



### About COST Action FP1407: ModWoodLife

The forest-based sector can become a leader in achieving the European Commission's ambitious target of reducing CO2 emissions with innovative production technologies, reduced energy consumption, increased wood products recycling, and reuse. Apart from these environmental benefits, the use of forest products in long life products, such as built environment applications, allows for the possibility of extended storage of atmospheric carbon dioxide.

#### ModWoodLife Facts

Type: COST Action FP1407: ModWoodLife

Duration: 4 years (2015-2019)

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#### Participants

4 working groups  
96 research partners  
33 countries

#### MC Chair

Dr Andreja Kutnar  
University of Primorska  
Muzejski trg 2, 6000 Koper, Slovenia

### Short Term Scientific Mission (STSM):

#### Dr. Roman Shchupakivskyy

Dr. Roman Shchupakivskyy from the Ukrainian National Forestry University, Faculty of Woodworking Technologies and Design completed a 3 week short term scientific mission at the University for Sustainable Development Eberswalde, Faculty of Wood Engineering in Eberswalde, Germany.

The main goal of this mission was to document the LCI of thermally treated cladding production from incoming Ash boards, LCI data collection due to the thermal modification. In particular estimation of heat energy, water, raw material and N2 consumption due to thermal modification were investigated and, thereafter, allocated environmental outputs for manufacturing thermally modified Ash cladding were estimated. Some data was received about the possibility of reusing this material as a construction and outline ways of EOL scenario.

Several results have been found as the outcome of conducted LCI. The first one is the high use of electricity as heat energy source in the process. It is the major source of CO2 contributing to global warming impact. Decisive influence also has the use of kiln dried sawn timber as the raw material. The influence of other factors (N2, water, etc.) is negligible for total emissions. Based on the obtained results of mechanical tests it can be concluded that used during 8 months cladding is absolutely suitable for recycling or reusing. For a more complete assessment of reusing ways should be conducted study on LCA at different EOL scenarios.

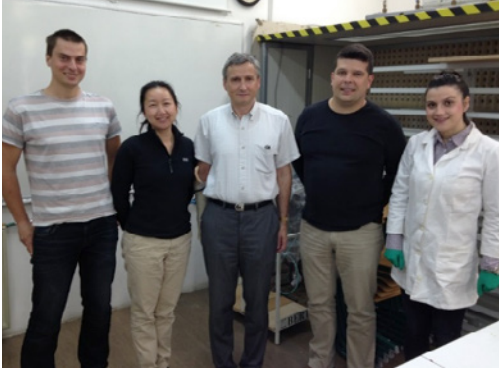


3-point bend testing equipment; TM testing equipment with wood specimens; the lab building on Wald Campus.

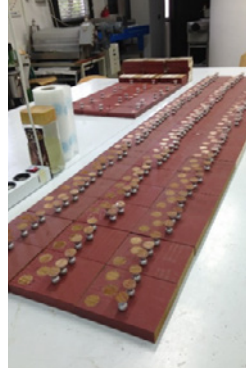
## Tinh Sjökvist

Tinh Sjökvist (Linnaeus University, Sweden) completed a STSM with professor Marko Petric (University of Ljubljana Biotechnical Faculty, Dept. of Wood Science & Technology) in Slovenia to learn measurement techniques on wood coatings.

Tinh is studying the adhesion force of a coating between thermally modified and unmodified spruce with different characteristics like fast grown, slow grown, sapwood and heartwood. We look forward to the results!



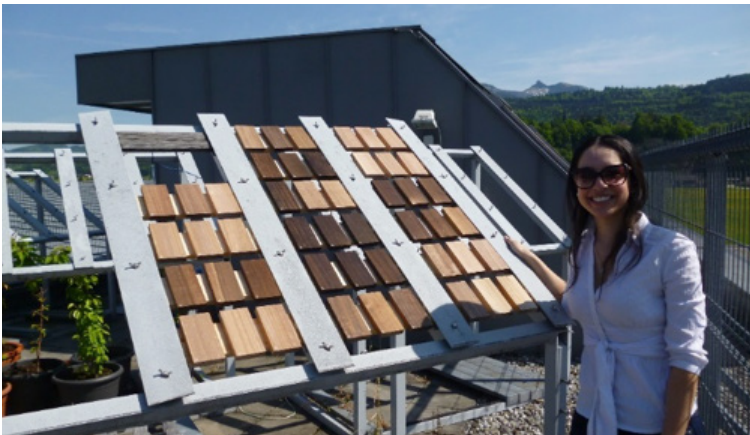
Tinh and STSM coworkers at University of Ljubljana Biotechnical Faculty, Dept. of Wood Science & Technology;



wood samples

## Carolina Griebeler

Carolina Griebeler, a PhD student at University of Lleida (Spain), completed a short-term scientific mission at the Fachhochschule Salzburg (Salzburg University of Applied Sciences) at the Kuchl campus under the supervision of Gianluca Tondi and Thomas Schnabel.



