# Book of Abstracts

## COST Action FP1407 - 3rd Conference

## „Wood modification research & applications“

Kuchl, September 14-15, 2017

**Salzburg University of Applied Sciences**
**Forest Products Technology & Timber Constructions**

in collaboration with
the Society of Wood Science and Technology &
the European Conference on Wood Modification





# COST Action FP1407

***Understanding wood modification through an integrated scientific and environmental impact approach (ModWoodLife)***

# Wood modification research & applications

*Third COST Action FP1407 International Conference*

*Kuchl, Austria*

*14-15 September 2017*

**Editors:** Gianluca Tondi, Marko Posavčevič, Andreja Kutnar and Rupert Wimmer

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# Improvement of wood heat treatment via an acoustic field

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Torrefaction is a wood thermal modification process which improves wood properties as moisture content, grindability and material homogeneity. This mild form of pyrolysis is carried out in inert atmosphere under relatively low temperatures (from 200 °C to 300 °C). Resulting thermodegradation reactions of wood polymers are essentially endothermic. Various technologies were developed and implemented in the industry (Acharya et al. 2012). The present work is devoted to develop an innovative technology aiming to improve the wood heat treatment coupling an acoustic field delivered by a sound speaker and temperature. The lab-scale reactor is illustrated on Fig. 1. Device development, characterization and first experimental results will be presented. A acoustic behaviour characterization and mapping within the reactor's cavity was executed.

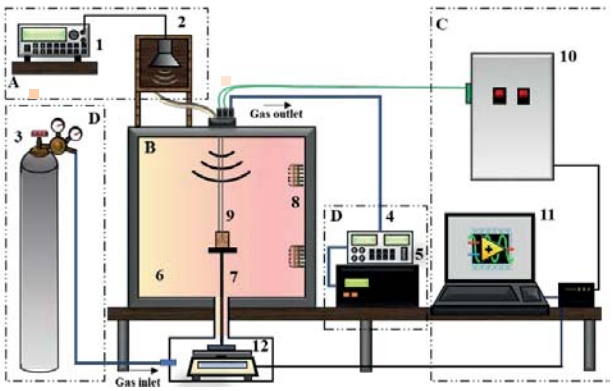


Figure 1: Experimental torrefaction system diagram: *1) Wave generator; 2) Speaker 3) $N_2$ cylinder; 4) Gas pump; 5) $O_2$ control; 6) Reactor chamber; 7) Sample support; 8) Electric resistances for heating; 9) Thermocouples; 10) System control; 11) Computer; 12) Weight balance.*

This characterization included the flow rate and acoustic intensity measurement at the exact sample's location in the reactor. The analyses enabled the identification of optimal acoustic frequency and intensity to produce a maximum acoustic flux around the wood sample. It has been assumed that the acoustics field within the torrefaction reactor could have the capability to modify the pressure distribution and heating medium velocity field around the wood sample modifying such way the wood surface thermal boundary layer and improving convection heat transfer. Experiments were carried out at 250 °C for 120 min under influence of two acoustic frequencies 1810 and 2696 Hz (103 and 107 dB intensities respectively). Experimentally recorded profiles of wood centre's temperature and mass yield are graphically illustrated on Fig. 2. A maximum temperature gradient of 2 °C was observed between treatments with and without acoustic. These results indicate that the acoustic fields affect the heat transfer under similar experimental conditions and consequently wood thermodegradation. Next step will be to analyse different parameters as temperature, biomass species and frequencies variations. This will be subject to new investigations and research publications.

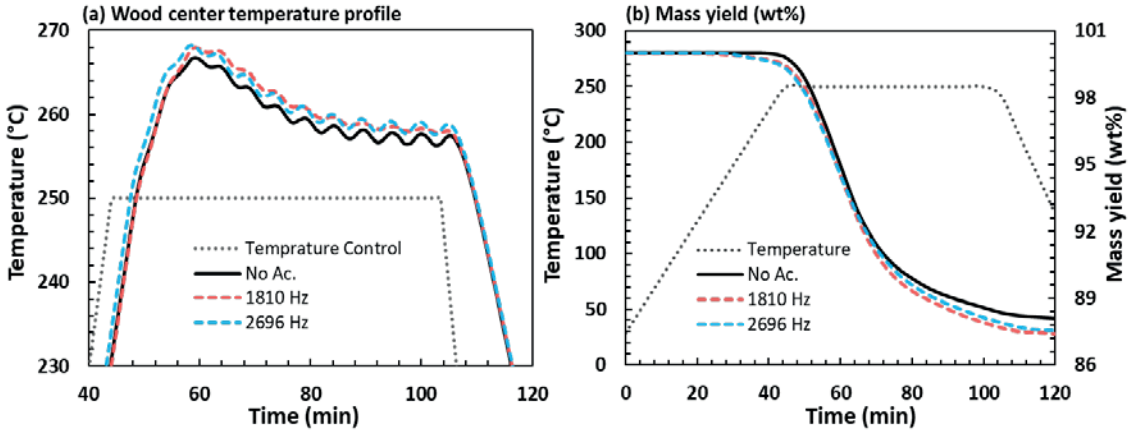


Figure 2: Thermal degradation at 250 °C under acoustic influence.

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