

Analysis of exposed cellulose surfaces in pretreated wood biomass by carbohydrate binding module (CBM)–cyan fluorescent protein (CFP) complexes

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In enzymatic saccharification of lignocellulosics, access of the enzymes to exposed cellulose surfaces is an initial key step to trigger the hydrolysis. However, knowledge of the structure-hydrolyzability relationship of the pretreated biomass is still limited. Carbohydrate binding modules (CBMs) are noncatalytic substrate binding domains of cellulolytic enzymes¹⁾. Here we used fluorescent labeled recombinant CBMs specific for crystalline cellulose (CBM3) and non-crystalline cellulose (CBM28) to analyze the complex surfaces of wood fibers pretreated by chemical, hydrothermal and physical methods.

Linear correlation between enzymatic saccharification ratio and the adsorption of CBM3-CFP and CBM28-CFP was observed for the chemically pretreated wood. Adsorption of CBM3-CFP and CBM28-CFP to the physically disrupted wood was much lower than that of the chemically delignified wood. Fluorescent microscopy revealed that CBM3-CFP and CBM28-CFP adsorbed preferentially on fibrillated wood tissues. This phenomenon was remarkable for CBM28-CFP. Thus the quantitative fluorometric method clarified the linear dependency of saccharification ratio on exposure of cellulose surfaces in the chemically delignified wood.

Reference

- 1) Shoseyov, O., Shani, Z., and Levy, I. (2006) Microbiology and Molecular Biology Reviews, **70**, 283–295.