

PHYSICAL CHARACTERISTICS OF MULTILAYERED PLYWOOD MADE FROM BEECH VENEERS

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ABSTRACT

The researches conducted were directed to production of stable multipurpose plywood from deciduous raw materials that are resistant to prolonged water impact, as well as to mutual impact of water and heat. For that purpose experimental seven-layer and nine-layer plywood panels were made from peeled beech veneers bonded with water-soluble phenol formaldehyde resin.

Water impact was analyzed in conditions of water regimes in order to define the change in thickness swelling and water absorption after immersion of test specimens in water for a period of 96 hours, and the change in density, volume, thickness swelling and water absorption after immersion of the test specimens in boiling water for 6 hours. Water impact on the degree of adhesion after 2 hours of immersion in water was also analyzed.

The research showed that panels are characterized by high stability during this kind of treatment. The panels showed consistency in form and dimensions, as well as consistency of adhesion in glue lines.

REFERENCES

- Almeida, D.H., Ferro, F.S., Varanda, L.D., de Souza, A.M., Icimoto, F.H., Christoforo, A.L., Rocco Lahr, F.A. (2013): Quality Control in Plywood Manufacturing: Physical Properties of Commercial Plywood of *Pinus sp.* International Journal of Composite Materials, 3(6): 163-167.
- Aziri, B. (2012): Study of water influence on the physical characteristics of the wood-based constructive panels. Master thesis. University of „Ss. Cyril and Methodius”- Faculty of design and technologies of furniture and interior. Skopje.
- Aziri, B., Jakimovska Popovska, V., Iliev, B. (2013): Water impact on the change of the physical characteristics of multilayered constructive plywood. Proceedings of 1th International scientific conference „Wood technology & Product Design”, Ohrid: 225-232.
- Carvalho, A.G., Zanuncio, A.J.V., Mori, F.A., Mendes, R.F., da Silva, M.G., Mendes, L.M. (2014): Tannin adhesive from *Stryphnodendron astringens* (Mart.) coville in plywood panels. BioResources 9(2): 2659-2670.
- Dieste, A., Krause, A., Bollmus, S., Miltz, H. (2008): Physical and mechanical properties of plywood produced with 1.3-dimethylol-4.5-dihydroxyethyleneurea (DMDHEU)-modified veneers of *Betula sp.* and *Fagus sylvatica*. Holz. Roh. Werkst. 66: 281-287.
- Dimeski, J., Iliev, B. (1997): Physical and mechanical properties of water-resistant plywood made from beech veneers and phenol-formaldehyde resin. Forestry review, XL (1992-1997), Skopje: 37-42.
- Hrazsky, J., Kral, P. (2010): Analysis of the shape stability of water-resistant plywoods. Acta univ. agric. et silvic. Mendel. Brun., LVIII, No. 1: 61-70.
- Iliev, B., Nacevski, M., Dimeski, J. (2004): Dimensional stability of water-resistant multilayer boards. Ann. Proc. Fac. For. University of „Ss. Cyril and Methodius” - Skopje, Vol. 39: 34-41.
- Iliev, B., Mihailova, J., Nacevski, M., Dimeski, J., Jakimovska, V. (2007): Possibility of plywood production with stable bonding quality. Proceedings of the International Symposium – „Sustainable Forestry and Challenges, Perspectives and Challenges in Wood Technology”, 24-26th October, 2007, Ohrid: 377-383.
- Iliev, B., Nacevski, M., Mihailova, J., Gruevski, G., Jakimovska, V. (2008): Analyze of the important physical and mechanical properties of the plywood compared with particleboards and solid wood. Proceedings of 19th International scientific conference „Wood is good-properties, technology, valorisation, application”, Ambienta 2008, Zagreb: 89-94.

Jakimovska Popovska, V. (2011): Comparative researches of the properties of laboratory plywood and some industrial manufactured wood-based panels. Master thesis. University of „Ss. Cyril and Methodius“- Faculty of design and technologies of furniture and interior. Skopje.

Jakimovska Popovska, V., Iliev, B. (2013a): Research on the characteristics of laboratory made plywood. Proceedings of 9th International scientific conference on production engineering „Development and modernization of production“, Budva: 717-724.

Jakimovska Popovska, V., Iliev, B., Mihaylova, J. (2013b): Water resistance of plywood bonded with alcohol-soluble phenol-formaldehyde resin. Inno science journal - Innovations in woodworking industry and engineering design, 1/2014 (5): 127-136.

Jakimovska Popovska, V., Aziri, B., Iliev, B. (2014): Water impact on the change of the physical characteristics of combined water-resistant wood based panels. Proceedings of 25th International scientific conference „New materials and technologies in the function of wooden products“, Ambianta 2014, Zagreb: 145-152.

Jamalirad, L., Doosthoseini, K., Koch, G., Mirshokraie, S. A., Hedjazi, S. (2011): Physical and mechanical properties of plywood manufactured from treated red-heart beech (*Fagus Orientalis L.*) wood veneers. BioResources 6(4): 3973-3986.

Macedonian standards – MKS D.A1.072; MKS D.A8.063; MKS D.C5.032; MKS D.C5.040; MKS D.C5.041.

Mihailova, J., Iliev, B., Yosifov, N. (2005): Comparative analysis of thickness swelling and water absorption of water-resistant combined wood-based panels. Proceedings of 7th International scientific conference „Wood in the construction industry - Durability and quality of wooden construction products“, Zagreb: 35-39.

Miljković, J., Dimeski, J., Iliev, B. (1997): Water-Resistant Wooden Composition Boards and Their Characteristics. The 3rd International Conference on the Development of Forestry and Wood Science/Technology, Volume I, Belgrade: 393-399.

Reinprecht, L., Iždinský, J., Kmet'ová, L. (2011): Wooden composites from beech plywood and decorative veneers of different natural durability-their decay resistance and selected physico-mechanical properties. Folia Forestalia Polonica, Series B, Issue 42: 3-16.

Uysal, B., Özcan, C., Yilidirim, M.N., Esen, R., Kibaroglu, R. (2010): Determination of dimension stability of plywood which exposed water steam. Technology, 13 (2): 125-132.

Zdravković, V., Lovrić, A., Stanković, B. (2013): Dimensional stability of plywood panels made from thermally modified poplar veneers in the conditions of variable air humidity. Drvna industrija, Zagreb: 175-181.

Zdravković, V., Lovrić, A., Todorović, N. (2014): Some characteristics of beech plywood for floors of the city buses. Proceedings of the 10th International Symposium „Research and Design for economy“, Belgrade, 2014: 185-191.