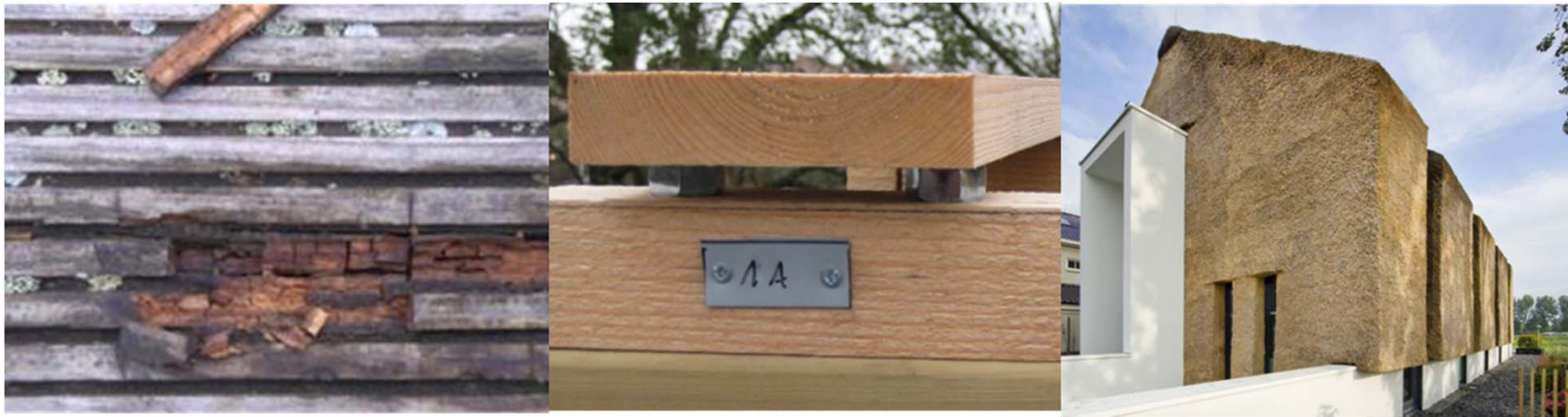


# Ongoing R&D projects in COST member countries

January 2014



COST FP1303: Performance of bio-based building materials

# Poland

January 2014



Faculty of Wood Technology, Poznan University of Life Sciences

Faculty of Wood Technology, Warsaw University of Life Sciences

Wood Technology Institute, Poznan





## *Thermal Properties of Wood-Based Panels*

**Dr. Łukasz Czajkowski**  
**Prof. Dr. Jerzy Weres**  
**Dr. Wiesław Olek**



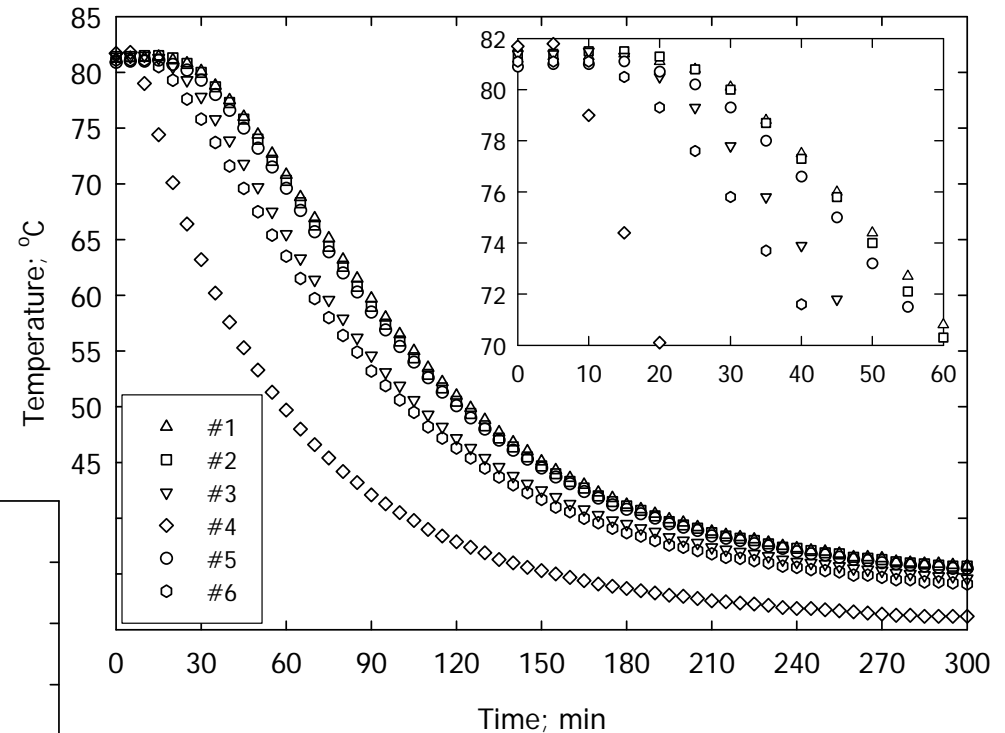
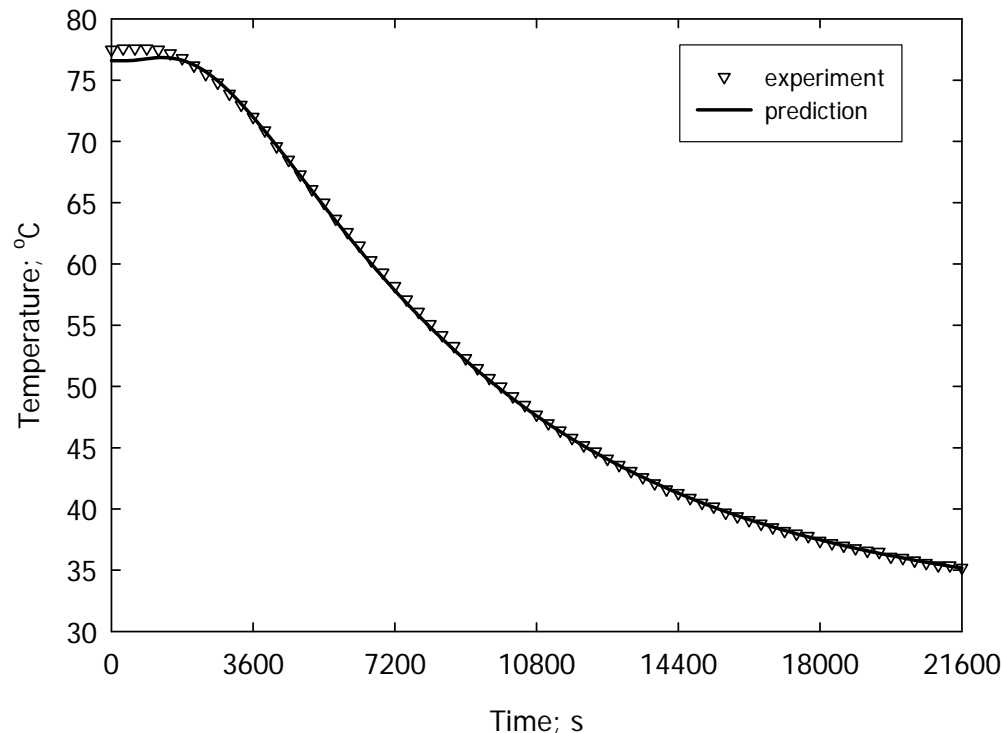
## Inverse identification

$$\rho \frac{\partial t}{\partial \tau} = \nabla(k \nabla t), \quad (\mathbf{x}, \tau) \in \Omega \times (0, \tau_F]$$

**Finding coefficients**

$$t(\mathbf{x}, 0) = t_0(\mathbf{x}), \quad (\mathbf{x}) \in \overline{\Omega}$$

$$t(\mathbf{x}, \tau) = t_s(\mathbf{x}), \quad (\mathbf{x}, \tau) \in \partial\Omega^I \times (0, \tau_F]$$



- separate estimation of thermal conductivity and specific heat,
- high accuracy of the procedure,
- importance of anisotropy in identified properties,
- temperature dependence of the thermal conductivity.





