

Ongoing R&D projects in COST member countries

September 2013



COST FP1303: Performance of bio-based building materials



Univerza v Ljubljani

1. University of Ljubljana, Biotechnical faculty,
Dept. of Wood Science and Technology
2. University of Primorska, Andrej Marušič Institute
(UP IAM) and Faculty of Mathematics, Natural
Sciences and Information Technologies (UP
FAMNIT)
3. Slovenian National Building and Civil Engineering
Institute (ZAG)
4. Building and Civil Engineering Institute (GL-
ZRMK)
5. Industry





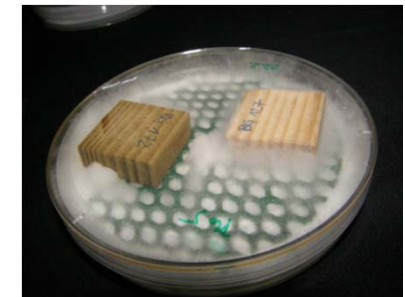
Descriptions of ongoing projects

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Program group – Wood and lignocellulosic composites

(P4-0015, Financed by Slovenian Research Agency; 2009-2014)

- Natural durability of the wood species from central Europe (lab and field trials)
- Non-biocidal treatment of wood
- Importance of the wood extractives (composition, concentration) for the natural durability
- Influence of ageing (indoor and outdoor) on the properties (mechanical, fungicidal, sorption, presence of extractives, ...) of wood
- Performance of surface coatings on wood, modified wood (indoor and outdoor)
- Formaldehyde free adhesives for wood composites





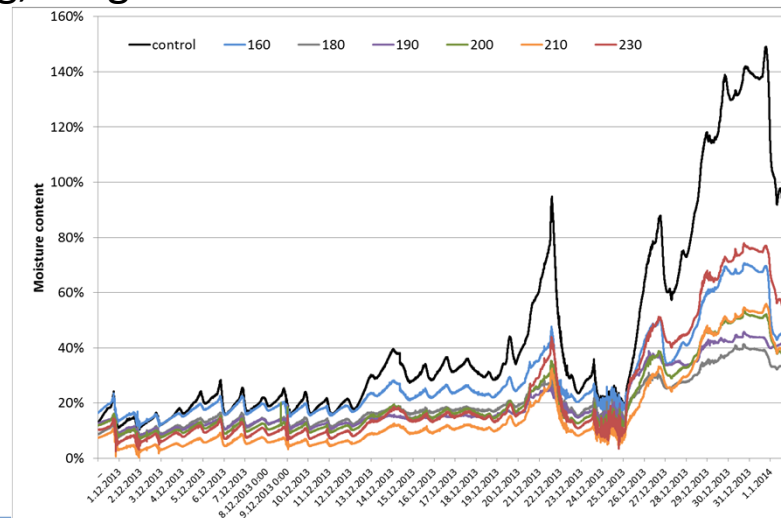
Descriptions of ongoing projects

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Water exclusion efficacy, measure for prediction of wood performance against wood decay fungi

(L4—5517, Financed by Slovenian Research Agency; 2013-2016)

- Compare moisture performance of different materials (naturally durable, modified, water repellent treated...) in laboratory and outdoor
- Correlate moisture performance and durability against fungi
- To determine overall performance of wood treated with hydrophobic agents
 - Influence of weathering, fungi ...





Descriptions of ongoing projects

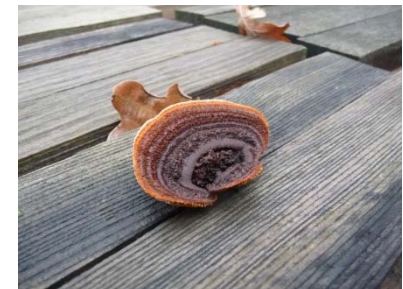
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Setting up system for monitoring of the performance of copper treated and thermally modified wood

(Industrial project; Silvaproduct; 2013-2015)



- To determine performance of copper treated and thermally modified wood in above ground, in ground, sea water applications.
 - Influence of composition
 - Influence of treatment methods (retention)
 - Influence of wood species
- To determine long term leaching of copper from wood (UC 3, 4, 5)





Descriptions of ongoing projects

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Performance of cellulose insulation and wooden facades

(Industrial project; Zimic, Mrazles, Msora; 2013-2015)



- Model house was build
- 22 different materials was used
 - Appearance of blue stain fungi
 - Wood degradation
 - Weathering (color)
 - Moisture (resistance)
 - Indoor air (HCOH, VOC...)
 - Thermal conductivity
 - Condensation on windows
 - ...





