# Ongoing R&D projects in COST member countries

January 2014

SWEDEN

# Sweden PARTICIPATION

January 2014

**WG 1 - *Material capability and enhancement***
SP, SWEREA, LTH, LTU

**WG 2 - *Functionality and performance***
SP, SWEREA, Innventia, KTH, LTH, UU

**WG 3 - *Adaptation and application***
SP, SWEREA

# Country
# Research institute/uni/company

January 2014

Luleå:
- Luleå University of Technology (LTU)

Skellefteå:
- SP

Stockholm:
- SP Technical Research Institute of Sweden (SP)
- Innventia
- KTH
- Wallenberg Centre

Uppsala:
- Uppsala University (UU)

Borås:
- SP

Gothenburg:
- Chalmers University

Lund:
- Lund University (LTH)

Växjö:
- SP
- Linnaeus University

# Sweden
# Field test sites

September 2013

Borås:
- Forest soil

Simlångdalen:
- Sandy soil

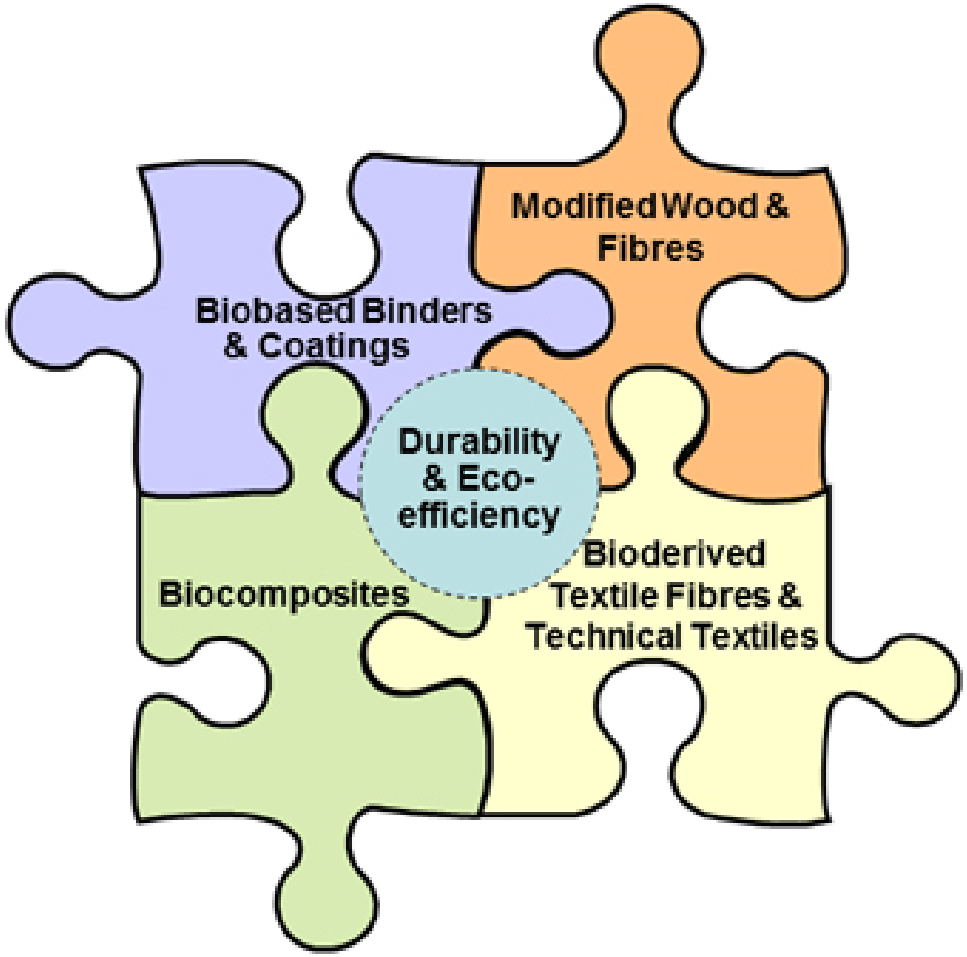
Ultuna
- Clay

**SP – Wood technology**

- **ECOBUILD** (www.ecobuild.se )
  Together with SWEREA IVF

  Several industrial projects

  - New composite materials
  - Durability



**Innventia**

- Composit materials:
  - The connection between moisture and properties
  - The mechanical properties of fibre-reinforced composite materials
  - Process development
  - Advanced bio-based matrices and multifunctionality
  - Stimuli-responsive materials

**KTH – Building Technology**

- Physico-chemical characterization of thermally modified wood using inverse gas chromatography (IGC)

**LTH – Lund University: Faculty of Technical Engineering**

- Modeling mould growth in building components as a tool for the building design processes
- Predicting service life of wood outdoors above ground

**UU – Dept. of Engineering Science: Applied mechanics**

- Material mechanics as a tool in development of dimensionally stable wood-fiber reinforced composites, party financed by WoodWisdom
