VUPC Bratislava, Slovak Republic
Stefan Bohacek

Europe

Slovak Republic

VUPC (PPRI) Bratislava
- Headquarter in WestEnd Gate

Second Generation Bioethanol - Advanced Biofuel

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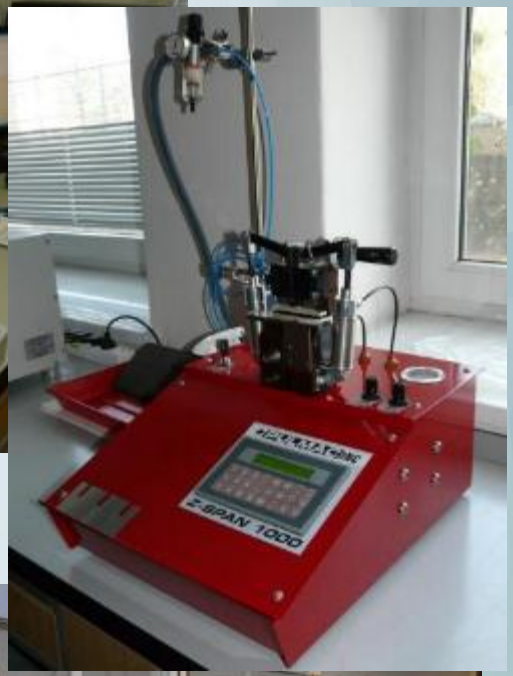
VUPC (PPRI) Bratislava - established in 1947

Main activities :

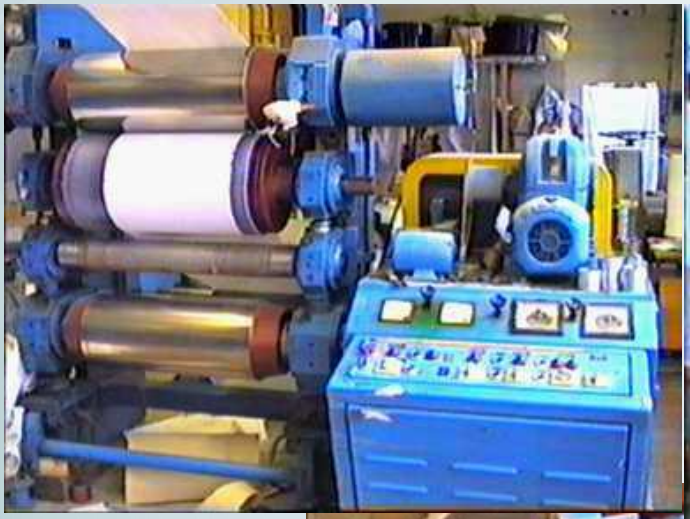
1. Research and development
2. Process simulation in laboratory scale
3. Technology testing in pilot plant scale
4. Specialty paper and board production
5. Coating and laminating
6. Pulp, paper and board quality testing
7. Technical and economical information services
8. Instrument service, development and production
9. Research activities for Bio-based Industry
10. Smart biodegradable packaging

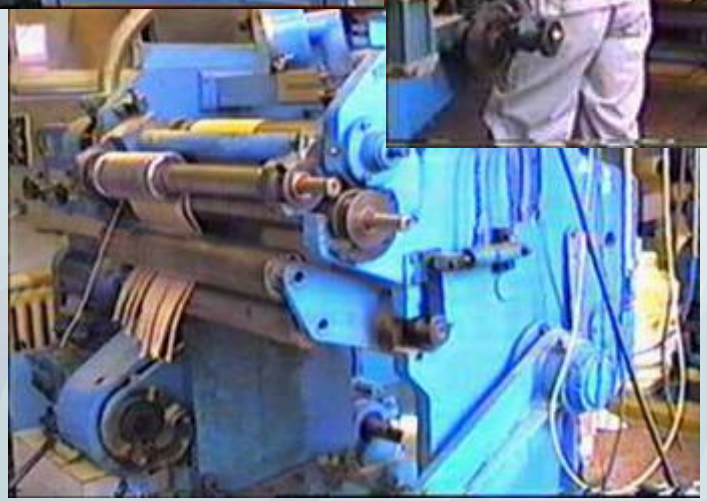
Well Equipped Laboratories



Universal Pilot Plant Paper Machine with 3 headboxes and in-line sizing press

Pilot Plant Supercalender and Pilot Plant Couting, Laminating and Roll-Slitting Machine





Research and development

activities are oriented to

- cooking technologies
- bleaching technologies
- recycling technologies
- papermaking
- surface treatment
- biofuel production technologies
- wood processing
- process & technology optimisation

More details about these activities you can find on the website **www.vupc.sk**

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- cooking technologies
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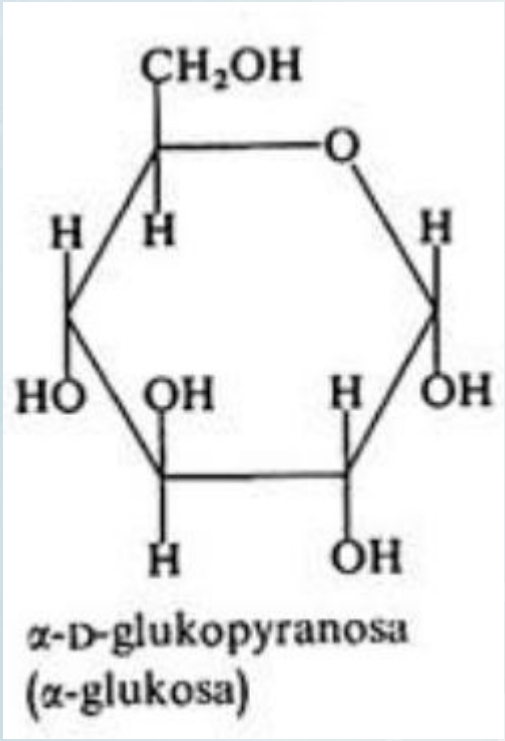
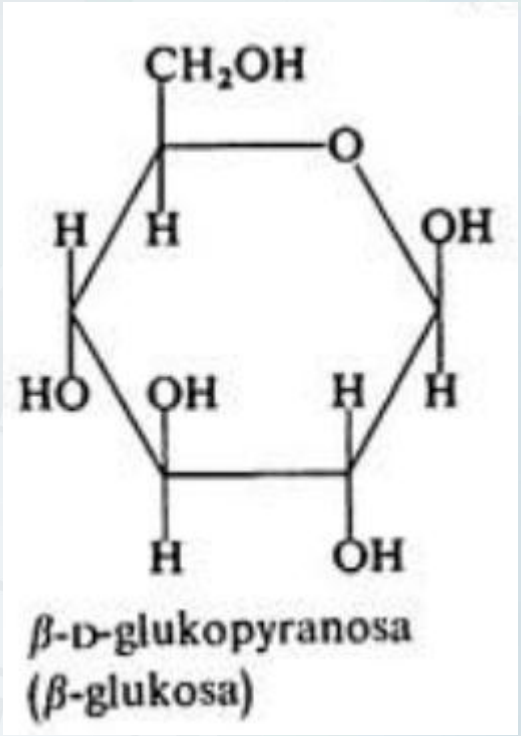
Raw Material: Fast-growing Trees - Paulownia, Softwood, Hardwood, Bamboo ...