# *Identification of Mathematical Model Coefficients of Bound Water Diffusion in Wood*

International research project in cooperation with  
**Prof. Dr. Patrick Perré** – LGPM École Centrale Paris

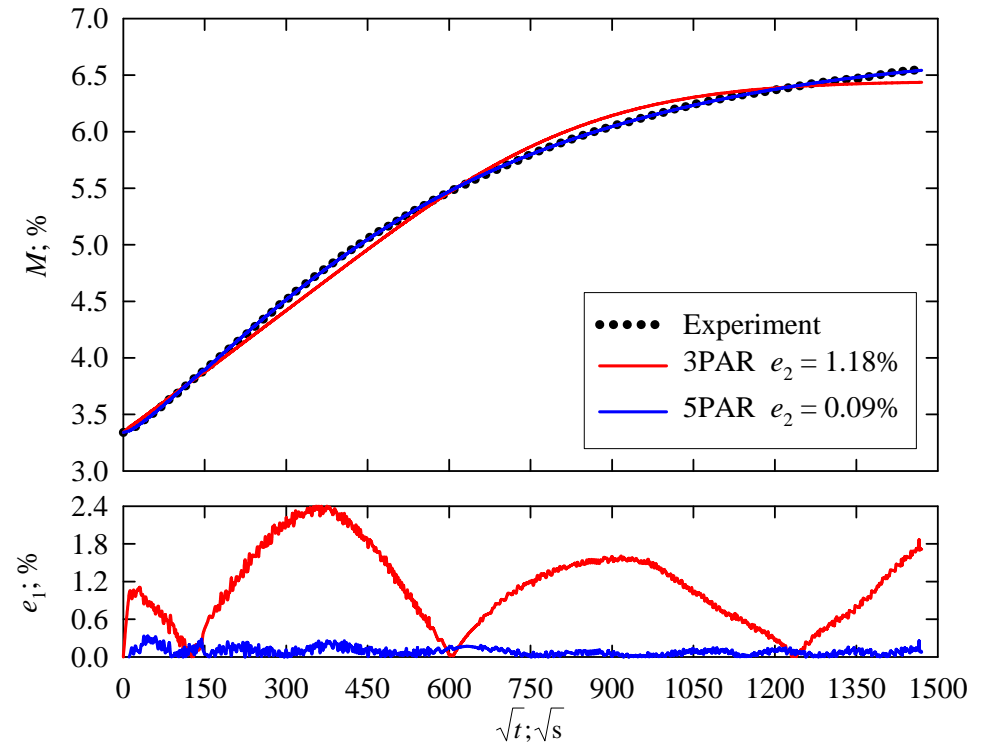
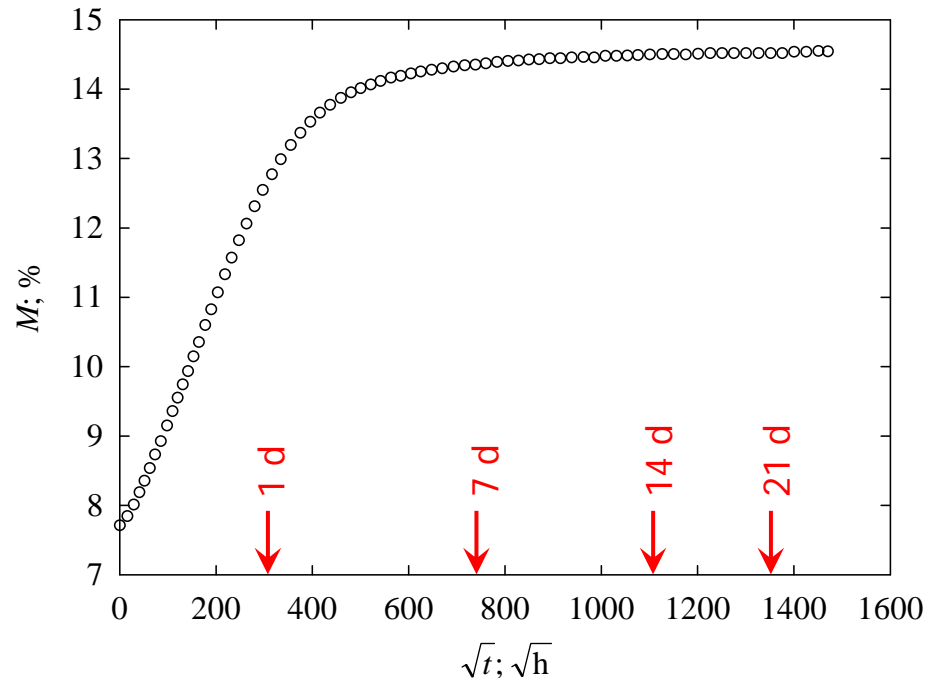
**Prof. Dr. Jerzy Weres**  
**Dr. Wiesław Olek**



Modified third kind b.c.

$$\left(-D \frac{\partial M}{\partial x}\right) = \sigma \cdot [M(x, t) - M_{\infty}], (x, t) \in \Gamma \times [0, t_F]$$

$$M_{\infty} = c + d \cdot [1 - \exp(-t/T)]$$



Significant increase of the identification accuracy after modification of the convective boundary condition.