- Mechanical performance of nanocellulose-based composites, micro- and nanomechanics, party financed by WoodWisdom
- Investigation of long-term properties in relaxation of cellulose press-boards. Fracture and deformation in foam-based biomaterials.
- Moisture driven crack growth in biofiber materials.

# Specialist equipment

January 2014

## SP - UV excimer laser

Ultraviolet (UV) excimer laser ablation technique suitable for precision micromachining of biobased materials such as wood and wood-based materials, particularly suitable for detailed micromorphological studies of wood-polymer interfaces and micro-crack formation in wood cell-walls. The present experimental set-up is a pulsing UV exciplex (excited complex) laser that applies a krypton fluoride (KrF) compound resulting in a laser light of wavelength 248 nm.

# Specialist equipment

January 2014

## SP - Artificial weathering

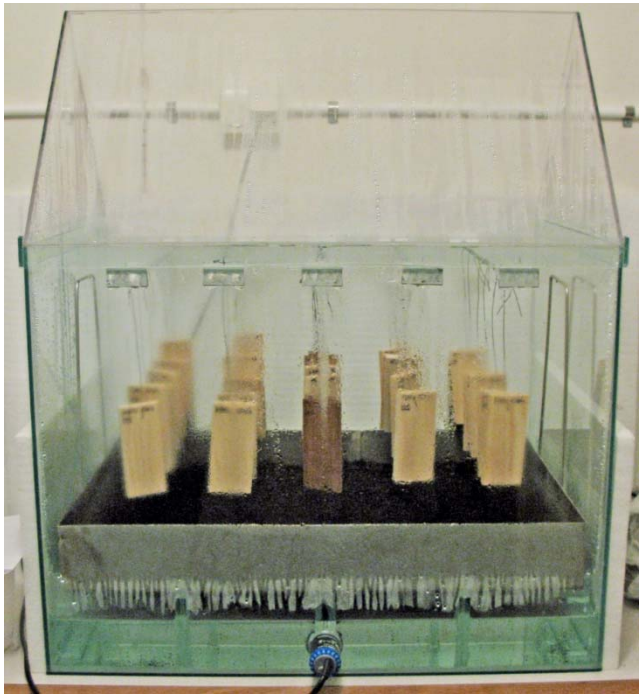

**ATLAS Weatherometer Ci 5000, Xenon-arc lamp**


**QUV, UV lamps at fixed wavelength**

# Specialist equipment

January 2014

## SP – ASTM environmental chambers for quick mould testing



**ASTM D3273**

## LTH - Isothermal calorimetry

Isothermal calorimetry (measurements of heat production rate) is used as a method to quantify the activity of mold and rot fungi. Measurements give a continuous monitoring of the respiration and can be used to follow how fungal specimens change their respiration rate during long periods of time (weeks), including when conditions (temperature, moisture state etc) are changed. Presently used to characterize rot and mold fungi with respect to moisture state and changes in moisture state, and to develop a new method to quantify colonization rate of rot fungi on wood based materials.

