8[TH] HARDWOOD CONFERENCE

WITH SPECIAL FOCUS ON "NEW ASPECTS OF HARDWOOD UTILIZATION - FROM SCIENCE TO TECHNOLOGY"

25-26[th] October 2018
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Volume 8

Editors: Róbert Németh, Alfred Teischinger, Peter Rademacher, Miklós Bak

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Now, the 8th Hardwood Conference has the pleasure to be linked with one of the current COST Actions, **FP1407**: Understanding wood modification through an integrated scientific and environmental impact approach (ModWoodLife).

As part of the interaction between this Action and Hardwood Conference, the following presenters have been provided with assistance for their involvement at this conference:

Pavlo Bekhta (Ukraine), Fatima Bouchama (Belgium), Lukas Emmerich (Germany), René Alexander Herrera Diaz (Spain), Edo Kegel (Netherlands), Edgars Kuka (Latvia), Andreja Kutnar, (Slovenia), Rastislav Lagana (Slovakia), Jaka Pečnik (Slovenia), Luigi Todaro (Italy), Nebojša Todorović (Republic of Serbia), Aleš Zeidler (Czech Republic)

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Thermal properties of thermo-treated native black poplar wood

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Keywords: Thermo-treatment; native poplar; insulation; conductivity, diffusivity

ABSTRACT

As is generally known wood undergoes changes as a consequence of thermal modification. Extensive research have been published on the field of thermal modification but thermal properties of thermally modified underutilized wood species such as native poplar wood (*Populous spp*) has not been deeply reported. Native poplar such as black poplar (*Populus nigra L*), widely distributed across Europe, Asia and northern Africa is considered as an important species of floodplain forests (De Rigo et al 2011) and is one of the cheaper hardwoods. Poplar wood is rarely used in the production of fine furniture, but extensively used for pulp and panel productions that result in an important economic impact worldwide. In order to develop models for predictions in different applications such as facade or fire resistance, reliable data of thermal behaviour of thermally modified wood at high temperatures are needed (Kol and Sefil 2011).

In this work the thermal behaviour of native black poplar after thermal modification according to (Todaro et al 2017) at different temperatures (180 °C, 200°C and 220 °C) was analysed and compared to reference samples (Fig. 1).

Measurements of thermal conductivity and thermal diffusivity in radial direction of poplar wood boards have been performed with ISO-MET 2104 at room temperature. The evaluation was based on analysis of the temperature response of the analysed material to heat flow impulses (Bekhta and Dobrowolsk 2006). Porosity determination was carried out using the automatic pycnometers Ultrapyc 1200e (Co. Quantachrome, USA).

The results (Table 1) indicate that the thermal conductivity of modified wood samples stay unchanged at 180°C but is significantly changed after a modification occurred at 200 or 220°C. Regarding the porosity, only in the samples treated at 220 °C showed a significant difference with the control. This evidence could be caused by the large degradation of wood structure after modification at high temperature. Mass loss increased and both density and equilibrium moisture content dropped down significantly after modification. Preliminary results showed that for selected purposes, where high insulation is needed such as saunas, windows, and for façades elements the use of this material might be a better option than untreated wood.

Table 1: Thermal propertie, porosity, density, moisture content and mass loss of poplar wood treated at different temperatures. Results are for means, (standard deviation), and letter ranking per Duncan's multiple range test for significance level of 0.0. Differences among mean values with same letter are not significant.

	N	T.C. (W/m K)		T.D. (m^2/s)		Porosity (%)		Mass Loss		Density (kg/m^3)		U (%)
CTRL	18	0.124 (0.004)	a	0.172 (0.003)	a	61.3 (1.53)	a	-		441.3	a	9.9
180 °C	18	0.118 (0.004)	ab	0.173 (0.007)	a	59.0 (2.0)	a	4.40 (0.20)	a	406.8	b	7.3
200 °C	18	0.111 (0.004)	b	0.188 (0.002)	b	59.0 (1.73)	a	7.88 (0.77)	b	407.6	b	5.2
220 °C	18	0.100 (0.004)	c	0.189 (0.004)	b	53.3 (0.58)	b	9.67 (0.57)	c	401.5	c	5.0

T.C. Thermal conductivity, T.D. Thermal diffusivity; N number of samples

Figure 1: Samples preparation

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