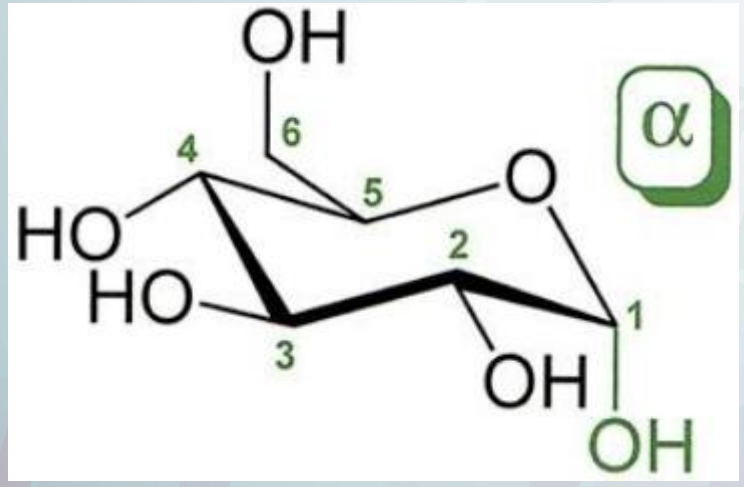


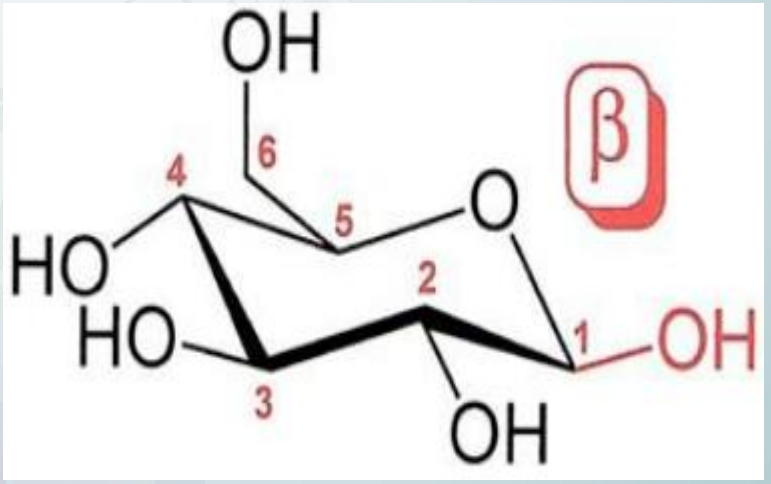
One-year Lignocellulosic Raw Materials: Sugar Cane, Hemp, Industrial Grasses, Arundo Donax...