Carolina and Eucalyptus globulus samples on the first day the samples were set up on the rooftop of the university building for the weathering experiment;



Carolina studied the physical properties of thermally modified Eucalyptus saligna from New Zealand and the effects of one year of natural weathering on color stability and surface cracking of thermally modified Eucalyptus globulus from Spain.

She had a great experience in Kuchl, and this opportunity was important for her research.

## Ben Mlouka

Selim Ben Mlouka, phd student from Aalto University, had a great experience on his STSM at Georg-August-Universität in Göttingen with Michael Altgen and Maximilian Wentzel. He researched the modification of wood in a reactor and extraction.

Selim also had the chance to listen to an excellent presentation made by Callum Hill.



Ben working in the lab at Georg-August-Universität in Göttingen;



sample setup.



## Benedikt Neyses

Benedikt Neyses (Luleå Tekniska Universitet, Skellefteå) completed a STSM at Aalto University (Finland) with Lauri Rautkari. He impregnated solid wood samples with sodium silicates before they are densified and evaluating performance of surface densified wood.



Benedikt prepares samples for experiments;



Normal and densified wood samples.

## Luke Beesley

Luke Beesley, soil scientist at The James Hutton Institute (Aberdeen, UK), completed a 7 day STSM entitled 'Leaching of metal[loid]s from CCA-derived wood ash; a column experiment to examine Cr speciation' at Czech University of Life Sciences (Prague, Czech Republic) in April 2016.

The mission's main aims were to: 1) to determine bulk leaching of water-soluble arsenic (As) and chromium (Cr) from wood ash derived from the combustion of CCA (copper-chromate-arsenate; a preservative compound) modified waste wood, 2) with particular attention to the speciation of Cr, determining the evolution of Cr (IV) versus Cr (III) during the course of a column leaching test. This was completed using an advanced semi-automated micro-column leaching system where 10g of ash was subjected to a 2000 min<sup>-1</sup> continuous leaching procedure designed to exhaust the water-soluble fraction of Cr and As, as well as other elements, in the ash, and hence provide detailed leaching curves for these elements approximating a period of environmental exposure of the ash.

The column procedure was successfully completed and, after sample preparation, analysis of the leachate samples for Cr and As was carried out, along with pH, dissolved organic carbon and other trace elements present in the ash, such as calcium, magnesium etc. The results reveal that the majority of the water-soluble pool of both Cr (82%) and As (65%), extracted during the whole test duration, was removed from the ash within the first 100 min<sup>-1</sup>; that corresponds to approximately 1% of the total amount of Cr and As in the ash, as previously determined by aqua-regia digestion. Thereafter 100 min<sup>-1</sup> Cr removal plateaued whereas As continued to be extracted in a linear fashion up to, and presumably beyond 2000 min<sup>-1</sup>. These results confirm the rapid loss (solubilisation) of potentially toxic elements from the ash, which could become mobile within the environment. The test also confirmed the rapid pH decrease in the ash upon leaching, which also influences the fate of metals and metalloids variously.

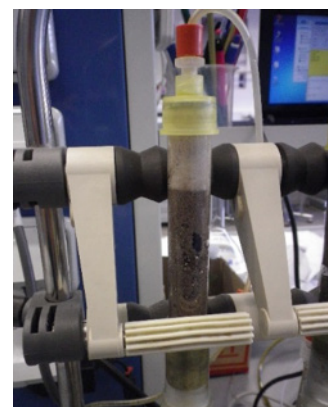
The next stages of the data analysis will 1) perform geochemical speciation modelling on all of the derived data to determine the species of Cr and As which influences their potential toxicity within the environment and 2) examine the mixing of bio-sorbents with the ash to limit the solubility of potentially toxic elements. This will be done by continued collaborations between The James Hutton Institute and Czech University of Life Sciences, Prague"



Luke preparing the samples for analysis;



Complete column-leaching set-up in operation;



The micro-column containing ash.

## Graham Ormondroyd

Dr. Graham Ormondroyd of the BioComposites Center, University of Bangor, performed a weeklong STSM at division Forest and Forest Resources, department Wood Technology, Norwegian Institute of Bioeconomy Research (NIBIO). Dr. Ormondroyd performed DNA quantification on *Postia placenta* decayed softwood samples for studying initial brown rot decay. The result from the testing at NIBIO will be compared with Dynamical Mechanical Testing on matched samples.



