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BOOK OF ABSTRACTS

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TBT
THE WORKING PARTY ON
TEXTILE BIOTECHNOLOGY

UNIVERSIDADE DO MINHO

Prot7 - GENETIC ENGINEERING OF SPIDER SILK, Paul Kiekens*, Veerle van Wassenhove* and Johan Mertens**, Universiteit Gent, Belgium, *Department of Textiles, Technologiepark 9, 9052-Zwijnaarde, **Laboratory for Ecology, K.L. Ledeganckstraat 35, 9000 Gent, E-mail: paul.kiekens@rug.ac.be

Half a billion years ago, spiders ancestors emerged from the water and soon afterwards silk was developed for several purposes. One of these was to catch airborne preys in sometimes-sophisticated aerial structures. The threads of these aerial structures can be very thin and extremely strong with a remarkable elongation at break. The intriguing properties of spiders silk are worth to be studied in order to reproduce the material via biotechnology. Work is being done to characterise silk from various spiders. Data about the mechanical, structural and physico-chemical features of the protein filaments are being used to manufacture threads after the model of the spiders. For this bacteria like Escherichia coli and/or analogous organisms are considered. The ultimate goal is to copy and even outsmart nature.

Prot8 - FIBER FORMATION OF SILK, Jun Magoshi[1], Yoshiko Magoshi[2], Toshihisa Tanaka[3], Shunichi Inoue and Shigeo Nakamura[4], [1]National Institute of Agrobiological Resources, Japan Science and Technology Corporation, Tsukuba 305-8602 Japan, [2]National Institute of Sericultural and Entomological Science, Japan Science and Technology Corporation, Tsukuba 305-0851, Japan, [3]Japan Science and Technology Corporation, Tsukuba 305-8602, Japan, [4]Faculty of Engineering, Kanagawa University, Yokohama 221-0802, Japan, E-mail: jmagoshi@abr.affrc.go.jp

Silk fiber is a fine, lustrous fiber produced by the silk worm and other insect larvae. This attractive characteristic is derived from the spinning methods of silkworm. The liquid silk of the silkworm is a highly viscous aqueous solution of two proteins, fibroin and sericin. The mechanism of silk thread formation from the liquid silk is the action of shear stress and elongational stress acting on the silk fibroin, which caused the liquid silk to crystallize. Silkworms perform molecular orientation control very accuracy by methods involving numerous sophisticated spinning technologies. When the tip anterior division of the silk gland is cut and fibroin solution pulled out rapidly, the solution is converted into silk filament, but when it is pulled out slowly; it fails to assume a fibroin form. This optimum speed is the speed (50 mm/min) at which the silkworm sways its necks when spinning cocoons. When a silkworm spins cocoons, the nozzle calibre in silk press is adjusted accurately by four muscles at the spinning part in the spinneret orifice to form the filament in a triangular shape that provided the silk yarn with its unique luster (self-control spinning). It was discovered recently that the characteristics of the fibroin aqueous solution changes during conversion of fibroin into filament. The liquid silk inside the silk gland due to the change in the fibroin molecular mode loses viscosity nearer to the outlet, and the fibroin molecular mode is determined accurately according to the increase or decrease of calcium ions (gel-sol transition spinning). When the liquid fibroin with lowered viscosity passes through the very fine tube, the orientation of the fibroin molecules is arranged neatly and the fibroin concerted into a transparent nematic liquid crystal (liquid crystal spinning). Silkworms performs molecular orientation control very accurately by methods involving numerous sophisticated spinning technologies, such as gel spinning, liquid crystal spinning, self exerted (traction) spinning, zone elongation, and porous spinning, ion spinning by control of calcium ions, dry spinning, and crimp spinning.

DE1 - FUNGAL DECOLORIZATION OF TEXTILE DYES: EFFECTS OF GLUCOSE AND DYE CONCENTRATION, Huanlian Cao, Ian R. Hardin and Danny E. Akin*, The University of Georgia-Athens, Georgia, *US Department of Agriculture - ARS, Russell Research Center - Athens, Georgia, USA, E-mail: ihardin@fcs.uga.edu

Six strains of white rot fungi, i.e., Phanerochaete chrysosporium, Pleurotus ostrealus, Trametes versicolor, Phellinus, tremellia, Pycnoporus cinnabarinus, and Cyathus strecoeus, were evaluated for their efficiencies in dye decolorization. The effects of glucose concentration at 0, 5, 10 and 20 mM, and dye concentrations at 50, 100, 150, and 200 mg/l were evaluated in agar plates. Some of the fungi declorized the dyes at concentrations up to 200 mg/l in 5 days. In the absence of glucose, most of the fungi could not decolorize dyes, and only Phellinus tremellia had the ability of dye decolorization without glucose.

DE2 - BIODEGRADATION OF BIOACCESSIBLE TEXTILE AZO DYES BY *PHANEROCHAETE CHRYSOSPORIUM*, M.ª Adosinda Martins, Isabel Ferreira, Isabel Santos, M.ª João Queiroz and Nelson Lima, Instituto de Biotecnologia e Química Fina (IBQF), Universidade do Minho, 4700-320 Braga, Portugal. E-mail: mjrpq@ci.uminho.pt

Azo dyes are important chemical pollutants of industrial origin. Textile azo dyes with bioaccessible groups, such as guaiacol and 2,6-dimethoxyphenol, for lignin degrading fungi were synthesized, using different aminobenzoic and aminosulfonic acids as diazocomponents. The inocula of the better biodegradation assays were obtained from pre- growth media containing one of the synthesized dyes. The results were evaluated each 7 days, by the decrease of the absorbance at the maximum wavelength of the dye, decrease of the saccharose concentration in the culture medium and by the increase of the biomass, during the 28 days of assay. The extension of the biodegradation depends on the saccharose concentration used, on the degraded dye structure and on the dye present in the pre-growth medium.

DE3 - SYNERGISTIC EFFECT OF PYRANOSE OXIDASE AND LACCASE IN THE BIOTRANSFORMATION OF ANTHRAQUINONE DYES, [1]Maria Costa-Ferreira, [1]Philip Cunnah and [2]Paul Ander, [1]Biotechnology Dept. National Institute for Industrial Engeening and Technology-INETI, Est. Paço do Lumiar, Lisbon, Portugal, E-mail: maria.ferreira@ibqta.ineti.pt. [2]WURC Wood Ultrastructure Research Centre, Swedish Univ. Agric. Sciences, P.O. Box 7008, S-75007 Uppsala, Sweden

Purified pyranose oxidase (EC 1.1.3.10) from white rot fungi including *Trametes versicolor, Bjerkandera adusta* and *Phanerochaete chrysosporium* reduced anthraquinone dyes. Both the nature of the substituents on the parent compound as well as the source of the pyranose oxidase dictated the kinetics of the reactions. The rate and extent of biodegradation of the dyes was enhanced in the presence of optimised concentration of purified commercially available laccase (EC 1.10.3.2). The synergistic effect of these combined oxido-reductive enzymatic reactions was found to be dependent on the physico-chemical properties of the dyes (LOMO, redox potential etc). Process variables that affect the biotransformation of these dyes in simulated effluent will also be reported.