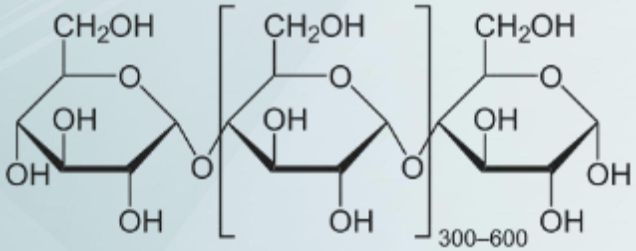


1 different chemical bond



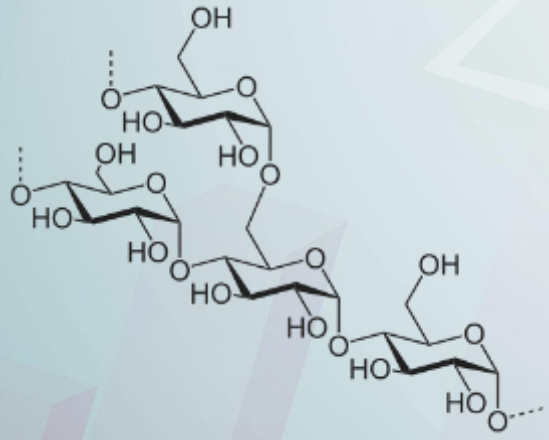


Starch vs. cellulose – molecular sight

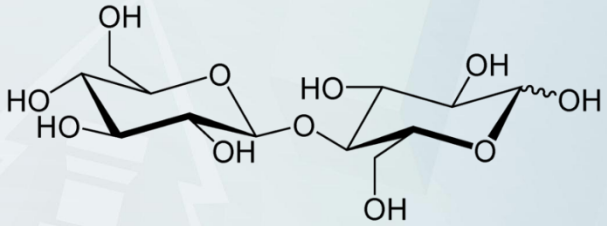


Amylose

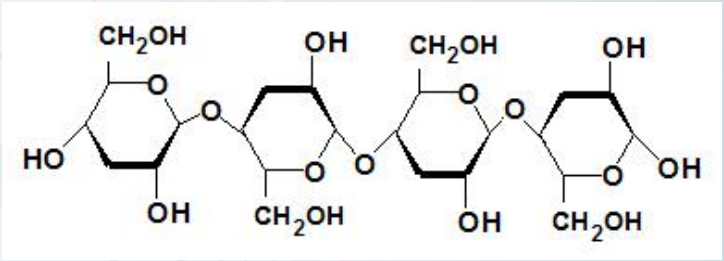
Amorphous Structure



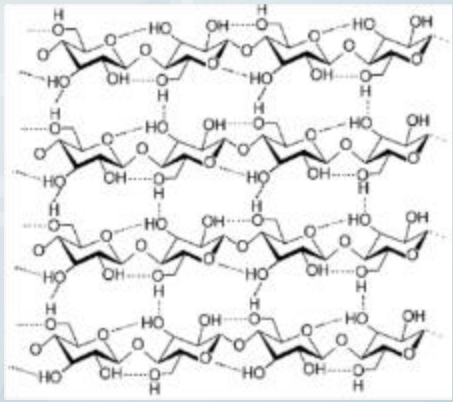
Amylopectin



Cellobiose

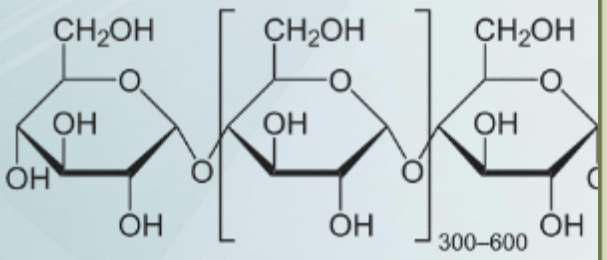


Symmetrical (Crystalline) Structure



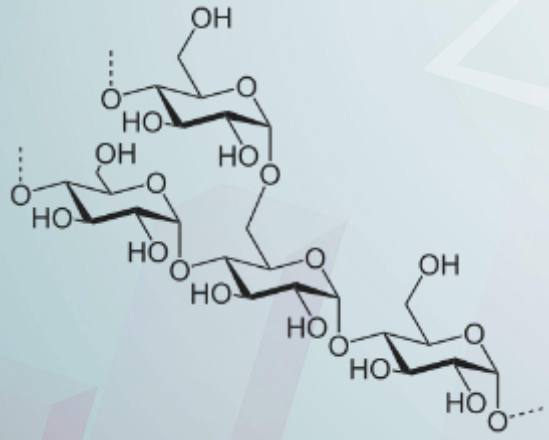
Intermolecular Hydrogen Bonds

Starch vs. c ecular sight

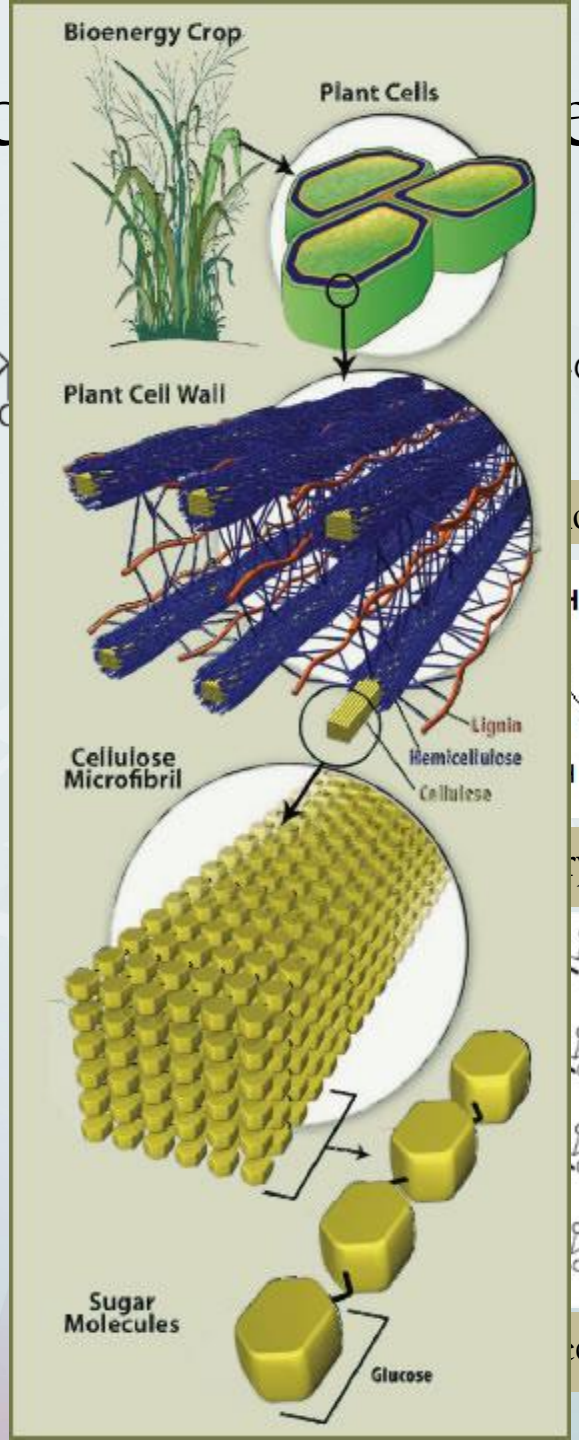


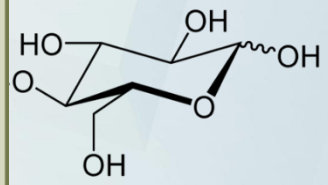
Amylose

Amorphous Structure

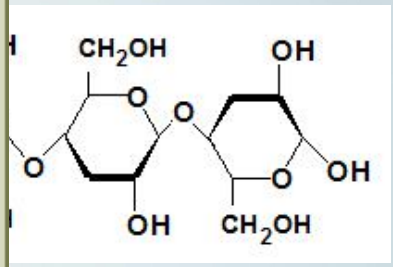


Amylopectin





obiose



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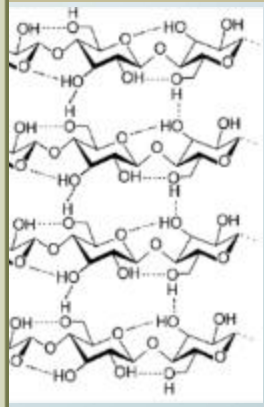


cular Hydrogen Bonds

The Main Goal is Optimisation

- of Lignocellulosic Biomass Pre-treatment
- of Hydrolysis of Lignocellulosic Biomass

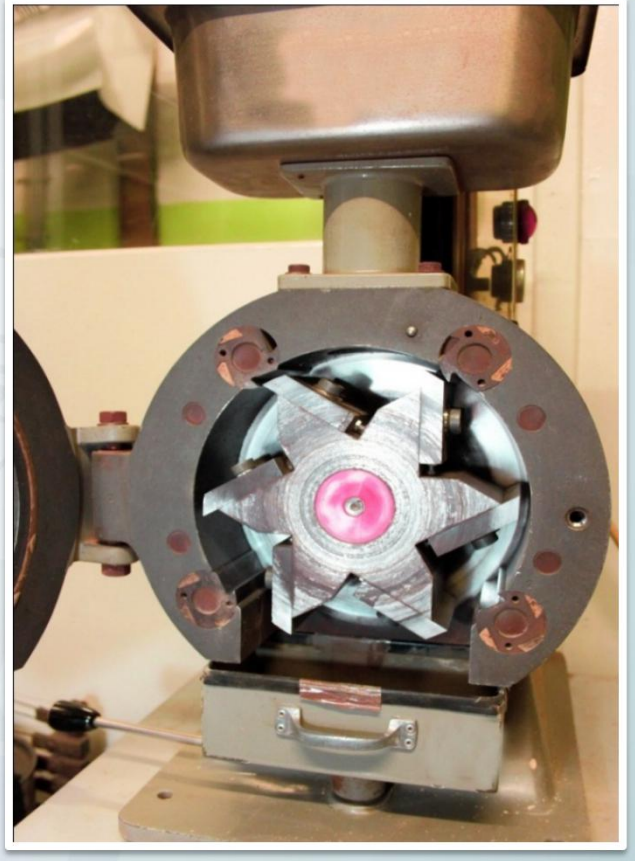
Pretreatment procedures

- Cryolysis-cyclic freezing-thawing (patent)
- Frozen mechanical pretreatment (patent)
- Dry mechanical pretreatment (milling in Brabender)
- Wet mechanical pretreatment (milling in Sprout-Valdron)
- Steam explosion
- Extrusion (continuous steam explosion)

Pre-treatment – Cryolysis – Destruction of LCRM by Rapid Deep Freezing and Thawing

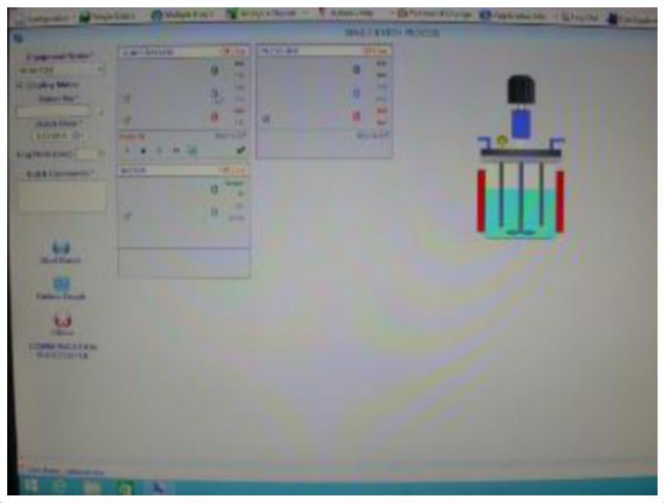
Patent application PP50076-2014 was submitted in 2014 „Increasing Accessibility of LC Materials for Hydrolytic Enzymes by Cryolysis During Biofuel Production“

Dry pretreatment of LCM in a laboratory rotary mill Brabender



Wet pretreatment of LCM with defibrator Sprout-Valdron

Reactor for Discontinuous Steam Explosion of Impregnated LCRM



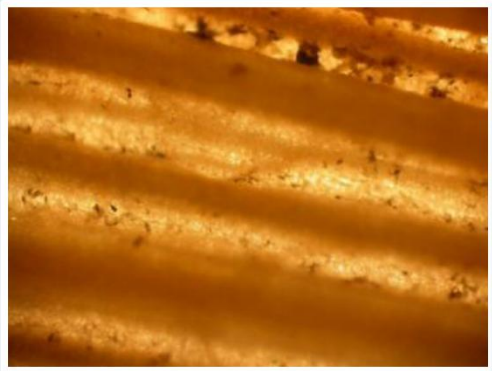
Extruder for Continuous Steam Explosion of Impregnated LCM

Comparison of enzyme accessibility of LCRM pretreated with mechanic, hydro-mechanic, thermo-hydro-mechanic procedures

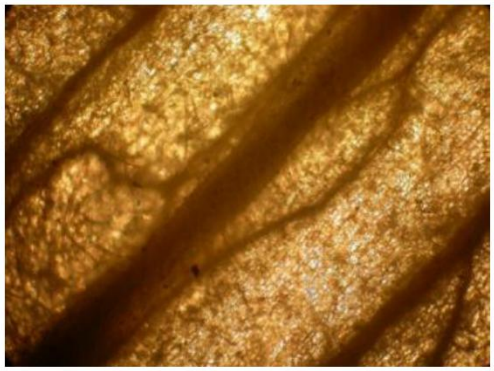
(note: dry milling B, cyclic freezing and thawing ZR, wet milling SW, extrusion SE-Ex at 145°C, steam explosion SE at 215°C)

