



Collaboration Arkhangelsk State Technical University & University of Oulu



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Oulu 16.4.2008

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Department of analytical and applied chemistry (prof. Bogolitsyn)



- Physical chemistry of plant polymers
 - Structure of the lignocellulosic matrix
 - Thermostability of wood polymers; thermological process development
 - Plant non-wood polymers
 - Structural and reactive properties of lignin
- Lignin behaviour in mixed solvents
 - Organosolvent stabilation of lignin
 - Properties of the polymers
 - solvation properties in mixed organic solvents
 - peculiarities of the methods
 - acceleration reaction, indirect redox ..., redox transformation

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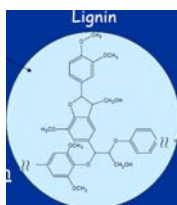


Department of analytical and applied chemistry



Joint Russian research cluster (with St. Petersburg and Moscow)

- Biological treatments
 - lignin
 - model for lignin compounds
 - Fundamental: way of oxidation, bleaching state
- Macromolecular properties of lignin under biological treatment
 - 35-40 % of lignin components desorbed
 - effluent contains molecular mass > a colloidal system -> sedimentation
 - COD index increases greatly
 - Low-molecular mass phenols, which are oxidized by microbes



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Department of analytical and applied chemistry - Cooperation



- ASTU & Pulp and Paper Industry
 - Priority in the monitoring system of the effluent
 - Transformation of chemical compounds during water treatments
 - Bleaching and cooking 15-20 years cooperation
 - Kinetic of cooking process
 - Organosolvent cooking kinetic modeling
 - Sulphur usage stopping
- Possibilities: modelling
 - ASTU: chemistry and phenomenological models → understanding
 - Oulu: data-driven intelligent models → tuning & adaptation
 - higher level of automation
 - enzymatic treatment of lignin under supercritical conditions in non-water environment

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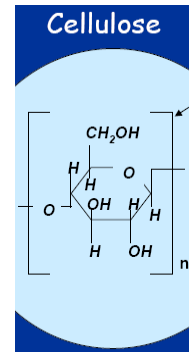




Biotechnology (prof. Novozhilov)



- Enzymatic technologies in paper & pulp industry
- Applications
 - Bioethanol
 - Treatment of effluents, wastewater
 - Food industry
 - Fermentation in waste treatment
 - Enzymatic treatments of berries
 - De-inking



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Biotechnology



- Automatic microbial detection
 - microscope + digital camera + computer + software: 300-500 samples can be treated per day
 - the system can enumerate organisms and calculate the amount of filamentous and non-filamentous microbes
 - the digital-camera-based microbial detection system looks very promising for use in projects of Oulu

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Conclusions

- Modelling: mechanistic + intelligent
 - CEL + ASTU (prof. Bogolitsyn)
& Joint Russian research cluster (with St. Petersburg and Moscow) → Eurosim
- Automatic microbial detection
 - CEL + ASTU (prof. Sokolov, prof. Novozhilov)
- Enzymes in Pulp&Paper
 - Process and Environmental Engineering + ASTU
 - ASTU - Applied Chemistry: lignin
 - ASTU - Biotechnology: enzymes
- Pyrolysis
- Biorefinery??