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Optimisation of enzymatic detoxification of pulp liquors

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PURPOSE OF THE ABSTRACT
During cellulose extraction in the pulp and paper process only a part of the wood carbohydrates is isolated as cellulose rich fraction [1]. The remaining mono- and polysaccharides are separated with the pulp liquor (spent sulphite liquor SSL and black liquor BL). The carbohydrate content and composition of the liquor depends on the type of wood used as well as the selected process conditions during the cooking process [1,2].
A lot of research has been done on the biotechnological valorisation of the carbohydrates present in the pulp liquor. For many processes, inhibitors formed during wood cooking, limit the usability of pulp liquor [3,4]. By performing an intensive inhibitor screening in laboratory scale we identified specific phenolic compounds with carbonyl-functionality to have the most negative effect on bacterial growth. Therefore detoxification methods for phenolic compounds degradation might be a suitable method for increasing the usability of pulp liquors. Positive effects have already been reported [5,6].
Within the research project CAFB (combined agro and forest biorefinery) we analyse and optimise the detoxification of pulp liquor by means of lignin-modifying enzymes. The enzymatic degradation kinetics of aromatic compounds is determined with NMR-spectroscopy. The detoxification process will be optimised using appropriate design of experiments (DoE).
A poster presentation at ISGC would be a great possibility to present our latest results to the scientific community.

FIGURES

Run	Temperature [°C]	pH-value	Enzyme concentration [mg/mg]	Aromatic degredation [%]
1	22	3,5	0,016	11,38
2	40	3,5	0,016	-
3	22	7,5	0,016	50,46
4	40	7,5	0,016	80,85
5	22	3,5	0,2	63,73
6	40	3,5	0,2	33,65
7	22	7,5	0,2	80,39
8	40	7,5	0,2	68,9
9	31	5,5	0,101	78,9
10	31	5,5	0,101	80,55
11	31	5,5	0,101	75,9

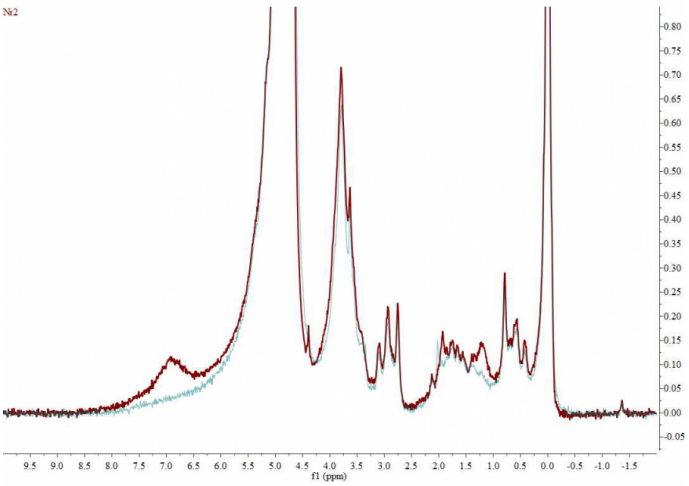

FIGURE 1
DoE Laccase results

Full factorial screening matrix

FIGURE 2
NMR-spectrum

NMR-spectrum of crude SSL (red) and detoxified SSL (blue) with the sum of aromates peak at 7 ppm

KEYWORDS
Design of experiment | Enzymatic detoxification | Phenoloxidase | pulp liquor

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