

Influence of particles fraction used for surface layer on particleboard strength

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Abstract: *Influence of particles fraction used for surface layer on particleboard strength.* In the present paper the investigation results of the influence of particles fraction, used for surface layer production, on particleboard strength, are described. The particles were produced from willow *Salix Viminalis* L. and black locust *Robinia Pseudoacacia* L. One layer panels were produced and their tensile strength was measured. There is no significant difference between the strength of the panels produced from the particles with fraction 2/1 and 1/0.5 mm. The panels produced from industrial particles dedicated to surface layers had the lowest strength.

Keywords: Particleboard, fibrous chip, particle, surface layer, fraction.

INTRODUCTION

Development of wood based panels results in intensified demand for raw materials. In the last five years production of particleboard in Poland increased about 25 % (www.faostat.fao.org). Thus, it seems obvious that search for new resources is reasonable and justified. In literature there are many reports on utilizing of fast-growing species like willow and poplar (Czechowska et al. 2010, Frąckowiak et al. 2008, Kowaluk et al. 2010, Kuzovkina and Volk 2009) It must be stressed that alternative raw materials usage usually results in a change of mechanical and physical properties when compared to the standard boards (Niemz 1993). Also the change of the fraction of the chips in the core layer of the particleboards changes strength and other parameters of the panels (Warmbier et al. 2010).

The aim of this work was to investigate the influence of particles fraction used for surface layer on particleboard strength. Because the surface layers of the 3-layer particleboard are responsible for tension/compression strength, the tension strength of single layer panels produced from particles for surface layers was investigated. The scope of research the particles produced from willow *Salix Viminalis* L. and black locust *Robinia Pseudoacacia* L. were used, as well as industrial particles dedicated to surface layers.

MATERIALS AND METHODS

Three types of particles were used to panels production: black locust, willow and industrial particles. The particles with the shape of fibrous chips from willow and black locust were produced on Pallmann mill equipped with defibrator instrumentation. The fractions of the particles from willow and black locust, used in the investigations, were 1/0.5 mm and 2/1 mm. The fraction of industrial particles, according to fig. 1a was 1/0.5 mm with significant share of smaller parts, i.e. dust. The results of the particles size mesh analysis is shown on fig. 1a. The single layer 10 mm thick panels were produced with the assumed density 800 kg/m³, resination 12%, with the use of industrial UF resin. The pressing parameters were

close to industrial. After the panels production the samples with the shape shown in fig. 1b were taken. The dimensions of the sample in the waist area were about 40x10 mm. Prior to mechanical testing the samples were stored in climatic room under air parameters 20°C/65% R.H. The samples were subjected to tension on the typical testing machine. For each fraction 15 samples of the panels were tested. The direction of tension was parallel to the long side of the sample. The reason of such testing was type of the forces appear in surface layers of 3-layer particleboard during bending, which are tensed/compressed.