Graham and colleague in the lab seek to assess the effects of very early onset decay on the dynamic modulus of Norway spruce

## Diego Penaloza

Diego Peñaloza Corredor, a PhD Student (Researcher) at SP – Swedish Technical Research Institute & KTH Royal Institute of Technology (Stockholm, Sweden) completed a STSM at the University of Primorska (Koper, Slovenia) under the direction of Assoc. Prof. Dr. Andreja Kutnar. The applicant is also part of the research project EnWoBio (Engineered Wood and Biobased Building Materials Laboratory, whose aim is to produce new knowledge that will contribute to the development of production, use and further refining of renewable forest or agricultural biomass.

The purpose of the STSM was to collect in situ the data necessary to carry out the LCA of the wax-treated windows that are the study subject of the Wintherwax project, and to complete this data with the data collected by the host institution in a previous similar project. Moreover, the work carried under the STSM and the Wintherwax project will be incorporated in one of the scientific publications appended to the doctoral thesis of the applicant, where the environmental effects from using selected novel biobased materials in finishing and small components (windows, flooring, cabinets, etc.) will be evaluated at the building level using LCA.



The visit to the manufacturing sites of MSora

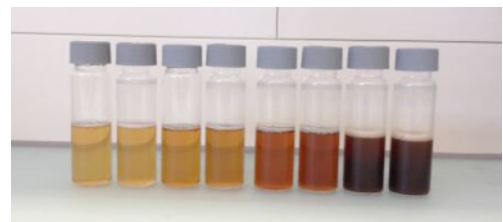


Silvaprodukt

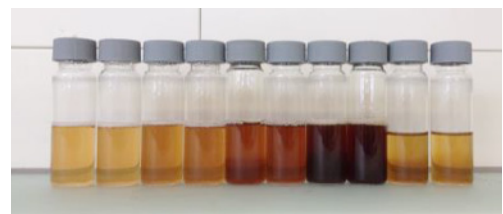
## Tianran Ding

Tianran Ding of Wood Material Science, University of Eastern Finland, Joensuu, Finland completed a STSM with Dr. Sc., Christelle Ganne-Ghédeville of Bern University of Applied Science, Institute for Material and Wood Technology. Tianran acquired firsthand experience of tannin extraction and related data and corresponding LCA model establishment.

The purposes of wood this STSM are to learn tannin extraction technique, analyze yield and composition based on different operating conditions, possible tannin utilization and learning LCA model of tannin as adhesive for particleboard, conduct LCA on tannin extraction at different conditions, and find out the most environmental friendly process.



Traditional hot-water extracts collected from each step (1st, 2nd, 3rd, 4th from right to left)



Adding one step of cold-water extracts collected from each step (1st, 2nd, 3rd, 4th from right to left)

## Tiina Vainio-Kaila

Tiina Vainio-Kaila, a Doctoral student at Aalto University completed a STSM with Dr. Martin Ohlmeyer, at Thünen Institut in Hamburg, Germany. This short term scientific mission aimed for analyzing the amount and quality of volatile organic compounds (VOC) of pine heartwood and sapwood and spruce heartwood and sapwood. Besides these also two separate substances, -pinene and limonene were studied, since they are both very common terpenes. It is part of my studies on the antibacterial properties of wood VOCs.

It has been previously found out that wood surfaces of some wood species are antibacterial (Milling & al., 2005, Vainio-Kaila & al., 2013) and the purpose of the ongoing study was to further analyze if also the volatile components from wood could have some antibacterial effect. Analyzing the emissions from wood used in the microbiological trials is essential for the understanding and analyzing the results. Besides the suitable equipment the wide knowledge and experience on this field in Thünen institute were important for accomplishing this this project successfully. The microbiological trials were done earlier and the results are very promising.



Glass container with wood dust and the sampling tubes. In the back is the clean air supply tube and in the front is the tenax tube attached to container. The other end of tenax tube is attached to a pump.

## STSM Scheduled for Year 2

- **Dennis Jones**  
hosted by University of Primorska, Koper
- **Mátyás Báder**  
hosted by University of Natural Resources and Life Sciences - Institute of Wood Technology and Renewable Resources
- **Anna Sandak**  
hosted by FCBA Institut Technologique
- **Nadir Ayrilmis**  
hosted by University of Ljubljana, Department of Wood Science and Technology
- **Lars Tellnes**  
hosted by Bern University of Applied Sciences
- **Rene Alexander Herrera Diaz**  
hosted by Universidad del Bio-Bio, Concepción, Chile

## PAST EVENTS

### ■ FP1407 Training School in Finland

During 26-28, April 2016, 19 trainees attended the FP1407 Training School on LCA studies on wood products at Luke in Vantaa, Finland. The goal of the training was to support students/researchers at their early steps in LCA studies on wood products. The course consisted of an introduction to LCA, use of LCA software, and a number of real world cases of LCA and EPD in particular. Students completed small group projects of their choosing.