Structural changes in LCM after pretreatment

Cyclic freezing-thawing of LCM

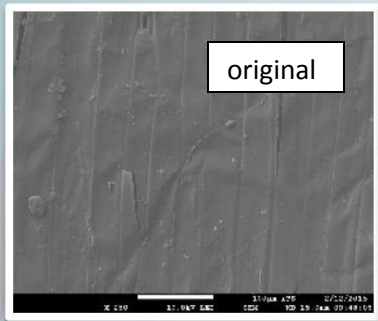


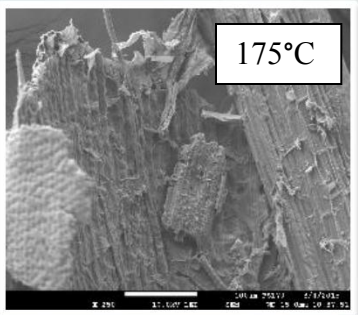
original sample

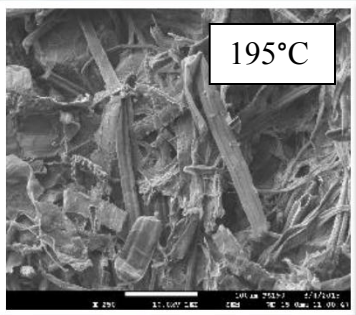


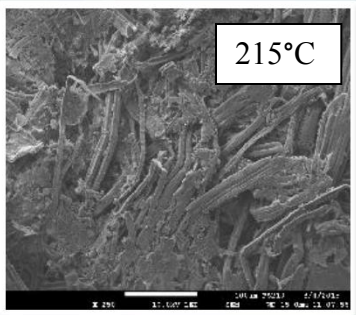
sample after freezing

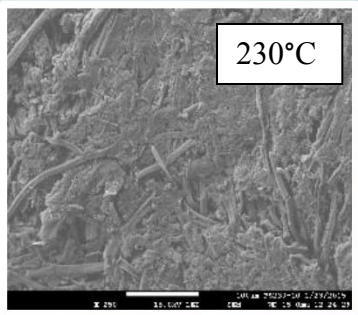
Steam explosion treatment of LCM







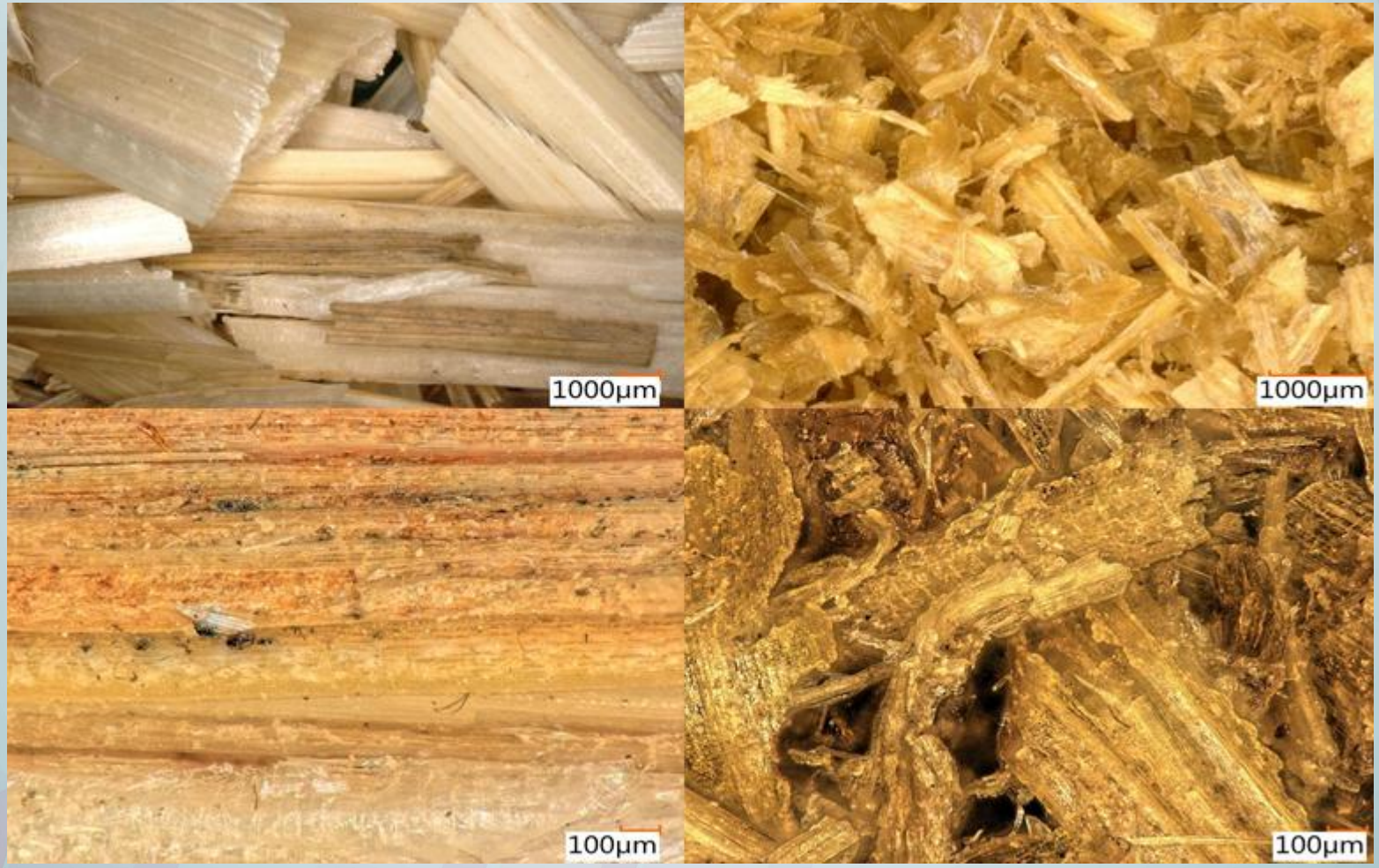




Steam explosion treatment of LCM

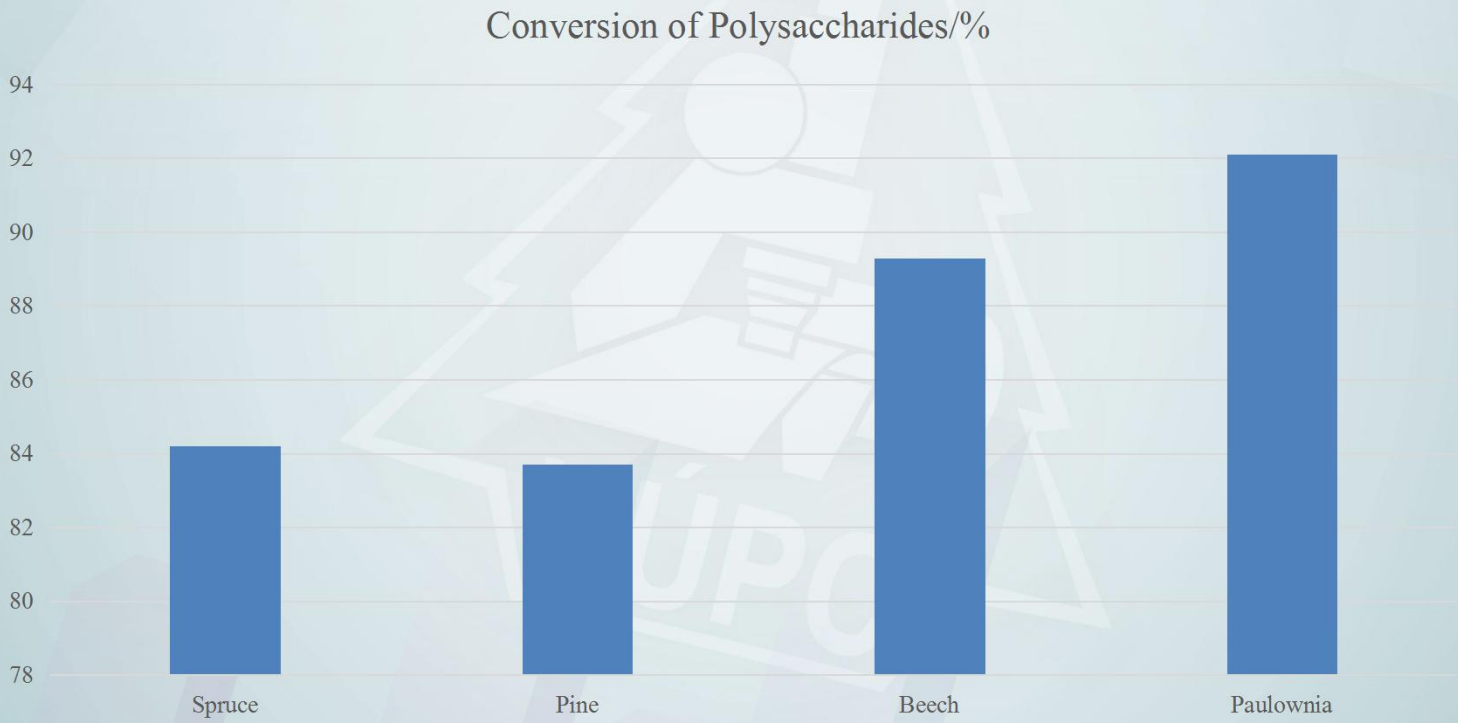
Original LCM

