

Modification of wood by oil heat treatment

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Introduction

Pannonia Poplar (*Populus x euramericana* Pannónia) and Robinia (*Robinia pseudoacacia* L) wood was heat treated at 160°C and 200°C in vegetable oils. The treatments were performed in hot oil bath using sunflower linseed and rapeseed oil for 2h, 4h and 6h durations. The dimensions of the samples were 18mm×40mm×220mm. The main aim of our research work was to improve the dimension stability (ASE) of the two investigated plantation timber species. Our further task was to show the influence of the treatment on different mechanical properties (MOR, MOE, impact bending, compression strength), and on the colour change.

Mechanical properties

All the investigated mechanical properties, except impact bending changed in different manner by Robinia and Poplar. Contrary to our expectation in some cases the mechanical properties did not decrease, but reached higher values. The significant reduction of impact bending indicates the brittleness of treated material (Fig. 1).

Colour properties

The treatments caused significant colour changes by both wood species. The colour properties were determined in the CIELab system. The higher temperatures and longer durations led to darker appearance by both wood species. The colour properties changed in different manner by the two wood species, which can be explained by the higher extractive content in Robinia compared to Poplar. Robinia showed more pronounced colour changes compared to Poplar (Fig. 2).

ASE – Anti Swelling Efficiency

The dimensional stability could be enhanced by both wood species significantly in radial and tangential directions as well. The dimension changes decreased by increased treatment temperature and duration (Fig.). The enhanced stability against shrinking and swelling can be explained by the applied heat, and in a smaller extent by the hydrophobic property of the oil itself.

Conclusions

- The mechanical properties generally decreased by Robinia and Poplar as well
- Compression strength increased by all treatments in case of Poplar, and by treatments at 160°C in case of Robinia
- The impact bending decreased by both wood species as the material became more brittle
- ASE values close to 60% could be reached
- The colour for both wood species got darker, but in a different extent.
- The colour of Robinia changed more intensive compared to Poplar
- As a consequence of rapid temperature changes in the material, cracks occurred in the wood of Robinia, while no cracks were detected by Poplar. In order to eliminate the cracks in Robinia wood we recommend to treat the wood with lower moisture content.
- The diffuse porous Poplar with open vessels absorbed considerable amount of oil, while the ring porous Robinia with closed vessels did not show oil uptake.
- According to our investigations no differences could be proved for the effect of three investigated oil types.

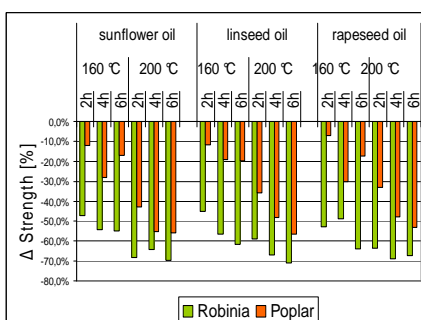


Fig. 1: Change of impact bending

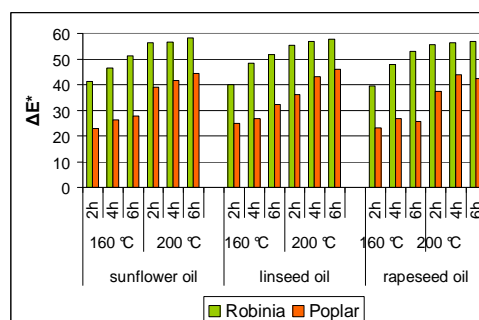


Fig. 2: Change of total colour difference

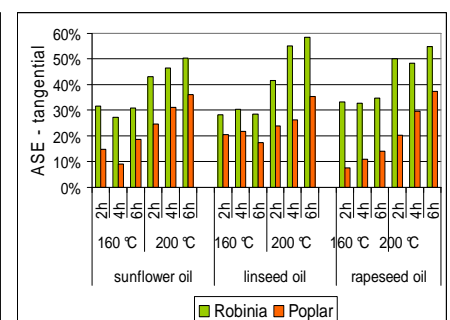


Fig. 1: Change of swelling