

# PROWOOD - WOOD AND DERIVATIVES PROTECTION BY NOVEL BIO-COATING SOLUTIONS - AN ERA-IB RESEARCH PROJECT (FUNDING PERIOD: 09/2017 - 08/2020) -

## SINTEF Industry (Norway)

Tonje M. B. Heggeset, Kjell D. Josefsen, Havard Sletta

SINTEF studies wood decay processes, rotting wood from the forests around Trondheim, and near León, and standardized wood bricks from a lumber yard are used. The samples represent wood at all stages of decay, whereas the standardized wood bricks are used to study the initial phase of rotting. Wood bricks of pine, Norway spruce and pine treated with a commercial Cu-based preservative were shipped to the University of Tübingen (Germany), Intel Centre (Romania) and INBIOTEC (Spain), and placed outdoors at these three locations as well as at Trondheim, Norway, to simulate natural outdoors exposure of vertical and horizontal panels. The bricks are sampled at different time points to get information about the development in the initial phase of rotting at these different locations. The rotting process is investigated by traditional methods, metagenomics, and metatranscriptomics.



Wood decay test-rig



Resinous Pine from Trondheim



Pine from Trondheim



Spruce from Trondheim



Wood from León

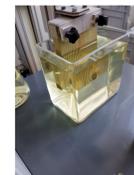
## TU Bergakademie Freiberg (Germany)

Fabian Gellrich, Konstantin Kraushaar, Edwin Kroke

TUBAF designs and synthesizes sol-gel-derived organic-inorganic hybrid materials. The approaches are based on formulations to reach the objectives on a laboratory scale, including analysis and characterisation of the coatings before/after curing and application. After evaluation of switchable synthesis routes and compatibility of the sol-gel hybrid materials with wood surfaces coating methods will be compared to get the most appropriate and economically feasible for the remaining ProWood studies. Microorganisms and related fillers obtained from INBIOTEC (Spain) will be introduced into the sol-gel coatings. Chemical, optical and mechanical properties of the coatings with and without fillers will be determined. The effectiveness of the wood protection and the ability to prevent wood-decay is to be evaluated together with the partners from Norway, Spain, Turkey and Romania.



Dip-Coating unit



Norwegian spruce during dip-process



Fully coated Norwegian Spruce

## INBIOTEC - Instituto de Biotecnología de León (Spain)

Carlos Barreiro, Mariana Fil, Katarina Kosalková, Óscar Velasco-Rodríguez, Alberto Sola

### Isolation of cultivable microorganisms

Microbial isolation from wood samples was individually done from bark, inner-bark (cambium) and sawdust. Identification was carried out by sequencing the 16S rRNA (bacteria) and ITS regions (fungi and yeasts).

### Characterization of microorganisms

Competition bio-assays between microbial antagonists vs fungi described as involved in wood-decay [reporters: *A. brasiliensis* (A. b), *A. pullulans* (A. p), *C. puteana* (C. p), *P. chrysogenum* (P. c) and *T. versicolor* (T. v)].

### Test of the bio-coating properties

Test of protective properties of bio-coating solutions. The wood samples were single coated, doubly coated, five-fold coated and without coated (control) with the solution. Then they were put on the agar plates inoculated with four species of wood-rotting fungus.



After 24h



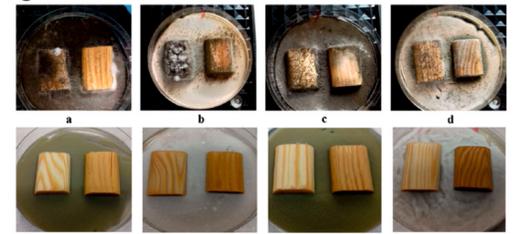
After 8 weeks



## PPIMC - Institute of Macromolecular Chemistry (Romania)

Fanica Mustata, Irina Rosca, Dan Rosu, Liliana Rosu, Teodora Rusu, Cristian Varganici

Synthesis and development of wood coatings based on vegetable oils.



Photographs of raw wood and treated samples:  
(a) W and SAW/DGEBA/SA/SAC/EGSO exposed to *C. cladosporioides*  
(b) W and SAW/DGEBA/SA/SAC/EGSO exposed to *P. chrysogenum*  
(c) W and SAW/GMA exposed to *C. cladosporioides*  
(d) W and SAW/GMA exposed to *P. chrysogenum*  
(e) W and SAW/DGEBA/SA/SAC/EGSO before exposure to *C. cladosporioides*  
(f) W and SAW/DGEBA/SA/SAC/EGSO before the exposure to *P. chrysogenum*  
(g) W and SAW/GMA before the exposure to *C. cladosporioides*  
(h) W and SAW/GMA before the exposure to *P. chrysogenum*

W...wood; SA...succinic anhydride; SAW...wood with succinic anhydride; SAC...salicylic acid; GMA...glycidyl methacrylate; DGEBA...diglycidyl ether with bisphenol A; EGSO...epoxidized grapeseed oil; ESO...epoxidized soybean oil

## DYO BOYA (Turkey)

Aydin Can, Beyhan Erdogan, Ozgur Sen, Asli Tag Dilek Yücel



DYO is one of the largest and leading paint & coating producers in Turkey having 1500 employees. DYO is the first Paint manufacturer and first "R&D Center" in Turkey. Being in the market for more than 70 years, DYO has a granted patent for Nano coatings series and widespread distribution network (reaching 13.000 sales points) and has large capability of semi-product production, e.g. synthetic resins. DYO has significant marketing and R&D expertise, strong brand portfolio (Different types of coatings:decorative, industrial, wood, automotive, marine and related products(i.e. printing inks), Nano Coating, Coil Coating, Protective Coating and polymer groups:Alkyd and polyester resins, Polyurethane resins, Inorganic resins, Solgel, Hybrid Systems, Acrylic emulsions, and 1100 different products).

## Summary

The objective of the ERA-IB-project ProWood is to generate innovative, economically feasible and ecologically friendly bio-coatings to protect wood against decay. The project involves sol-gel-systems, functionalized vegetable oils and alkyd coatings suitable for incorporation of decay preventing biotechnologically derived fillers (microorganisms or biological compounds such as enzymes).

## Partner



## Acknowledgement

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