Experimental and Computational Micro-Characterization Techniques in Wood Mechanics – 

COST Action FP0802

Nov 2008 - Nov 2012
Main/ primary objectives

Increased understanding of wood microstructure and micromechanics

- by exploring and evaluating emerging techniques in the fields of physics, chemistry, materials and computer science

- in order to provide a strong basis for the development of innovative wood-based products in the future and for enhancing the use of the natural resource wood.
WG1 – Wood microstructure
Leader: L. Thygesen (DK), Deputy: S. Tschegg (AT)

**Topics:** molecular structure of cell wall (incl. bonds), molecular origin of time and moisture dependence of mechanical behaviour

**Methods:** microscopic and spectroscopic methods, X-ray techniques; wood modification and mechanical treatment

**Deliverables:** deepened understanding of microstructural (molecular) origin of mechanical behaviour, explanatory models

- Molecular structure of cellulose *(Chaplin 07)*
- Bleached spruce fibre *(Daniel et al. 07)*
- Distribution of wood polymers *(Fahlen & Salmén 05)*
WG2 — (Hygro-)mechanical properties
Leader: M. Eder (GE), Deputy: O. Arnould (FR)

**Topics:** (micro)structure function relationships, hygro-thermo-mechanical properties of cell wall and its components, in-situ tests

**Methods:** micro-tensile testing, DMA, nano-indentation, SAM, NMR, Dynamic Vapour Sorption

**Deliverables:** hygro-thermo-mechanical properties of wood across several length scales under different environmental conditions

Micro-tensile testing stage and fibre fracture zone *(Eder et al. 07)*

Nano-indents in wood cell wall *(Jäger 06)*

NMR images of moisture distribution *(Almeida et al. 08)*

Initial state before pressure application

270 minutes of drainage
WG3 – Modelling of the material behaviour
Leader: K. Gamstedt (SE), Deputy: M. Jarvis (UK)

**Topics**: multiscale approaches, hygro-thermo-mechanical couplings, inverse parameter identification, virtual testing

**Methods**: finite element simulations, homogenisation techniques, composite micromechanics, molecular dynamics

**Deliverables**: predictive integrated computer models for hygro-thermo-mechanical behaviour

Molecular dynamics simulation of simultaneous drying and shearing *(Navi et al. 02)*

Deformation at compressive loading in R-direction *(Ransgri et al. 04)*

Multiscale model for wood *(Hofstetter et al. 05)*
<table>
<thead>
<tr>
<th>Signatures</th>
<th>MC members</th>
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Further information

- **Action webpage:** [http://cost-fp0802.tuwien.ac.at](http://cost-fp0802.tuwien.ac.at)

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