

CHANGES IN THE CHEMICAL AND MECHANICAL PROPERTIES OF ASH-TREE WOOD AFTER HYDROTHERMAL MODIFICATION

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THE AIM

To investigate the thermal modification of ash-tree, to ensure a longer lifetime and expand it's applicability for producing products with a higher added value.

THE TASK

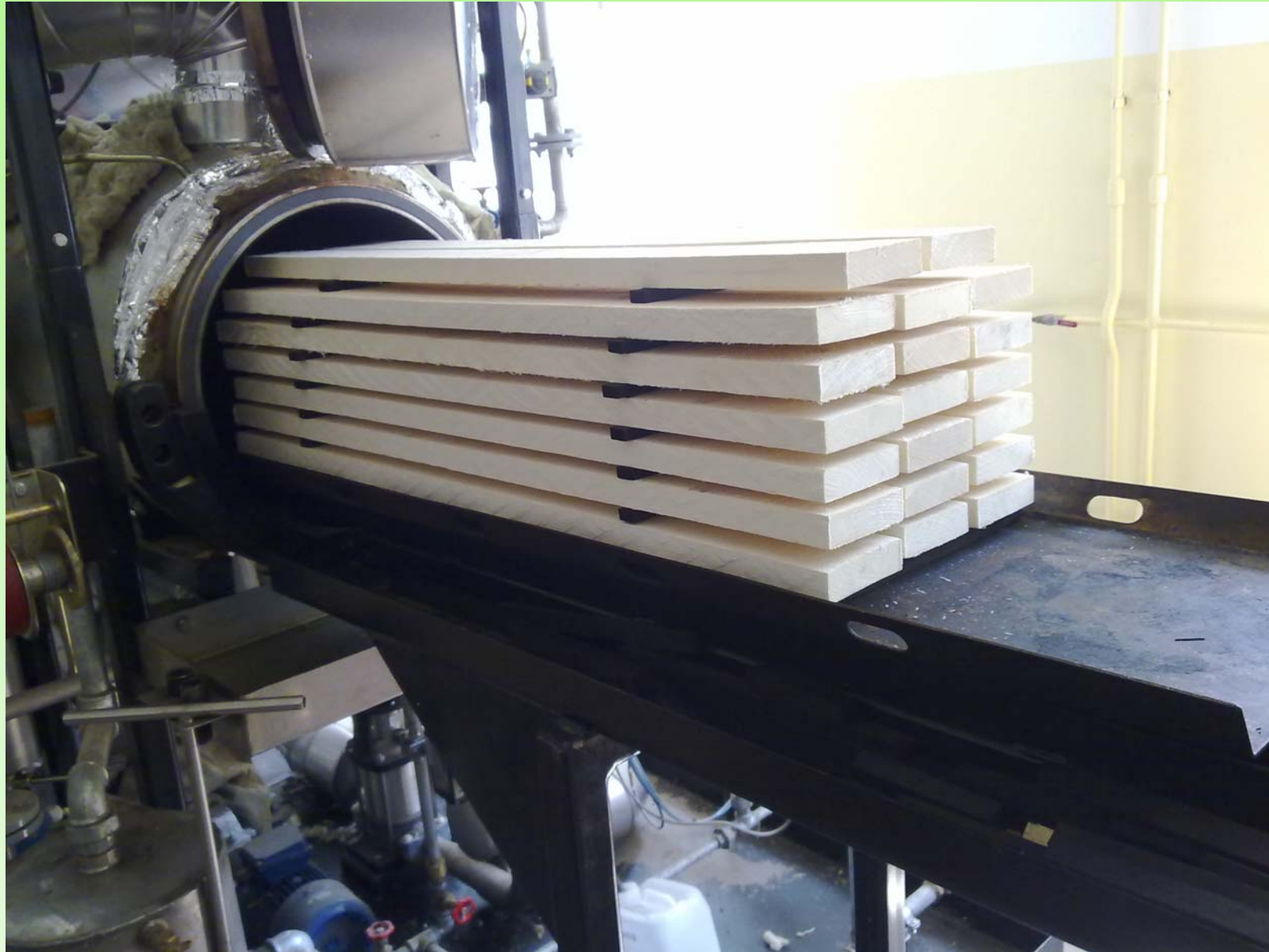
To determine the effect of the hydrothermal treatment on the chemical structure and mechanical properties of ash-tree wood, to estimate optimal treatment regimes (temperature, time).

INTRODUCTION

The total stock of deciduous trees in the Republic of Latvia is ~250 million m³, from which approximately 2% is ash-tree. In the recent years, studies have been initiated in Latvia on the use of soft deciduous wood for producing products with a higher added value, but practically, there are no studies on the thermal modification of hard deciduous wood (ash-tree, oak). To forecast the properties of the modified material as well as its stability in service conditions, it is important to understand the processes occurring in wood as a result of the thermal action.

