CLIMATIC TESTING OF WOOD-POLYMER COMPOSITES

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ABSTRACT

In this study, wood polymer composites were obtained using local poplar and paulownia tree flours and their physical and mechanical properties were analyzed. In addition, the effect of composite composition on the strength of composites was studied and analyzed. That is, the role of chemical bonds was studied and the results were presented.

Keywords: poplar, paulownia, tree filler, wood, poplar, polymer, secondary polyvinyl chloride, wood polymer composites, chipboard, fiberboard

Introduction. One of the promising areas of modern chemical technology is the creation of composite materials, where thermoplastics (polyethylene, polypropylene, their copolymers, etc.) are used as a binder. Recently, special attention has been paid to the development of building materials based on cheap plant waste and environmentally friendly binders or without them, because Due to stricter environmental requirements, the use of particle boards (chipboards) containing toxic binders is limited. This niche is successfully occupied by wood-polymer composites (WPC). They are distinguished by a high degree of filling combined with environmental friendliness. The use of wood fillers is especially important, since the Russian woodworking industry annually produces about 780-800 thousand m³ of

crushed wood waste. Despite the large number of studies devoted to WPC, there remain a number of unresolved issues related to formulation and technological parameters of the process. An important role in formulation development is played by the type of polyolefin, the type and size of filler particles, and the introduction of special additives to improve final characteristics of WPC. Obtaining competitive products from WPC is possible only with a comprehensive study of the influence of these factors on the properties of WPC.

Experimental part: For the consumer, in addition to the strength characteristics, the behavior of the products during operation is of utmost importance. Warping and fading are the main defects that appear during use. To assess the overall durability and behavior of finished products under real operating conditions, tests were carried out in special artificial weather apparatus (weatherometers). In laboratory conditions, intensive exposure to sunlight, rain, condensation formation and temperature changes were simulated, assessing the light resistance of coatings, materials and products under the influence of sun, rain and temperature changes.

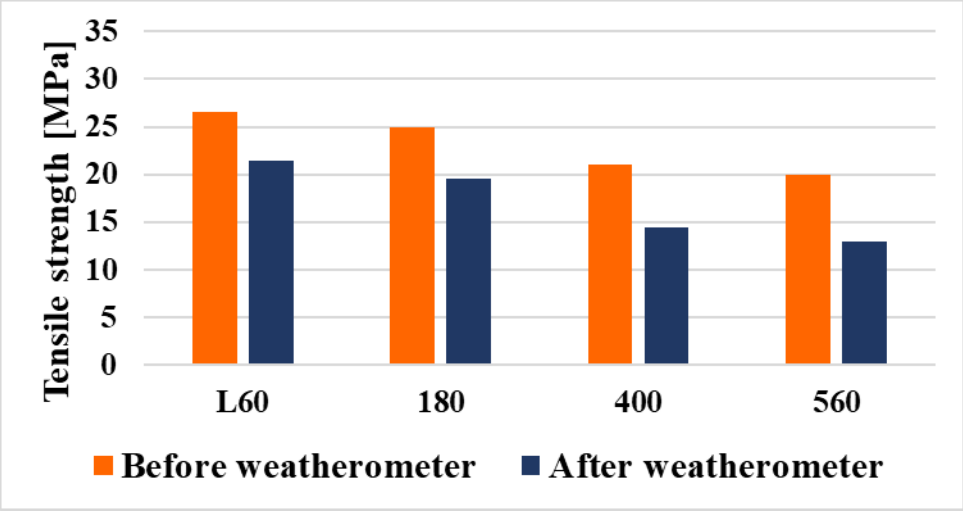

Figure 1 – Tensile strength of compositions with different types of wood flour containing 50% wt.

For research, samples filled with different types of wood flour with a dosage of 50 and 60% wt, as well as compositions modified with nan additives, were selected.

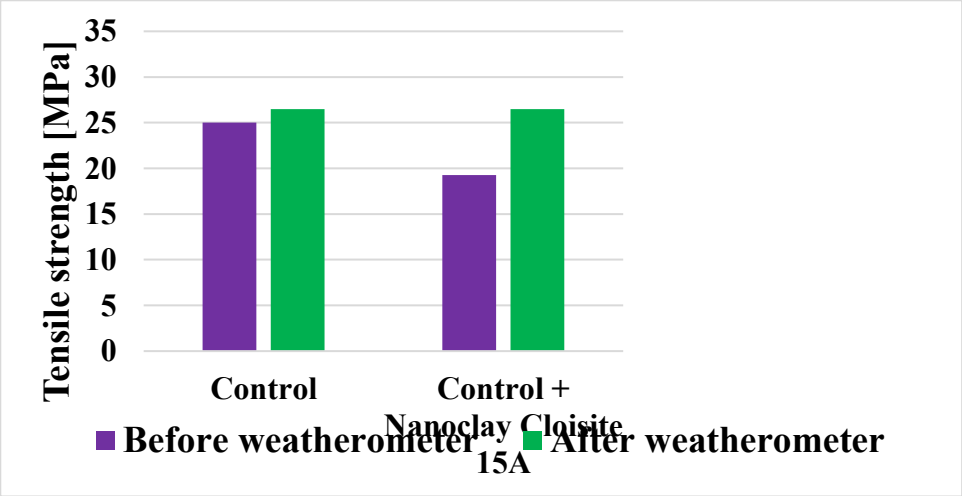

Figure 2 – Tensile strength of compositions modified with nanoclay containing DM 180 50% wt.