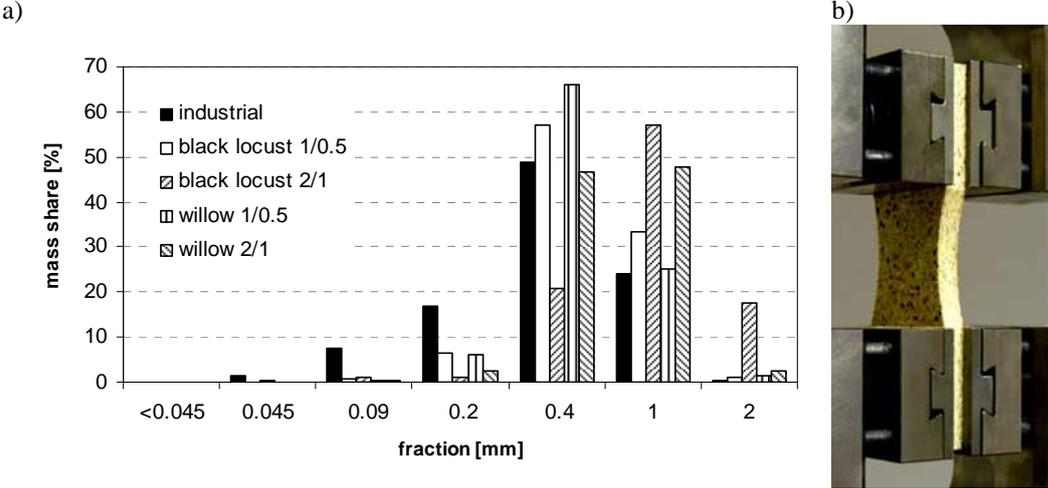


Fig. 1. The particles mass fraction share (a) and shape of the samples (b).

RESULTS AND DISSCUSION

The results of the measurement of the tensile strength of the panels produced from willow and black locust particles, as well as from industrial particles, are displayed on fig. 2. As it is shown, the lowest value of the tensile strength of the investigated panels was for particleboards produced from industrial chips. There was no significant difference between the tensile strength of the panels produced from willow and black locust chips.

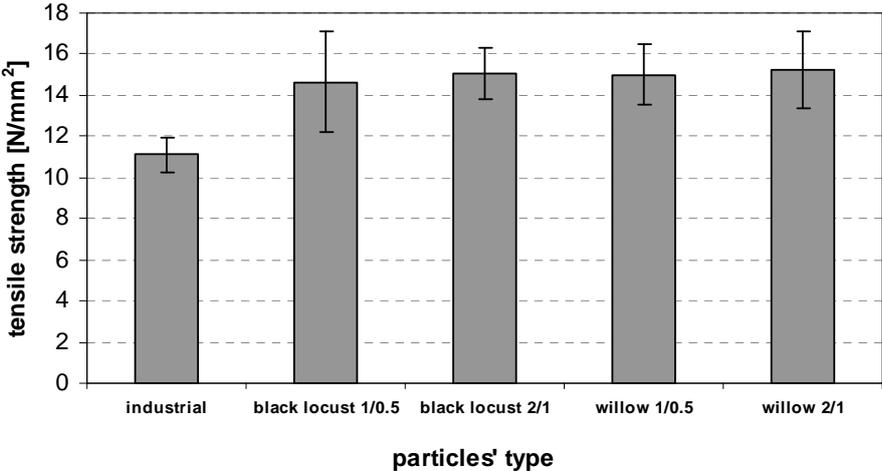


Fig. 2. The values of tensile strength of investigated panels.

The lowest value of the strength of panels produced from industrial chips can be explained by the presence of high amount of small fractions of particles. The specific surface of such fractions is higher than for larger particles. The resination of all investigated panels was the same. The amount of resin was too small to bond the industrial particles, including smallest parts and dust. To reach the strength comparable to other investigated panels, larger amount of resin should be used to produce the panels from industrial particles.

CONCLUSION

On the basis of the above mentioned results, the following conclusions and remarks can be formulated:

- there is no significant influence of particleboards' surface layers particles fraction on the tensile strength of the panels produced from them,
- the tensile strength of the panels produced from industrial particles dedicated to surface layers was significantly lower compare to the panels produced from investigated raw materials.

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Streszczenie: *Wpływ frakcji cząstek warstw zewnętrznych płyt wiórowych na wytrzymałość płyt.* W niniejszym artykule opisano wyniki pomiarów wytrzymałości na rozciąganie jednowarstwowych płyt wiórowych z różnych frakcji wiórów. Wióry wytworzono z wierzby *Salix Viminalis* L. oraz robinii *Robinia Pseudoacacia* L. Użyto również cząstek przemysłowych przeznaczonych na warstwy zewnętrzne płyt wiórowych. Badania wykazały niższą wytrzymałość na rozciąganie płyt z wiórów przemysłowych. Nie stwierdzono istotnych różnic w wytrzymałości płyt z różnych frakcji wiórów z wierzby i robinii.

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