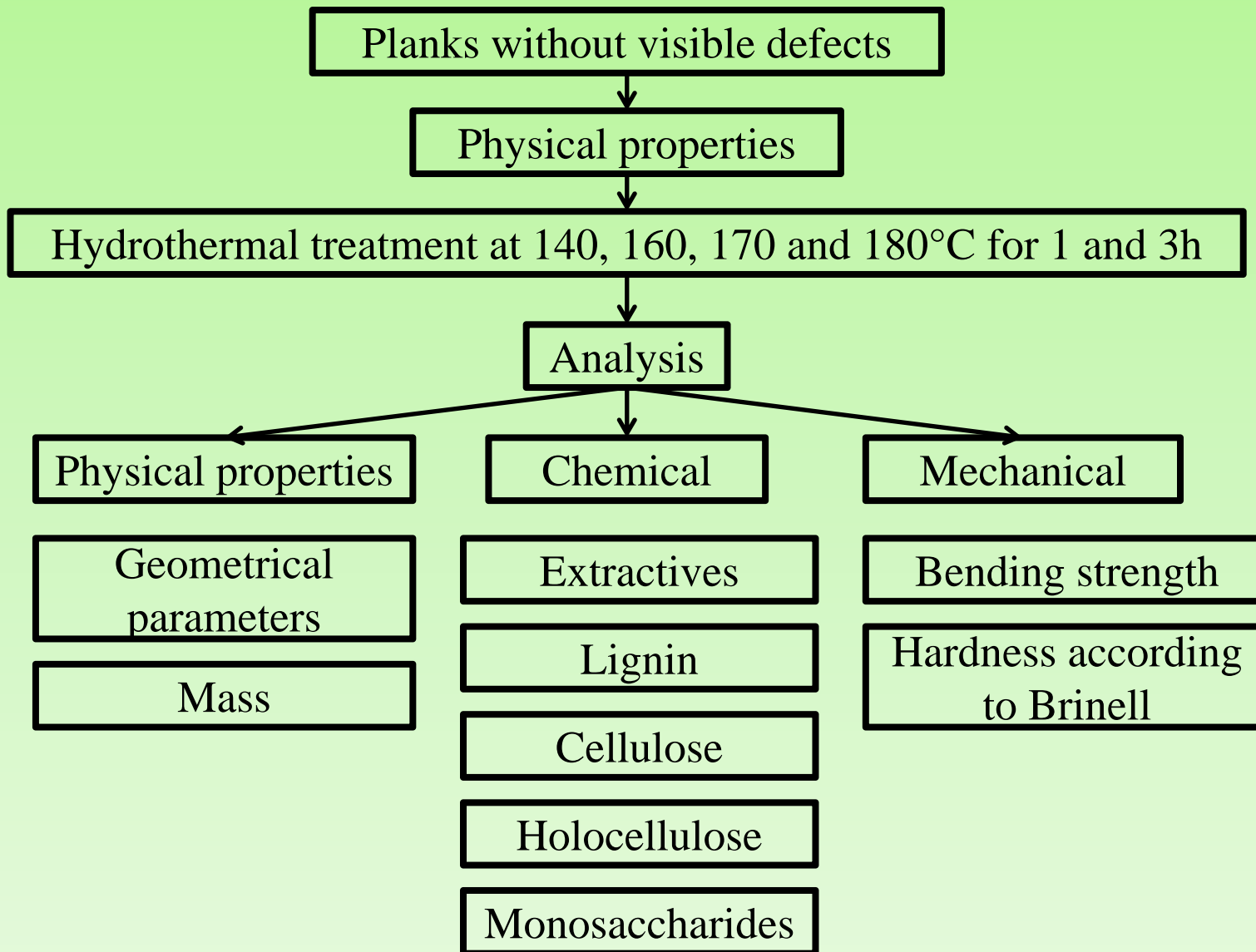


MATERIALS AND METHODS

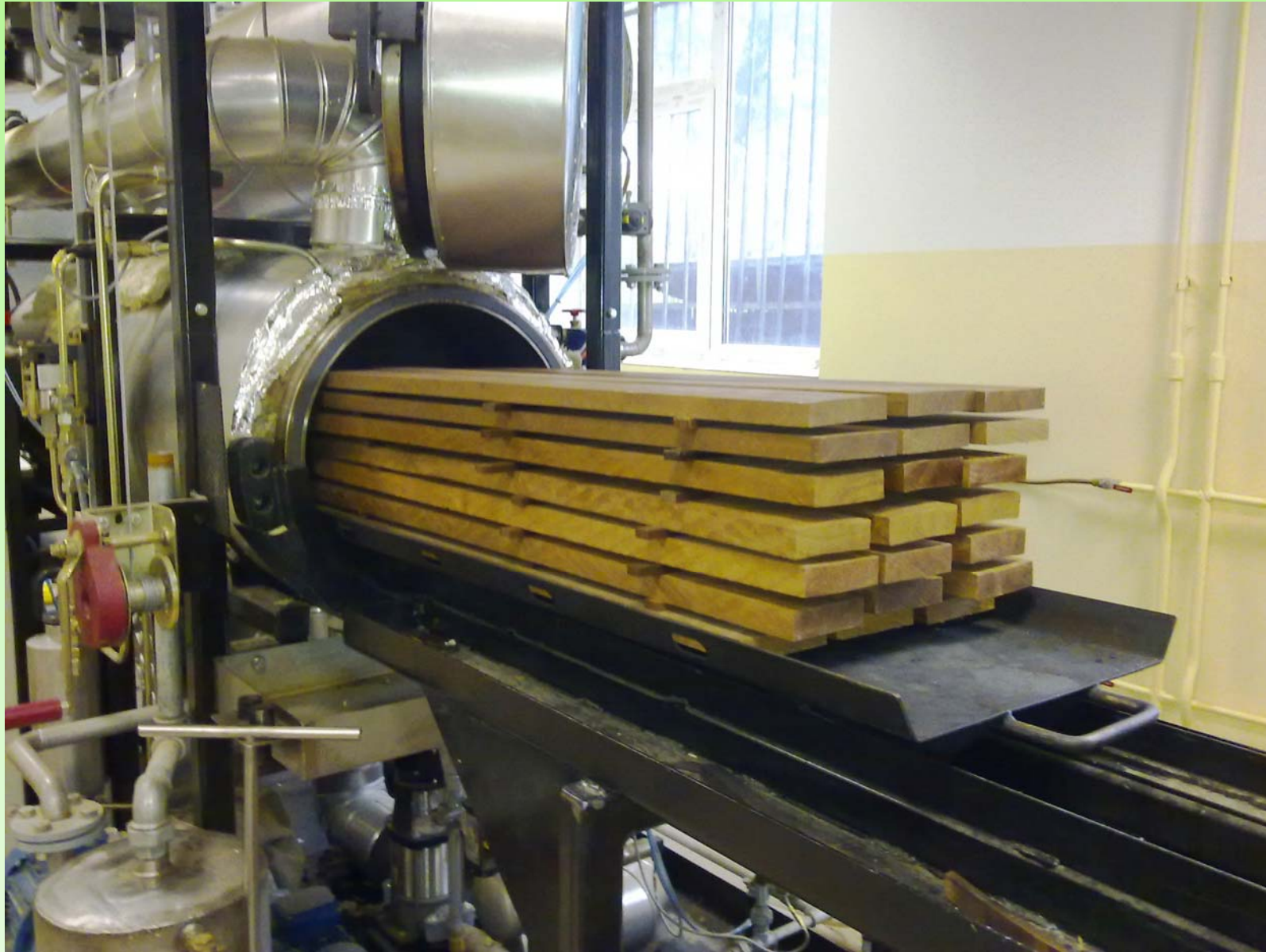