Descriptions of ongoing projects

Changes of sorption properties of wood due to the action of the biotic and abiotic factors

(PhD project; Financed by Slovenian Research Agency; 2013-2017)

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- Changes of the sorption properties, short term and long term water uptake due to the: UV light, weathering, blue stain fungi, wood degrading fungi





Descriptions of ongoing projects

Development of low Formaldehyde Wood-Based Products (WBP)

- Screening of the formaldehyde emissions from the wood composites on the regional market



Bark Valorization into Insulating Foams and Bioenergy, Biofoambark (ERA-net+, WoodWisdom-Net Research Programme)

- Development of insulation material from conifer bark tannins

Management of recovered wood (PhD project) (ERA-net+, WoodWisdom-Net Research Programme)

- End of life issues related with wood

Biotechnological processing of lignocellulosic materials

- Use of lacase for grafting of hydrophobic agents, pigments, biocides to wood



Descriptions of ongoing projects

What We Wood Believe? Societal perceptions of the forest-based sector and its products towards a sustainable society (W³B – Wood Believe; ERA-net+, WoodWisdom-Net Research Programme)

- Creating and demonstrating innovative cost-efficient ways for communicating towards stakeholders the relevance of the European forest-based sector and its products for a sustainable bio-economy

Pinosylvins as novel Bioactive Agents for Food Applications, PINOBIO (ERA-net+, WoodWisdom-Net Research Programme)

- Importance, distribution, concentration of extractives in pine wood

Importance and potential commercial applications of phenolic extractives for the performance of the pine wood (Post doc project)

- Influence of the extractives for the durability of the conifer wood species





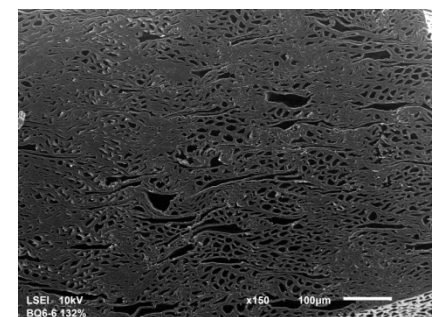
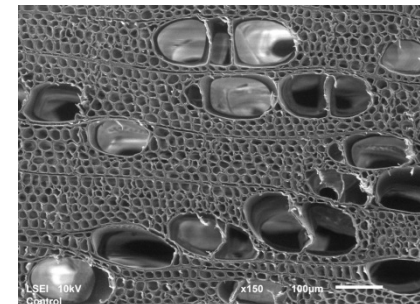
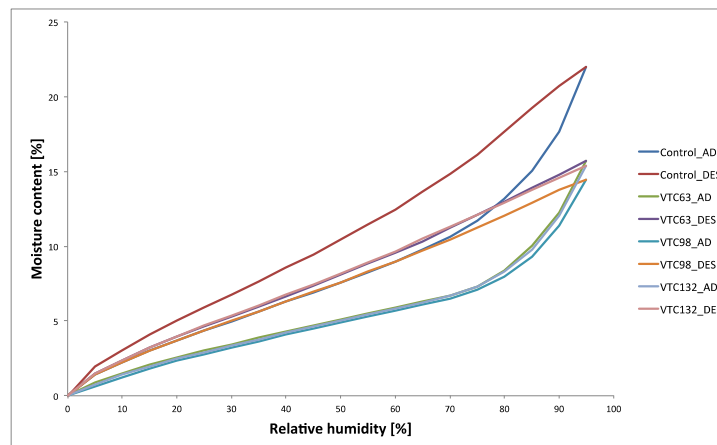
Descriptions of ongoing projects

Rheological properties of ThermoHydroMechanical (THM) treated wood (Z4-5520-1669, Financed by Slovenian Research Agency; August 2013-July 2015)

Time dependent behavior of THM wood under bending, exposed to varying regimes of temperature and moisture (humidity) - creep deformation vs. density of THM wood.

Collaborating with:

- Oregon State University from USA
- EMPA and ETH from Switzerland
- Aalto University from Finland





Descriptions of ongoing projects / previous activities

Wood as an element of Restorative Environmental Design

(PhD; October 2013-)

Aim - develop a matrix of test factors and levels related to wood in the built indoor environment that may affect human health;
Includes: salivary cortisol measurements of stress level; influence of cultural; naturalness of building materials

Interdisciplinary – involving also psychologist

Collaborating with:

- Tretnesnik (Norway)
- Aalto University (Finland)



Slovenia

January 2014



University of Primorska, Andrej Marušič Institute, UP FAMNIT

Descriptions of ongoing projects

EnergyViLLab (INTEREG, Italy-Slovenia Cross-border Cooperation Programme 2007-2013); <http://www.energyvillab.eu> (November 2011 – May 2014)

SME ViLLab – living laboratory (ecosystem for experimentation and co-creation with real users in real life environments) developed at UP FAMNIT
- energy efficiency of houses and healthy living environment that can be achieved with the usage of wood.



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Descriptions of ongoing projects

Cascading Recovered Wood (CaReWood; ERA-net+, WoodWisdom-Net Research Programme)

- Up-grading concept for recovered solid timber as a source of clean and reliable secondary wooden products; Business model for cascade use of wood recovered from building renovation and demolition, the furniture sector and the packaging and transport industries.