LCM after SE



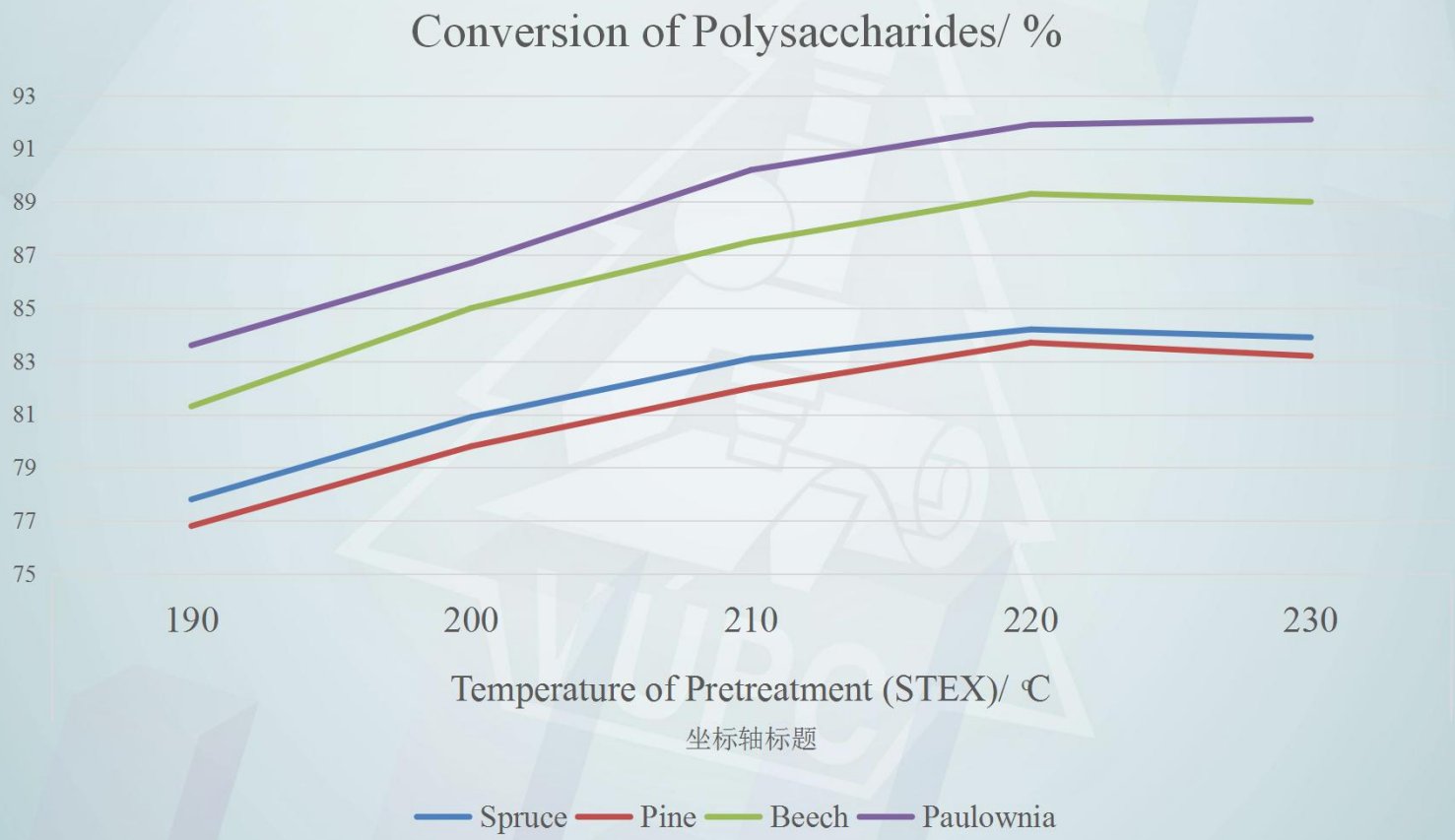
Influence of wood species on enzymatic hydrolysis efficiency of pretreated wood branches and roots

Conversion of cellulose and xylan to monosaccharides during hydrolysis of LCRM pretreated by steam explosion after mechanical pre-treatment



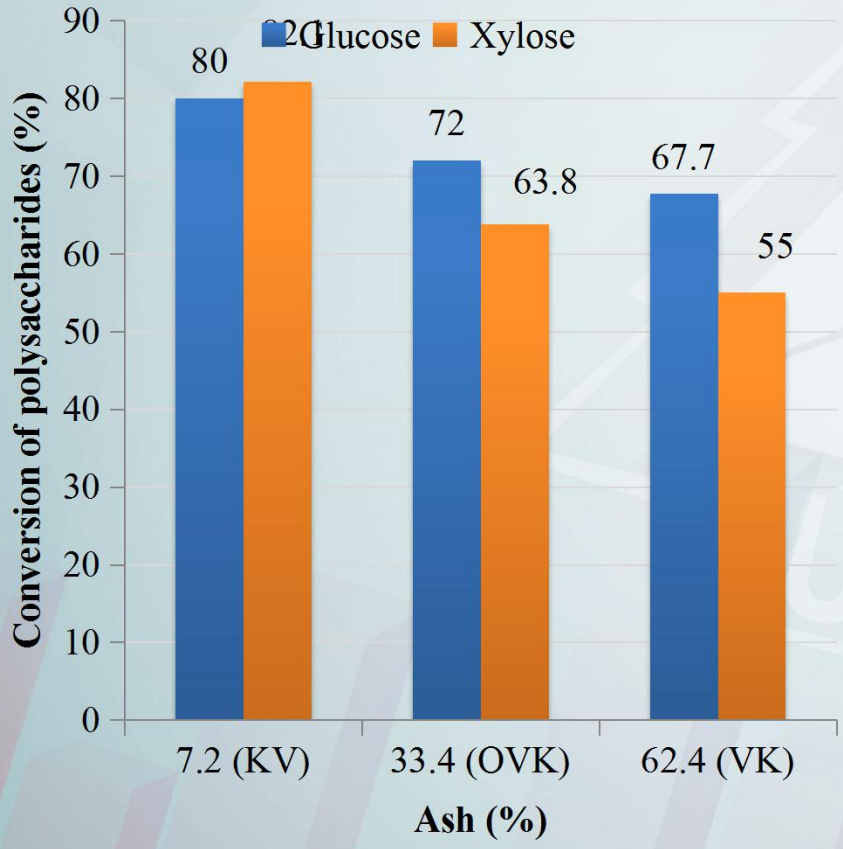
Branches and Roots of Trees (Forest Waste)

Influence of steam explosion temperature on enzymatic hydrolysis efficiency of pretreated wood branches and roots