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Materials and methods

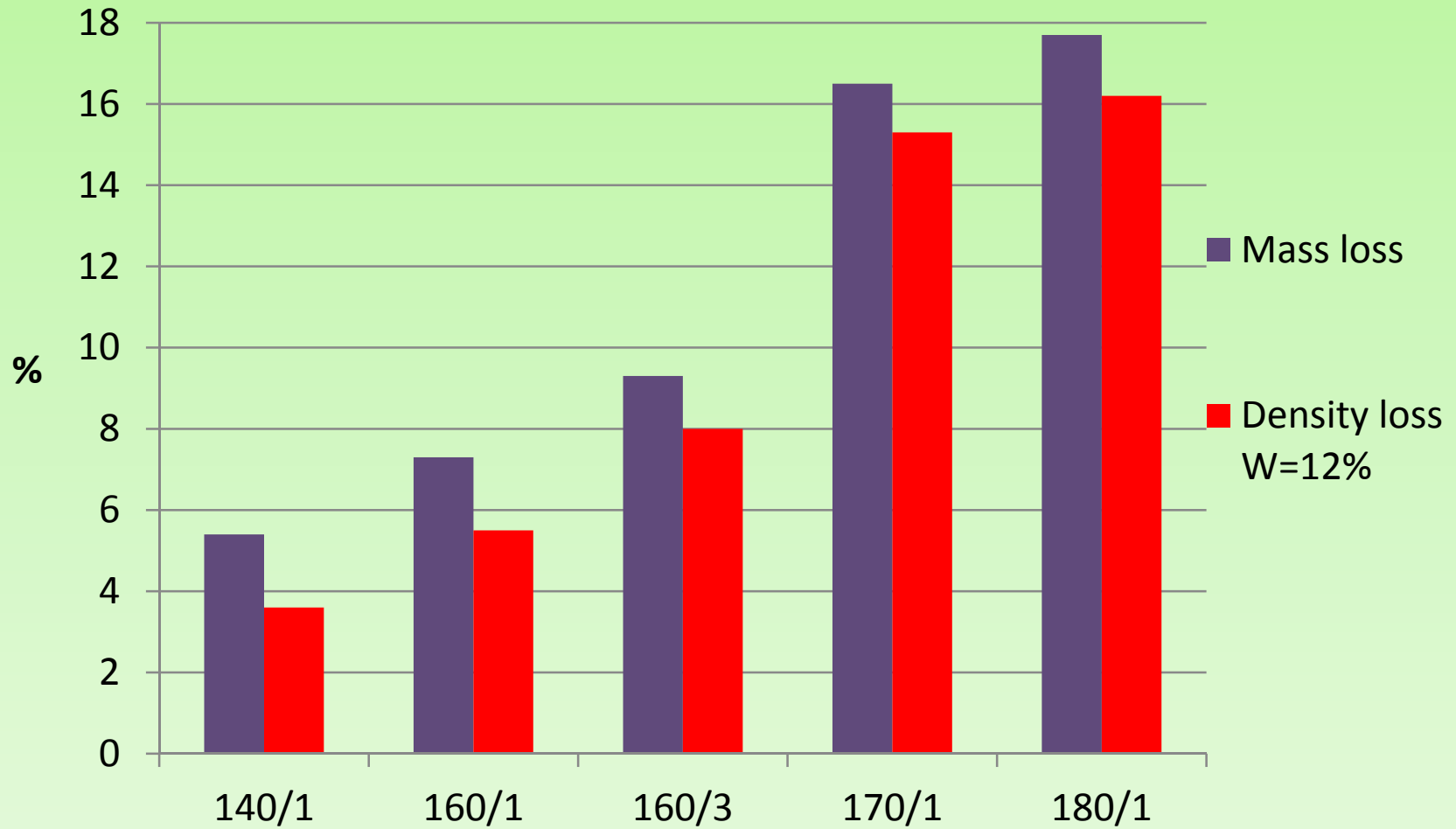


RESULTS AND DISCUSSION