The non-Fickian diffusion can be efficiently modeled.



## *Superior bio-friendly systems for enhanced wood durability*

Polish-Norwegian Research Programme Pol-Nor/203119/32/2013

**Prof. Dr. Bartłomiej Mazela, Dr. Izabela Ratajczak** (Faculty of Wood Technology, Poznan University of Life Sciences, Poznan Poland)

**Dr. Anna Komasa** (Adam Mickiewicz University, Poznan Poland)

**Dr. Lone Ross Gobakken** (Norwegian Forest and Landscape Institute, Ås Norway)



### Objectives:

- development of systems for quality assurance and performance classification of eco-friendly treated wood,
- using eco-friendly ingredients (organosilicones, alkaloids, imidazoles, oils, etc.),
- development of natural and synthetic wood protection systems,
- characteristics of a wood protective systems,
- performance of protective wood systems,



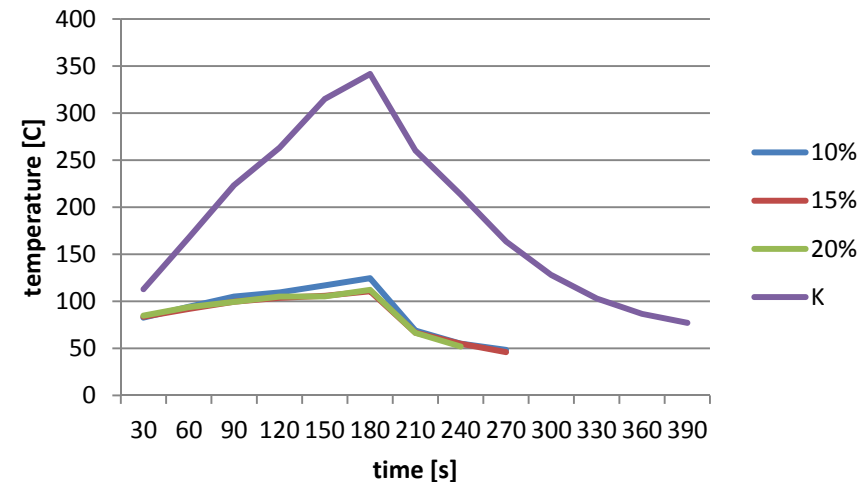
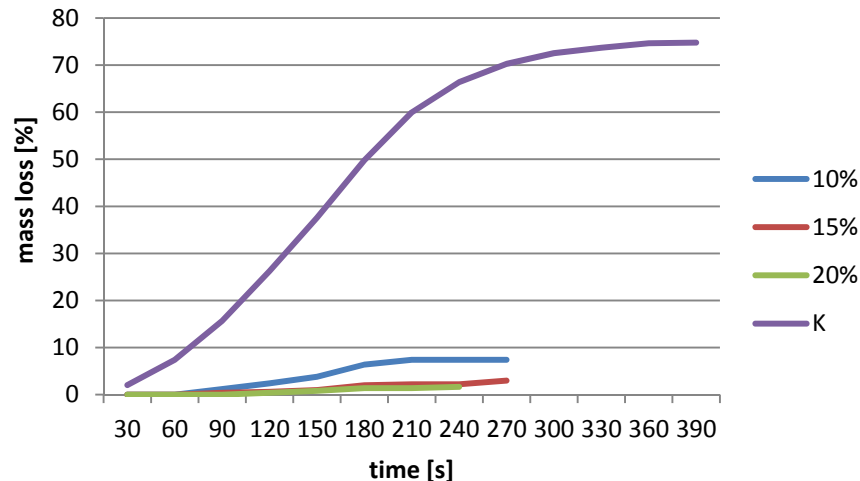


*Guanidine carbonate as a component  
supporting fire retardancy in new preservatives  
for wood and wood-based materials*

**Dr. Wojciech Grześkowiak**  
**Dr. Monika Bartkowiak**



Objective - finding synergisms between guanidine and phosphorous



- Compounds Metz method; results – high effectiveness of the fire retardant containing guanidine carbonate,
- Impact on the effectiveness and degree of concentration has been observed,
- Maximum effectiveness - samples protected 20% concentration.