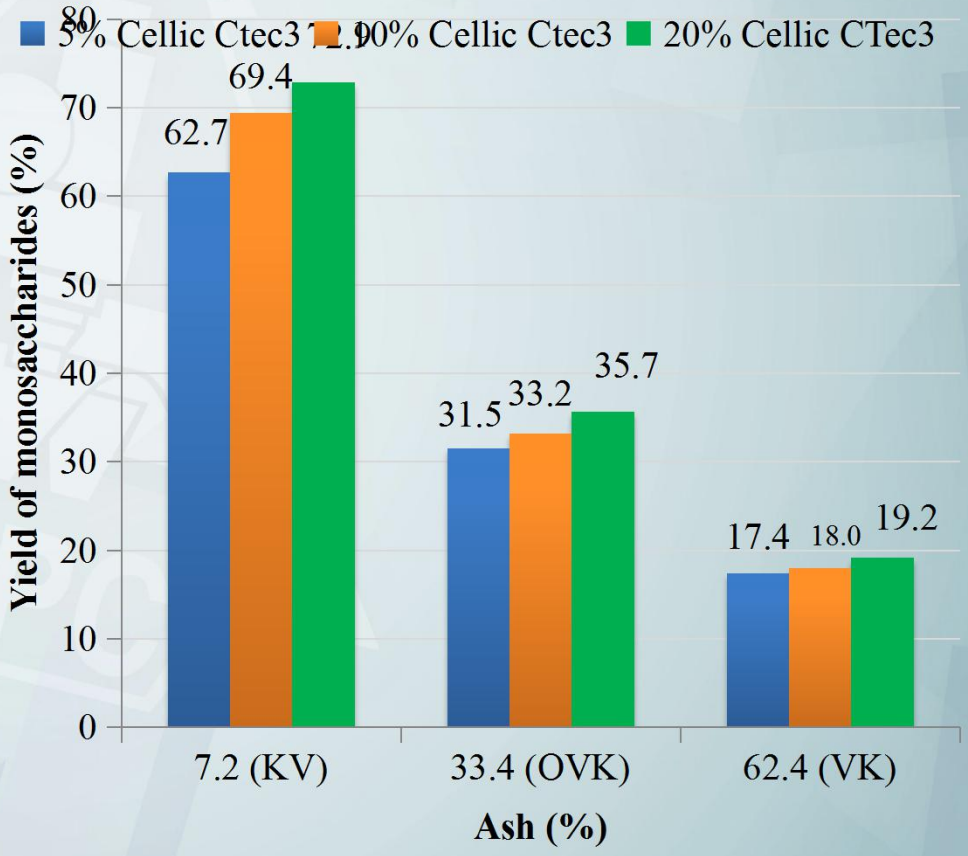


Enzymatic hydrolysis of short fibers from recycled paper tretament(VK) after de-ashing (OVK) and short fibers from pulp treatment (KV)