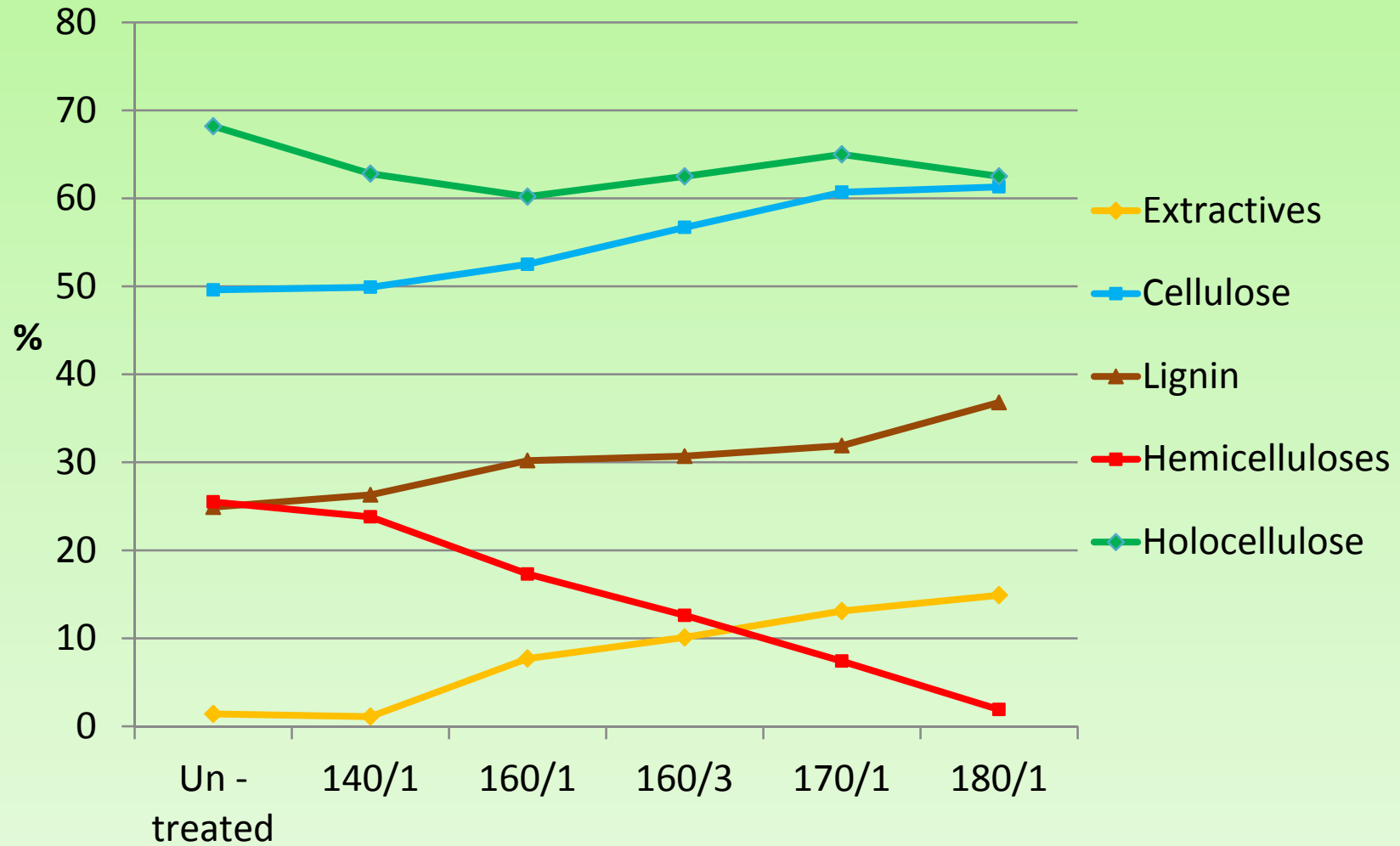


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