What We Wood Believe? Societal perceptions of the forest-based sector and its products towards a sustainable society (W³B – Wood Believe; ERA-net+, WoodWisdom-Net Research Programme)

- Creating and demonstrating innovative cost-efficient ways for communicating towards stakeholders the relevance of the European forest-based sector and its products for a sustainable bio-economy

LCA analysis – environmental impact assessment included in all projects

Slovenia

January 2014



Descriptions of ongoing projects/activities

Laboratory tests of the load-bearing capacity of timber structures and structural elements

Short-term tests and Long-term tests in artificial and natural environments

Standardized tests of timber products

The fire characteristics of building materials and the fire resistance of the elements of building structures.

Life Cycle Assessment

Environmental Products Declaration



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OPEN HOUSE (FP7; http://www.openhouse-fp7.eu/open_house_portal)

Aim to develop and to implement a common European transparent building assessment methodology, complementing the existing ones, for planning and constructing sustainable buildings by means of an open approach and technical platform



State of art equipment

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- Processor Tensiometer K 100 MK2 with a cryothermostat, Krüss GmbH
- Rheometer ARES G2, TA Instruments, serial No. 4010-0013
- HPLC – High pressure liquid chromatography (Thermo scientific)
- DSC - Differential scanning calorimetry - METTLER TOLEDO
- Universal testing machine Zwick Z100, Zwick, LT68
- Universal testing machine Zwick Z005, Zwick
- UV-Vis Spectrophotometer, Perkin Elmer
- Infra red spectrometer (FTIR), with attached microscope, Spectrum one, Perkin Elmer
- X-ray fluorescence spectrometer (Twin X), Oxford instruments
- HPLC High pressure liquid chromatography (Agilent)
- Vacuum-pressure chamber, Kambič
- Chamber for wood modification, Kambič
- QUV Accelerated Weathering system
- Single point loading cells (HBM), PMX acquisition for moisture performance measurements
- Equipment for formaldehyde monitoring



State of art equipment

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- Ultra-Centrifugal Mill Retch ZM 100
- Rotarry mill Retch SM2000
- Ball mil Retch MM 200
- Centrifuge Eppendorf 5430R
- PCR MASTERCYCLER PRO S Eppendorf
- Universal automatic extraction system Soxlet B811, BUCHI
- Equipment for continuous measurement of wood moisture content (Scantronic)
- Equipment for non conatct measurement of wood dimensions
- Equipped joinery workshop for preparation of the specimens (planes, circular saw...)
- Climatic test system VTRK 500 MU, Heraeus Vötsch, LT5
- Microbiological laboratory (laminar flow, autoclaves, shaker, dryer, clime chambers ...)
- Equipped laboratory for wood anatomy and dendrochronology (light microscope Nikon+ Lucia image analysis system, stereo microscope Olympus (1), stereo microscope Olympus (2), sliding microtome, rotary microtome, tissue processor EG 1120, PR 04058-200, exhauster, measuring table Lintab

Slovenia

January 2014



University of Primorska, UP IAM, UP FAMNIT; Brest-pohištvo d.o.o.

State of art equipment

XRF X-MET 7500 OXFORD Instruments (XRF – X-ray fluorescence – analyzer)

FTIR iS50 Thermo Scientific (FTIR – Fourier-transform infrared spectroscopy)

Thermal analyzer STA 449 F3 Jupiter Netzsch

Reactor Optimax Mettler Toledo

Laboratory Hot Press LZT-UK-30-L Langzauner

Microscope Leica DM 2700 M

Microtome Leica RM2125RTS Manual Rotary Microtome

Analytical balance KE-ABT220-5DM, KERN & SOHN

Climate chamber Kambič

Equipment for bioremediation: laminar, incubator



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Specialist equipment

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INSTITUTE	Properties						Environmental				
	Natural Durability	Moisture / sorption studies	Resistance to mould	Fire resistance / reaction to fire	Insect /termites / pests	Dimensional stability	Life Cycle Assessments	Whole Life evaluations	Product accreditation	Emission testing	Environmental Product Declaration (EPD)
Unilj	x	x	x	X(?)	X(?)	x			X(?)	x	
UO IAM (Brest)	X	X	X			X	X	X			
ZAG				x			X	X	X		X
ZRMK							x	x			

Specialist equipment

January 2014



	Laboratory tests						Field tests				
INSTITUTE	Natural Durability	Mould resistance	Insect /termite testing	Leaching / weathering	Sorption studies	Dimensional stability	In ground contact tests	Out of ground contact tests	Natural weathering	Surface performance / coatings	Moisture data logging
Unilj	x	x	x	x	x	x	x	x	x	x	x
UO IAM											
ZAG											
ZRMK											