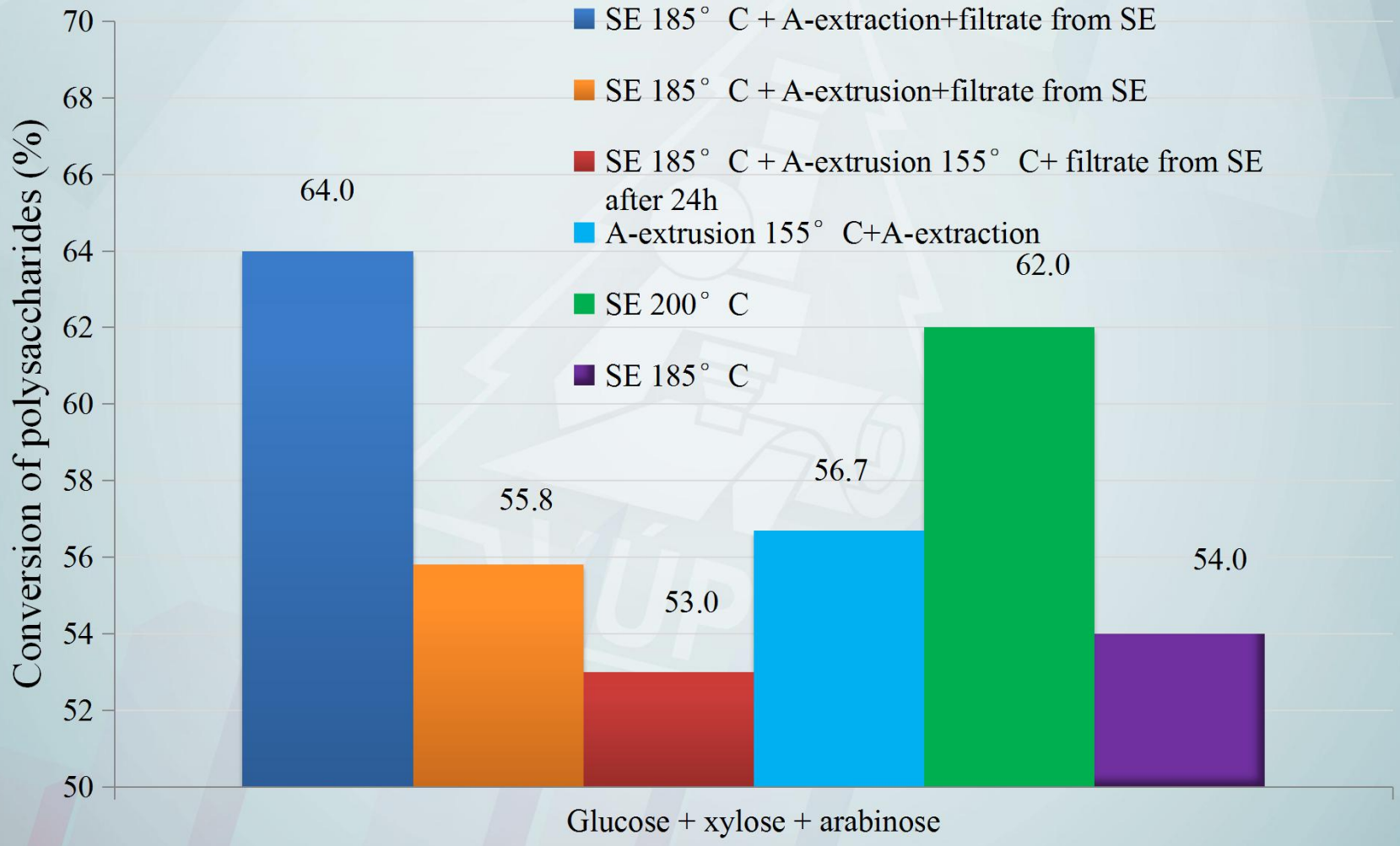
Conversion of polysaccharides



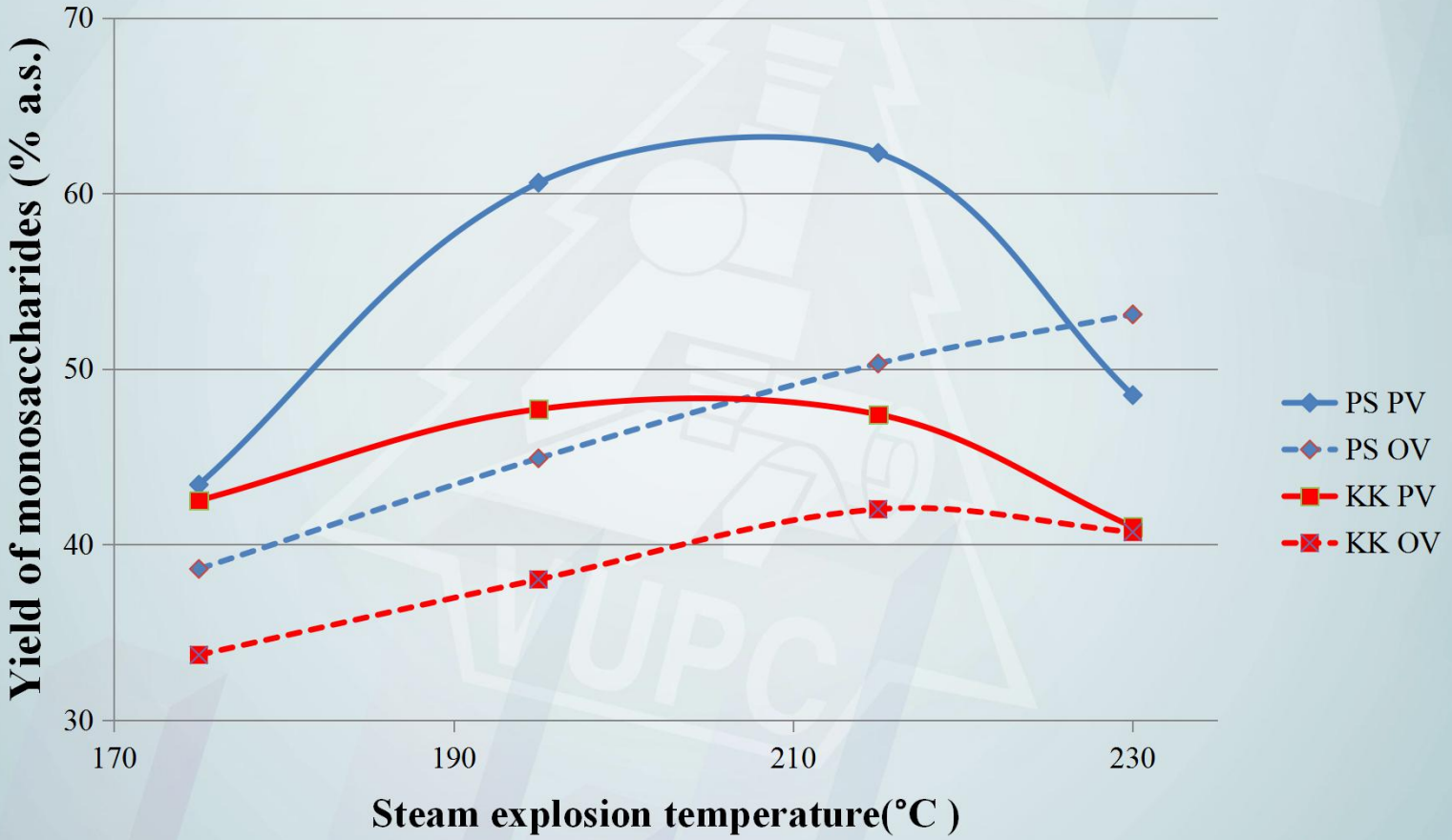
Yield of monosaccharides



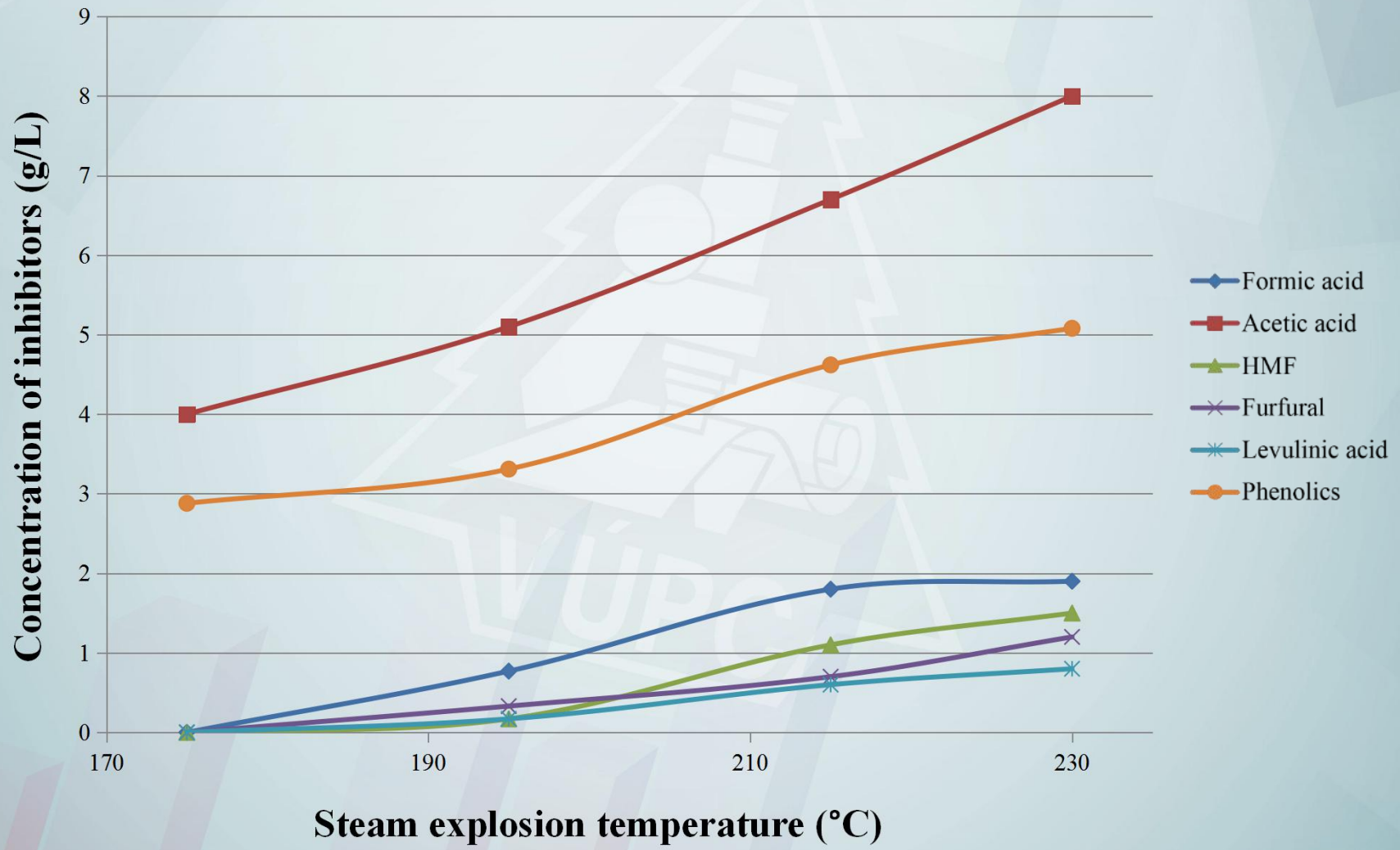
Comparison of conversion of polysaccharides from wheat straw pretreated with various procedures



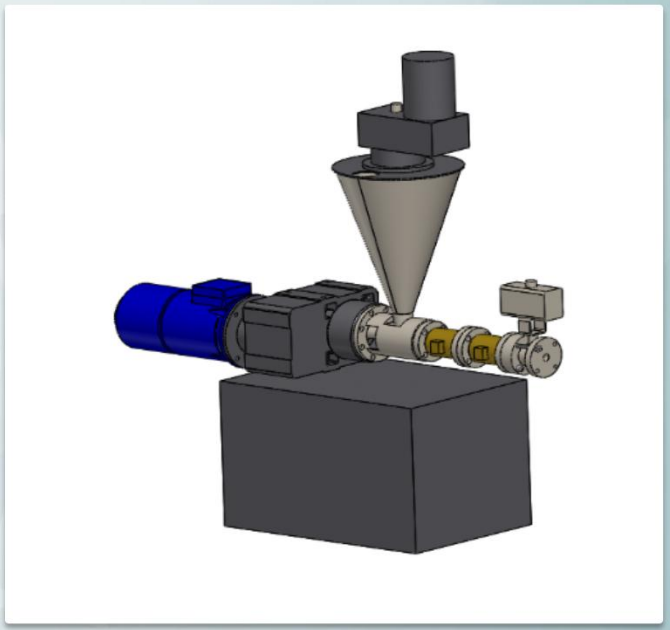
Yield of monosaccharides from original and washed samples of wheat straw and corn stover



Concentration of inhibitors of fermentation (v g/L) in hydrolysates of original corn stover samples



Pilot plant equipment for pretreatment of LCRM with steam explosion



Pilot mixing batch reactor for hydrolysis

Conclusions

Optimal Conditions of STEX Pretreatment of LCRM

- mass concentration 12,5 %
- temperature 210-230°C
- retention time 3-6 min

Conclusions

Optimal Conditions of Enzymatic Hydrolysis of Pretreated LCRM

- mass concentration 15 %
- temperature 49°C
- reaction time 72 h
- pH 4,9
- 3 – 6% dose of enzyme product Cellic CTec 3 per cellulose content in LCRM