Tests were carried out in accordance with ISO-4892, ASTM-D4587, D4799, SAE-J2020, GOST 9.401 standards. The test conditions for light fastness and weather resistance of the samples corresponded to operation in rain and sun. The results of physical and mechanical tests of samples are presented in Fig. 1.

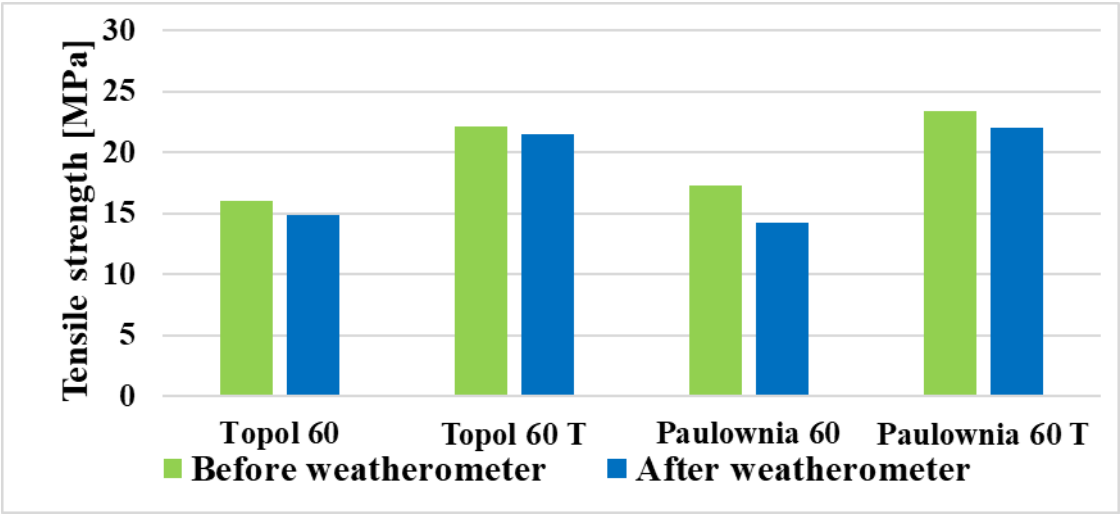

Figure 3 – Tensile strength of compositions with wood flour of coniferous and hardwood (60% wt.) original and thermally modified

The indicators of changes in the strength of compositions with different types of wood flour, modified with nanoadditives, compositions with wood flour of coniferous and deciduous species (original and thermally modified) after testing in an artificial weather apparatus are given.

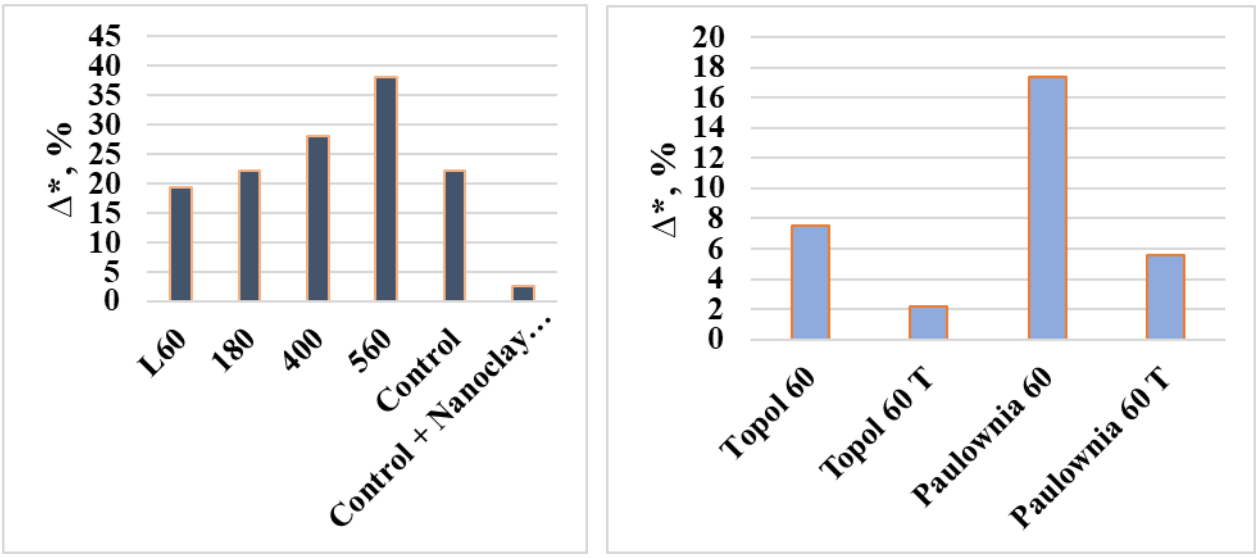

Figure 4 – Change in tensile strength after the compositions are in an artificial weather apparatus.

From figure 4. It follows that the larger the particle size of wood flour, the greater the percentage reduction in strength after climatic tests. At the same time, modification of the compositions makes it possible to maintain the strength properties of WPC after climatic tests.

Conclusion. Thus, mechanochemical modification of wood flour makes it possible to increase the physical and mechanical properties of WPC by 30% and reduce the degree of water absorption by 17%. Thermal modification of poplar and paulownia wood flour does not have a significant effect on the change in the viscosity properties of the compositions under consideration.

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