, 4905 Deocriste*

*** Unidade de Microbiologia Industrial-Bioprocessos, Dep. Biotecnologia, INETI, 1699 Lisboa Codex, Portugal*

The research on new treatment technologies to improve recycled pulp quality became one of the most important scientific challenges on the paper industry. One of the problems in producing good quality recycled paper is related to the loss of the pulp ability to release water. Several reports can be found in the literature which show that enzymatic treatment induce an improvement on drainability properties of pulps [1], [2]. Our goal is to study the underlying mechanism of this phenomena, and the present work shows preliminary results.

As Table 1 indicates, several enzymes have been tested. A wastepaper pulp at 3% consistency was treated for 30 min at pH 5 and 50ºC. After incubation, enzyme activity was destroyed by increasing pH to alkaline values (8-10) and by boiling the pulp for 5 minutes. At the same time a blank and a control were made so that any modification caused by enzymatic action on pulp properties could be conveniently evaluated.

Table 1: Enzymatic action on drainability and mechanical properties of pulp and paper

		ENZYMATIC ACTIVITY		PHYSICAL PROPERTIES OF PULP AND PAPER			
	Enzyme	**FPase (FPU/ g o.d. pulp)**	**Xylanase (U/ g o.d. pulp)**	**Drainability (ºS)**	**Burst Index ($KPa.m^2/g$)**	**Tensile Index (N.m/g)**	**Tear Index ($mN.m^2/g$)**
	Blank	–	–	20,0	2,24	35,9	18,7
	Control	–	–	23,0	3,36	48,8	15,2
(A)	*Celluclast*	4,4	34,5	15,5	3,00	44,7	12,3
(B)	*Ecostone L*	3,8	200	16,5	2,90	43,6	11.6
(C)	*Viscosyme*	0,9	53	19,0	3,13	46,5	13,4
	Blank	–	–	43,5	2,44	39,8	11,4
	Control	–	–	63,0	3,10	47,5	10,9
(D)	*Xylanase C482*	0,4	120	55,0	3,12	48,1	11,2

(A), (C) Commercial preparations by Novo Nordisk (Denmark); (B) Commercial preparation by Alko Ltd. Biotechnology (Finland); (D) This enzymatic preparation was produced by INETI (Portugal)

The most effective improvement in dewatering properties, expressed as reduction in ºS, was obtained by treatment with preparations (A) and (B), which correspond to a blend of cellulases and xylanases. Preparation (D), a strict xylanase, showed no benefit to the drainage rate of the pulps. As previously reported by Stork *et al.* [3], these results reveal that cellulase activity is critical to the enhancement of this property.

The main challenge in using enzymes to treat secondary fiber is to increase the pulp drainage rates without reducing the paper mechanical resistance. As we have shown, the enzymes can lead to some strength lost, which must be controlled (control *vs* enzymatic assay). However, the comparison between blank, control and enzymatic assay pulps' strength properties may suggest that this problem could be overcome by increasing the pH to alkaline values, after the enzymatic treatment, or by simply operating the enzyme at a different pH.

[1] Pommier, J. C., Fuentes, J. L. and Goma, G., *Tappi J.*, 72 (6): 187 (1989)
[2] Pommier, J. C., Goma, G., Fuentes, J. L., *Tappi J.* 73 (12): 197 (1990)
[3] Stork, G. and Pereira, H., *Tappi J.* 78 (2): 79 (1995)