## *Changes in physical and chemical properties of wood decayed by white-rot and brown-rot fungi*

**Dr. Piotr Witomski** (Faculty of Wood Technology, Warsaw University of Life Sciences, Warsaw Poland)

**Prof. Dr. Jan Bonarski** (Institute of Metallurgy and Materials Science, Polish Academy of Sciences, Kraków, Poland)

**Dr. Wiesław Olek** (Faculty of Wood Technology, Poznan University of Life Sciences, Poznan Poland)



Wood ultrastructure and strength properties were related to different stages of white-rot and brown-rot decay.



## *Electro-acoustic detection of insects destroying wood in cultural heritage objects*

**Dr. Piotr Witomski**

**Prof. Dr. Adam Krajewski**

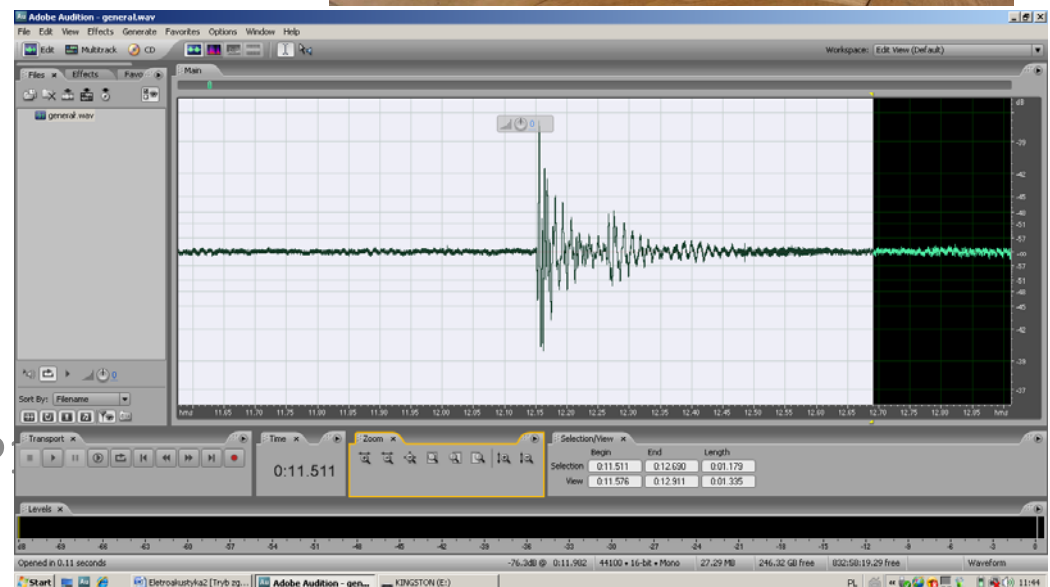
**Dr. Piotr Bobiński** (Faculty of Electronics and Information Technology,  
Warsaw University of Technology, Warsaw Poland)



Detection of the following insects:  
*Hylotrupes bajulus* L.,  
*Anobium punctatum* De Geer,  
*Xestobium rufovillosum* De Geer,  
*Ptilinus pectinicornis* L.,  
*Lyctus* sp.



COST FP







*New structural material – an ecological wood-based nanocomposite of enhanced resistance to fire and water, produced in an energy saving production process*

**Dr. Iwona Frąckowiak**

Research project in cooperation with Chemical Plant „Silikony Polskie”



EBM is intended for:

- wall paneling
- floors
- partitions
- ceiling paneling
- means of transport
- packaging
- indoor app. and furniture

The new material is

- fully ecological
- homogenous on the surface and cross section
- resistant to moisture
- resistant to biological decay
- fire retardant
- easy to machine



System for computer-aided identification of thermal and diffusional properties of wood and wood-based panels:

- Inverse Problem Solver (IPS) - software developed for inverse and direct finite element analysis,
  - experimental setups for analyzing transient diffusion and heat transfer processes.
- 
- Mycological laboratory
  - Laboratory scale treatment plant
  - Mass loss calorimeter
  - Apparatus for determining oxygen index
  - Charring Rate Chamber, Mini Fire Tube (MTF)
  - Truax-Harrison's apparatus with fire tube