OHT of poplar round wood – the wood's resistance to white rot

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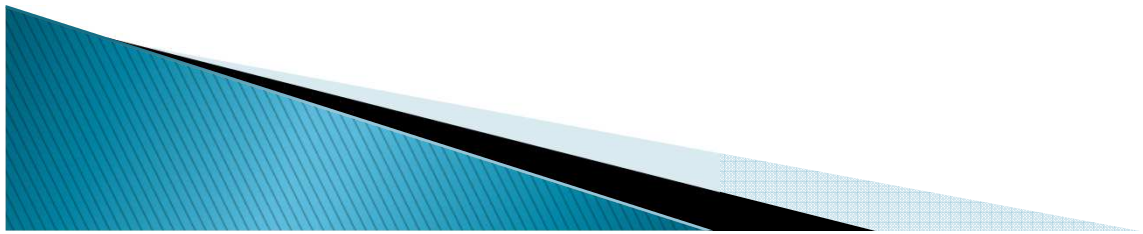
Introduction – thermal modification

- Environmental friendly
- No chemicals

- Improves the properties of wood
  - Hygroscopicity,
  - Dimensional stability,
  - Resistance to biotic factors

Introduction

- Chemical changes in wood
  - Hemicellulose degradation 160 – 240°C
  - Cellulose
    - 250°C decomposition to H_2O, CO and CO_2
    - Reduction of polymerization 2600 – 600
  - Lignin
    - 100–180°C softening
  - Non-cellulose carbohydrates
    - decomposition to H_2O, CO and CO_2
    - form dextrin and branched polysaccharides



Introduction – OHT modification

Advantages

- Hot oil, as a heating medium
- Oil doesn't penetrate the wood
- Relatively simple apparatus
- Usually conducted at a temperature of 180–220°C
- Even distribution of heat

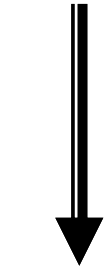
Disadvantages

- Resins in oil

Aim of the study

Poplar wood

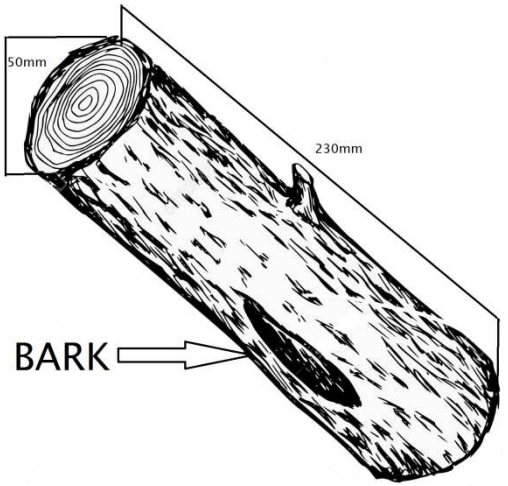
OHT



Limited decay action
of the poplar wood

Materials

- Age of trees – 3 years
- Wood Species:
  - Populus maximowiczii
  - Populus trichocarpa
- Wood moisture approx. 20%
- Samples dimension with bark:
  - 230 mm long
  - 50 mm diameter

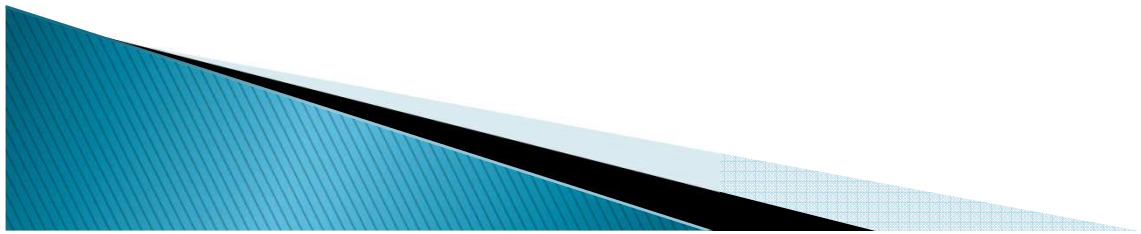


OHT process

Heating medium –palm oil

Two stages of modification

Wood species	Modification time at 100 °C [h]	Modification time at 180 °C [h]	Sample code
P. maximowiczii	24	24	1
P. maximowiczii	24	48	2
P. trichocarpa	24	24	3
P. trichocarpa	24	48	4



Examination

Mycological examination

- Samples dimension: 5x15x40 mm
- Fungi: *Coriolus versicolor*
- Fungi action:
  - Time: 8 weeks
  - Humidity: 70±5%
  - Temperature: 22±1°C

Aging test

- EN84

Results – Change of the mass of poplar rollers subjected to thermal modification

Wood species	Modification time at 180 °C	Sample code	Change of the samples' mass [%]	
			24h	48h
P. maximowiczii	24	1	65	–
P. maximowiczii	48	2	66	81
P. trichocarpa	24	3	100	–
P. trichocarpa	48	4	100	109

Results – Wood mass losses and wood moisture content as a result of the test fungi action

Sample Code	Non leaching				Leaching			
	Density [kg/m³]	Mass Loss [%]	RSD	WMC after test [%]	Density [kg/m³]	Mass Loss [%]	RSD	WMC after test [%] [%]
P. Maximoviczii 24h modification 180°C	467	12.11	3.54	38.62	472	12.44	1.11	30.61
Control	341	39.21	4.74	202.55	340	37.95	2.92	187.06
P. Maximoviczii 24h modification 180°C	506	14.74	1.89	49.63	509	12.93	1.55	41.91
Control	329	39.75	2.58	174.09	303	37.83	2.53	205.50
P. *Trichocarpa* 24h modification 180°C	797	12.42	3.51	21.21	822	8.37	2.02	18.80
Control	413	38.36	4.41	143.86	411	39.98	5.29	152.26
P. *Trichocarpa* 24h modification 180°C	568	13.68	2.24	28.64	604	16.00	2.41	28.52
Control	422	37.76	2.34	142.68	349	37.47	6.63	184.63

Conclusions

1. Thermal modification by OHT method enhanced the resistance of *P. maximowiczii* and P*. trichocarpa* wood to *C. versicolor*.
2. Irrespective of the thermal treatment parameters and differences in mass loss values resulting from modification, the durability of wood of both species increased
3. The best resistance against *C. versicolor* was observed for *P. trichocarpa* wood modified for 24h (ML 8%)

Thank you for your attention