

# VALBEECH



## Valorizing beech wood through innovative and environmentally friendly chemical modification treatments

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**Context** — Beech (*Fagus sylvatica*) is one of the most important hardwood species in France and in Europe. Used mainly for furniture's manufacturing, its uses in outdoor conditions are limited due to its low natural durability and weak dimensional stability. Largely underexploited, valorization of beech wood implies development of protection methods to improve its properties in exterior conditions.

**Objectives** — The objective of this study was to develop new methods of beech modification based on the utilization of waterborne solution of different derivatives of glycerol and polyglycerol susceptible to polymerize in the wood structure after impregnation. Combination of chemical with thermal treatment (150, 200, 220°C) under inert condition will be investigated to evaluate the potential synergy between these two treatments and in order to develop cheaper treatment. The general goal of this research is to develop more environmentally acceptable non biocide wood preservation systems based on utilization of chemical of renewable origin.

**Approach** — Beech wood samples were impregnated with aqueous solutions containing 10% of different vinylic derivatives of glycerol or polyglycerol and subjected to curing at different temperatures (103, 150, 200 et 220°C). Properties of modified wood samples were investigated to evaluate the effect of these treatments, especially as concerns the substitution of polyglycerol by glycerol more easily accessible.

**Key results** — Characterizations realized on wood samples treated with the different treatments developed up to now allowed to highlight evolutions of wood properties in agreement with expected properties:.

- Decrease of the wettability of the wood
- Improvement of wood dimensional stability
- Decrease of wood mechanical properties (MOE and MOR)
- Improvement of the durability towards the wood decaying fungi
- Durability towards termites in the course of evaluation

**Main conclusions including key points of discussion** — The results obtained on laboratory scale allowed to confirm the possibility of associating treatments of chemical modification with low concentration of chemical with heat treatment to improve wood properties. Besides, the use of the polyglycerol instead of the glycerol influences weakly the obtained results allowing to envisage treatments using directly the glycerol of easier access.

**Future perspective** — Pursuit of the works in the preindustrial scale within the framework of the collaboration organized with Professor Holger Militz in Göttingen from January, 2018.

**Valorisation** —

Feasibility study of utilization of Commercially Available Polyurethane Resins to Develop Non-biocidal Wood Preservation Treatments. Mubarak M., Sudo Hadi Y., Suryana J., Darmawan W., Simon F., Dumarçay S., Gérardin C., Gérardin P. *Eur. J. Wood Prod.* 75:877-884, 2017

Valorization of Beech Wood through Development of Innovative and Environmentally Friendly Chemical Modification Treatments. Mahdi Mubarak, Stéphane Dumarçay, Holger Militz, Philippe Gérardin. 6<sup>èmes</sup> Journées Annuelles du GDR Sciences du Bois, 21-23 novembre 2017, Nantes (Poster)

Valorization of Beech Wood through Development of Innovative Friendly Environmentally Chemical Modification Treatments. Mahdi Mubarak, Stéphane Dumarçay, Holger Militz, Philippe Gérardin en cours de rédaction pour *Wood Sciences and Technology*