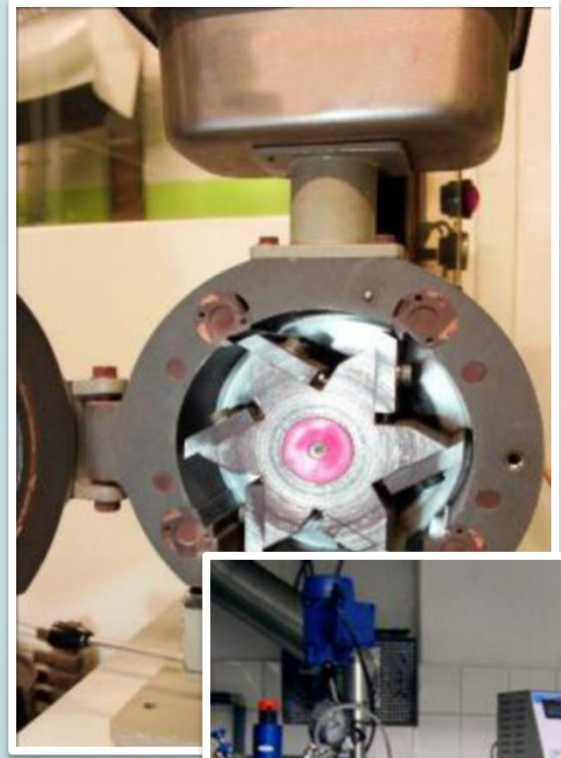
The Optional Cooperation Areas

1. Pulping technologies
2. Pulp bleaching technologies
3. Recycling technologies
4. Papermaking technologies
5. Surface treatment
6. Coating and laminating
7. Biofuel production technologies
8. Process & technology optimisation
9. Process simulation in laboratory scale
10. Technology testing in pilot plant scale
11. Specialty paper and board production
12. Publication of research results in WOOD RESEARCH
13. Pulp, paper and board quality testing
14. Technical and economical information services

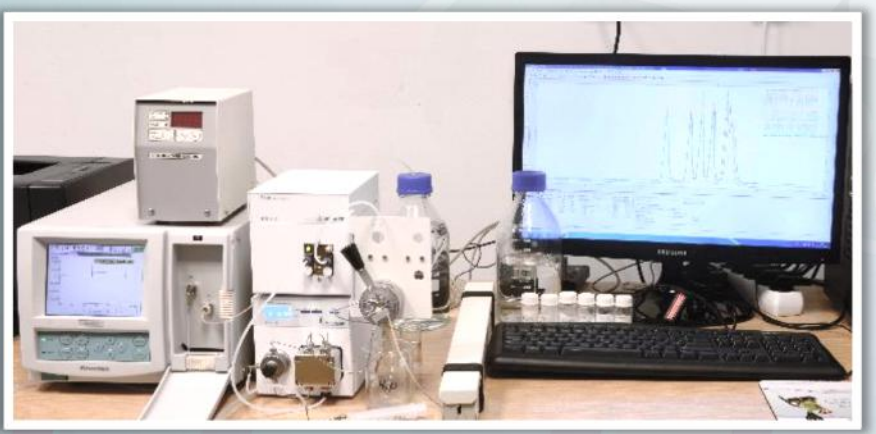
The Optional Cooperation Areas – Focused on Biofuels

1. Pulping technologies
2. Pulp bleaching technologies
3. Recycling technologies
4. Papermaking technologies
5. Surface treatment
6. Coating and laminating
7. **Biofuel production technologies**
8. **Process & technology optimisation**
9. **Process simulation in laboratory scale**
10. **Technology testing in pilot plant scale**
11. Specialty paper and board production
12. **Publication of research results in WOOD RESEARCH**
13. Pulp, paper and board quality testing
14. Technical and economical information services

Biofuel production technologies – Process simulation in laboratory scale



Biofuel production technologies – Technology testing in pilot plant scale



Biofuel production technologies – Process & technology optimisation

PAPSTAR REPAY

RECOPT OPTIMEN

Publication of research results in Scientific Journal

WOOD RESEARCH

(ISSN 1336-4561)

Issued
bimonthly

in the even year
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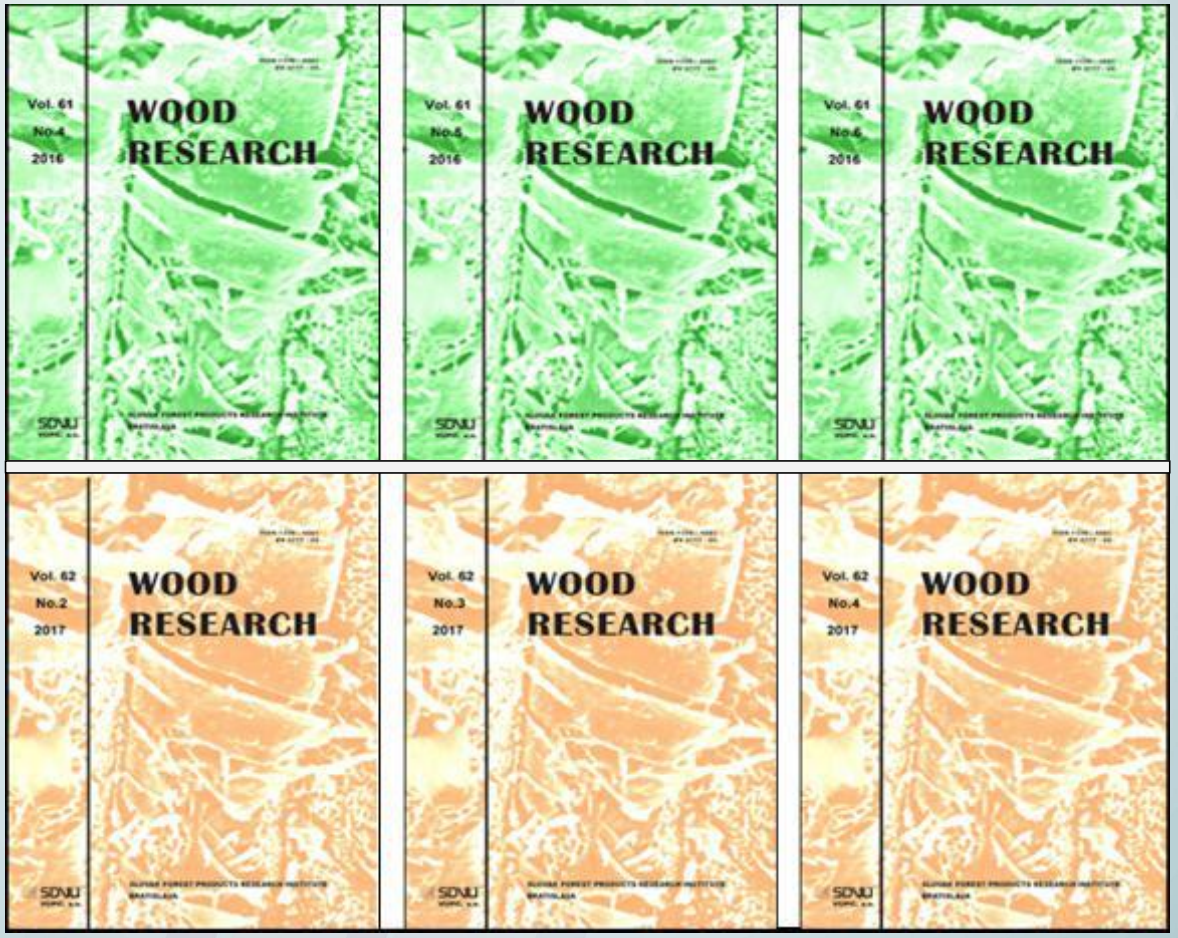
in an odd year
in brown color



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Beijing, China
October 30-31, 2017

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Thank You for Your attention!

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