# Specialist equipment

January 2014

## KTH - Inverse gas chromatography

| | |
|---|---|
| **Name** | **IGC, Inverse gas chromatography** |
| **Model** | iGC Surface Energy Analyzer (SAE) |
| **Manufacturer** | SMS Surface Measurement Systems |
| **Tool Id** | |
| **Category** | Analytical |
| **First responsible** | Magnus Wålinder |
| **Responsible group name** | KTH - Building materials |
| **Area name** | Biobased building materials laboratory |
| **Description** | Inverse gas chromatography analysis of particulate and fiber materials. This particular equipment and analyzing software also provides the possibility to determine the surface energy distribution of heterogeneous and micro porous particle materials as well as to operate at different moisture conditions of the investigated stationary phase. |

# Specialist equipment

January 2014

## KTH - Tensiometer

| Name | Tensiometer |
|---|---|
| Model | Sigma 70 |
| Manufacturer | KSV Instruments |
| Tool Id | |
| Category | Analytical |
| First responsible | Magnus Wålinder |
| Responsible group name | KTH - Building materials |
| Area name | Biobased building materials laboratory |
| Description | Measurements of surface tension of liquids using a Wilhelmy plate or Du Nouy ring. Methods for estimation of wetting forces and dynamic contact angles on wood veneers, including liquid sorption, based on the Wilhelmy principle. |

# Wallenberg Wood Science Center

- Moisture Lab (at Innventia)
  - dynamic water sorption (DVS) equipment
  - dynamic mechanical thermal analysis (DMTA)
  - FT-IR spectroscopy facilities possible to use during mechanical loading
- Biopolymer/Composites Processing Lab
  - melt-mixers, powder mixers, extruders and injection molding machines
- NMR Laboratory
  - MR-imaging and solid-state NMR
  - Mapping moisture content and chemical distribution in wood
  - Controlled relative humidity and monitored as a function of time.

# Specialist equipment

January 2014

## UU – Uppsala University

- **X-ray computed microtomography Skyscan 1172** equipped with an in-situ tensile stage for 3D monitoring of deformation and damage mechanisms in wood-based materials on the microscale

- **Hitachi M1000 scanning-electron microscope with in-situ tensile machine** for monitoring wood micromechanisms

- **GOM Aramis digital-speckle photography** for 2D and out-of-plane full-field displacement and strain measurements during mechanical loading of biobased and other material

## LTH – Lund University, Building Materials, Building Biology Group

### Isothermal calorimetry

Isothermal calorimetry (measurements of heat production rate) is used as a method to quantify the activity of mold and rot fungi. Measurements give a continuous monitoring of the respiration and can be used to follow how fungal specimens change their respiration rate during long periods of time (weeks), including when conditions (temperature, moisture state etc) are changed. Presently used to characterize rot and mold fungi with respect to moisture state and changes in moisture state, and to develop a new method to quantify colonization rate of rot fungi on wood based materials.

# Specialist equipment

September 2013

| 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) |
| **SP** | x | x | x | x | | x | x | x | x | x | x |
| **Swerea** | | x | | | | x | x | x | x | | x |
| **Innventia** | | | | | | x | | | | | |
| **KTH** | | x | | | | x | | | | | |
| **UU** | | x | | | | x | | | | | |
| **LTH** | x | x | x | | | x | | x | | | |
| **Chalmers** | | | | | | | x | x | | x | x |

# Specialist equipment

September 2013

| | 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 |
| SP | x | x | | x | x | x | x | x | x | x | x |
| Swerea IVF | | | | | x | x | | | | x | |
| Innventia | | | | | x | | | | | | |
| KTH | | | | x | x | x | | | | | |
| UU | | | | | x | x | | | | | |
| LTH | x | x | | | x | x | | | | | x |