### ■ Technical Workshop: Application of NIR spectroscopy in wood science and technology

The National Research Council, Trees and Timber Institute (CNR- IVALSA) Technical Workshop at IVALSA in collaboration with COST actions FP1303 and FP1407 and the Italian Society for NIR Spectroscopy (SISNIR) hosted the Technical Workshop: Application of NIR spectroscopy in wood science and technology, on April 19-21 2016 at Trees and Timber Institute (IVALSA) in San Michele all' Adige, Italy.

The purpose of the workshop was to encourage dialogue at the international level and to exchange of experiences related to the research and applications of NIR spectroscopy for wood science and technology. The workshop covered all areas of bio-materials and related applications: wood science and technology; tree breeding; biomass/bio-energy; timber construction and material performance; cultural heritage; recycling & reuse of wood; wood modification; and industrial application / process monitoring.



- **FP1407 meeting in Vienna**

On August 22, 2016, FP1407 had a successful meeting in Vienna and discussed the use of modified wood as a building material for sustainable construction. The discussion included the performance of modified wood in construction and environmental impact assessments of modified wood and buildings using it. Also discussed was the importance of communicating these findings and characteristics of modified wood to architects and engineers. The FP1407 members also participated at the WCTE2016 conference and share their research with the engineers and architects attending the event.



- **Hardwoods conference: Eco-efficient Resource Wood**

The University of West Hungary and the BOKU University organized the conference, "Eco-efficient Resource Wood with special focus on hardwoods" in Sopron, 2016. 08-09th September. In conjunction with "Conference of Climate protection through forestry, renewable materials, smart technologies, and environmental education and with a COST Action FP1407 Workshop. Topics included, materials properties of both native and modified wood, processing technologies, sustainability in the long-term perspective, and a poster session on a variety of hardwood-related topics. The Hardwood Conference was a great opportunity to meet with colleagues, build relationships, and share our research.



- **COST Action FP1407 2nd Conference: Innovative production technologies and increased wood products recycling and reuse**

The second international conference of COST Action FP1407 "Understanding wood modification through an integrated scientific and environmental impact approach" (ModWoodLife) brought together 77 researchers and industry representatives from 26 countries. It was held in Brno, Czech Republic from 29- 30 September 2016. The two day conference was focused on "Innovative production technologies and increased wood products recycling and reuse", including state-of-the-art production technologies in wood modification, as well as development of recycling technologies and systems for modified wood, related barriers, and challenges. Special emphasis was given to the cascading use of wood and related environmental impacts. The conference was a success and a wonderful opportunity to meet with colleagues, exchange ideas, and strengthen mutual cooperation.



## UPCOMING EVENTS

### 1. STSM

Short Term Scientific Missions are available from COST Action FP1407.

Projects should cover any of the activities covered by the Action, which include:

- modification of wood or other biobased products;
- Environmental aspects of wood or biobased materials processes, products, or services;
- related activities (i.e., modelling, user studies, characterisation, LCA, EPDs, etc.)

Applications should be submitted at least two weeks before the expected travel dates through the online system found at: <http://www.cost.eu/stsm>. The information required by the COST system includes: dates of the STSM, length of stay, title of planned scientific activity, short description of the work-plan, short CV and a budget request (to cover travel and living expenses during the STSM, at a maximum of 2500 EUR).

### 2. Conference

We kindly invite you to participate in the **COST Action FP1407 3rd Conference: "Wood modification research and applications"** at the Salzburg University of Applied Sciences in Kuchl/Salzburg, Austria.

The conference will focus on presenting innovative materials and process developments for various wood modification technologies, ecologic solutions and further related challenges with the focus of improving the properties of timber to guarantee a more sustainable usage of wood. Special emphasis will be given to innovative bio-friendly wood protection techniques and preservatives. The conference committee is also open to accept a variety of contributions with the target objective in line with the "green" principles and with particular interest for studies that deals with timber quality enhancements.

**When:** 14-15th of September, 2017

**Where:** Kuchl/Salzburg, Austria

#### CALL FOR ABSTRACTS

An extended abstract (1-2 pages) relevant to the topics of the conference should be submitted by email to Gianluca Tondi ([gianluca.tondi@fh-salzburg.ac.at](mailto:gianluca.tondi@fh-salzburg.ac.at)) no later than 26th June 2017. Additional information available on <http://costfp1407.iam.upr.si/en/events/cost-fp1407-3rd-conference>

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