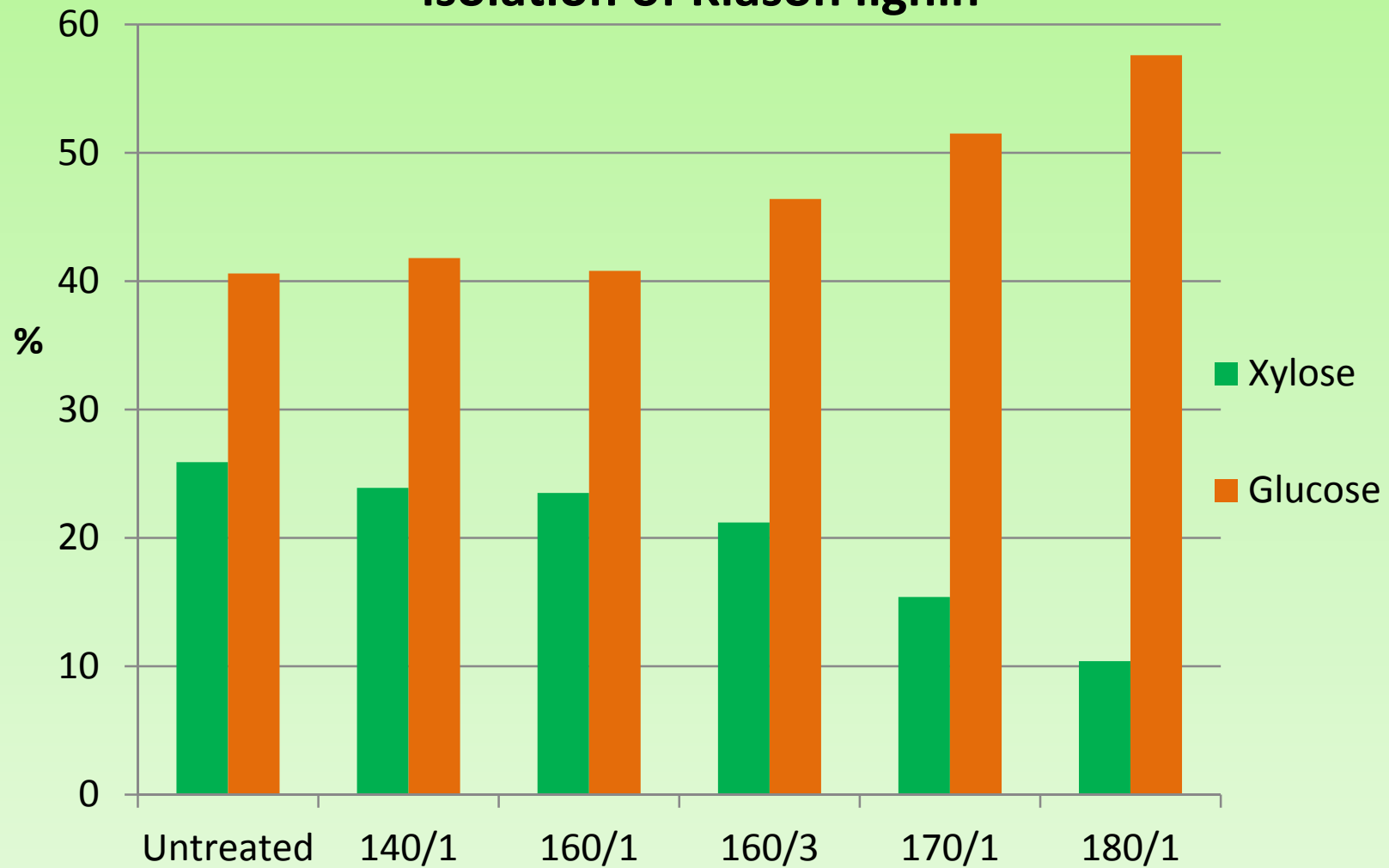
Changes in the physical parameters of ash-tree wood depending on the modification temperature



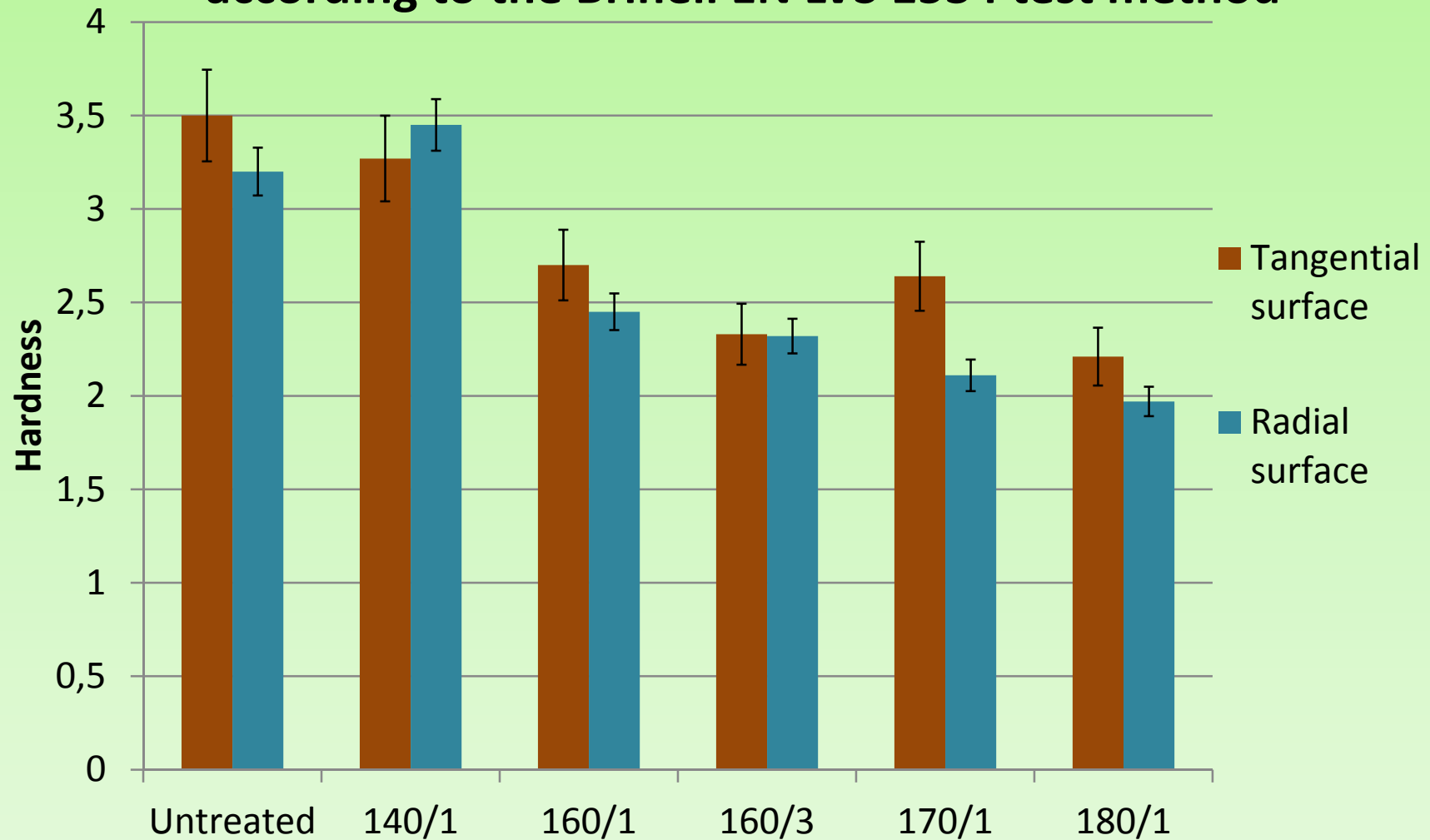
Chemical composition of ash-tree wood depending on the modification temperature



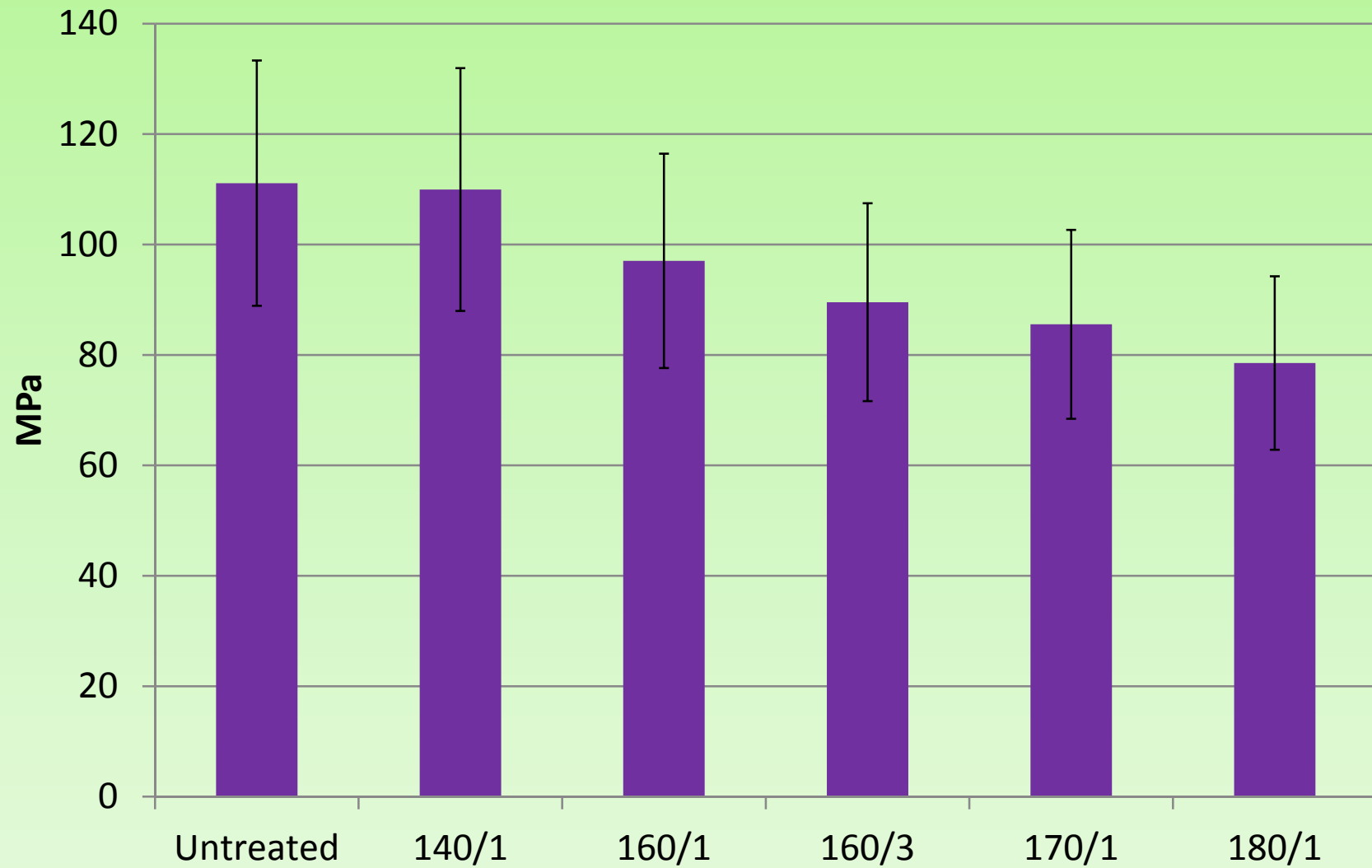
Monosaccharides in the filtrate after the isolation of Klason lignin



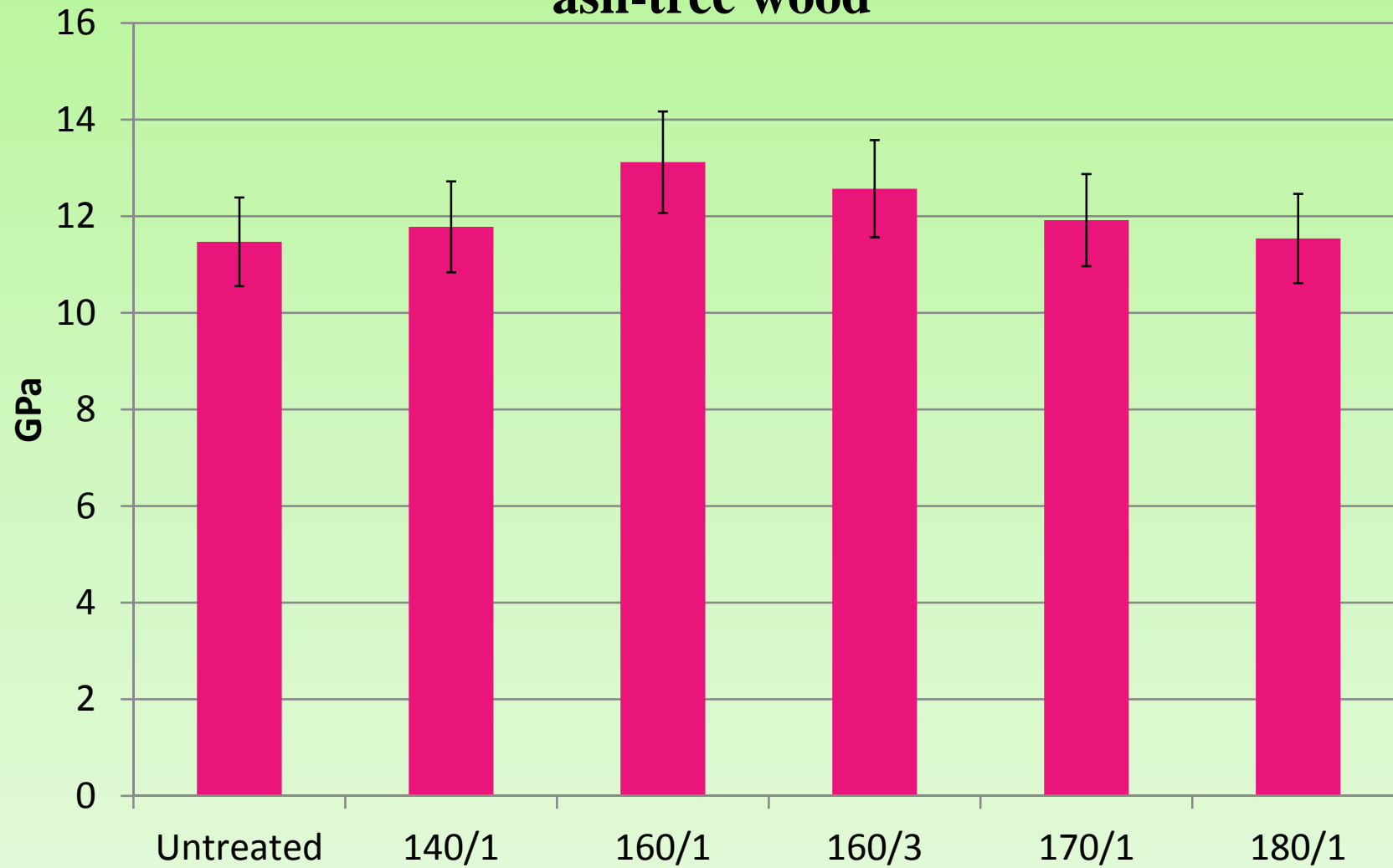
Hydrothermally treated ash-tree hardness according to the Brinell EN LVS 1534 test method

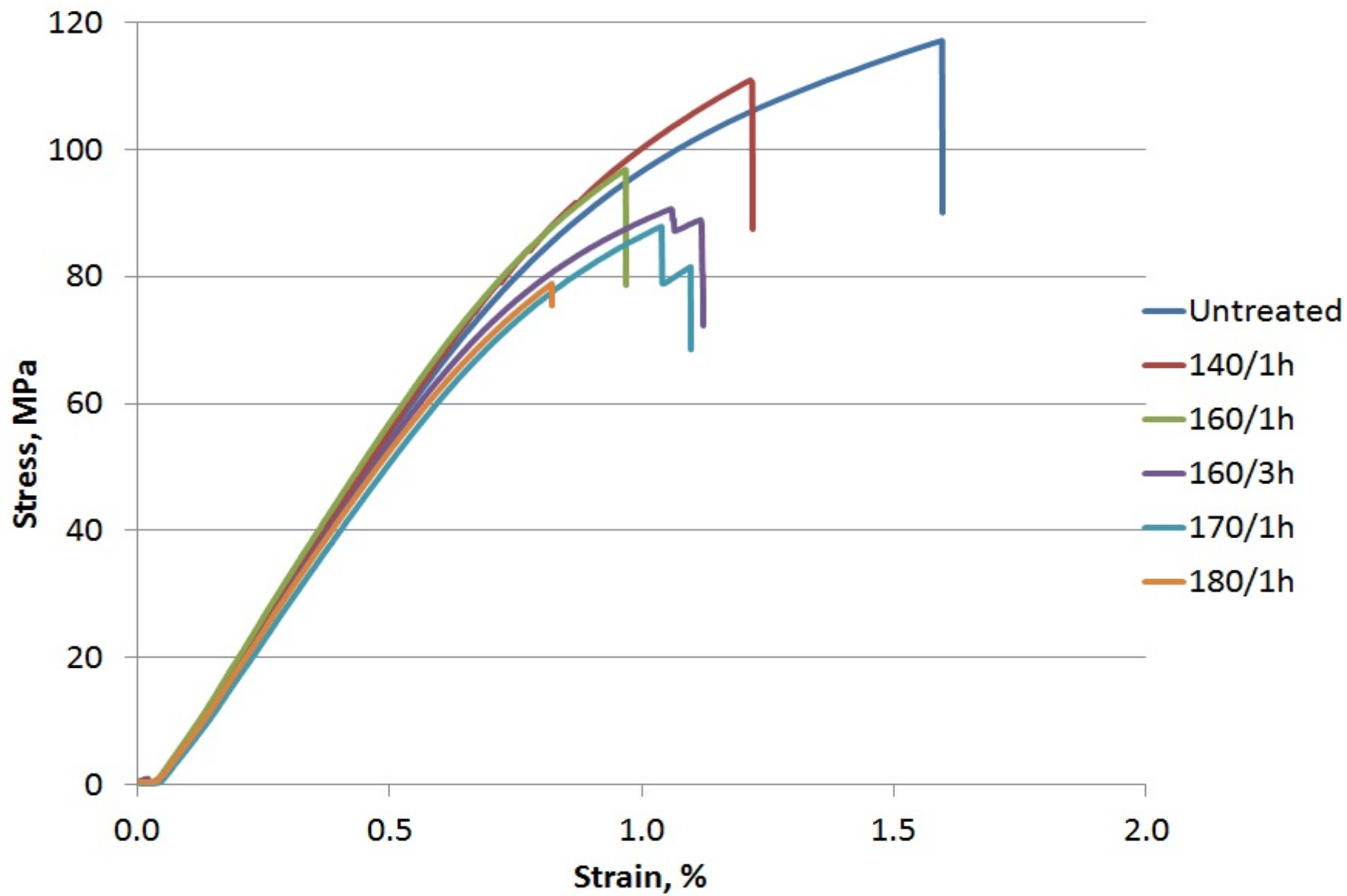


Bending strength of hydrothermally treated ash-tree wood



Modulus of elasticity of hydrothermally treated ash-tree wood





CONCLUSIONS

With increasing hydrothermal treatment temperature for ash-tree wood:

1. Density decreases and mass losses grow;
2. Relative amounts of extractives, cellulose and lignin grow. No linear relationship is observed for the changes in the holocellulose amounts. The calculation testifies that the amount of hemicelluloses decreases.
3. In the filtrate, after the isolation of Klason lignin, the relative glucose amount increases, and the relative amount of xylose decreases.

4. Surface hardness, both in tangential and radial direction, decreases. Tangential surface hardness is higher by 5-20% than that for the radial surface.
5. Modulus of elasticity grows at the first treatment regimes (140°C and 160°C/1h), then decreases. Bending strength decreases.

ACKNOWLEDGEMENT

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Thank you for your attention!