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Editorial

Physicochemical Surface Treatment of Wood Raw Materials

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1. Introduction

Wood is a vital and widespread natural material. It is used in construction as an internal and external finishing material; in the furniture industry, it is used for the production of wood boards and composites. At the same time, it should be noted that wood raw materials, along with theirinherent valuable properties (low price, ease of treatment, etc.), also have negative qualities that complicate the production of a high-strength material: theirlow biostability, significant humidity deformations, swelling pressure; pronounced anisotropy, significant elasticity during compaction of the mixture, and increased chemical aggressiveness [1].

The main disadvantages of woodthat affect the durability of wood products can be mitigated by using various treatment methods: chemical, thermal, thermomechanical types of wood modification [2].

The chemical method involves modification with various chemical solutions, which allowsincreasing the biological protection of wood and its hydrophobicity [3].

Heat treatment ensures structural changes in wood caused by high temperature, which reduces the hygroscopicity and the development of swelling pressure of the material.

Thermomechanical processing increases wood density and, accordingly, the strength of the wood-structural material.

However, these modification methods subsequently complicate the use of the treated material in gluing and refining; in particular, researchers note a significant decrease in the adhesion of adhesive compositions to heat-treated wood, the impossibility of applying paint and varnish compositions to chemically modified wood.

These data show that the improvement of wood materials' properties requires more diverse modification methods. In lightof this, it is critical to investigate and develop new technologies based primarily on environmentally benign methodsof wood treatment, which would lead to its physical and chemical modification to improve the quality and competitiveness of finished products [4].

This Special Issue covers the most recent advances in modification and surface treatment of wood in order to improve the properties of finished construction materials. We hope that this will stimulate future research and application.

2. Physicochemical Surface Treatment of Wood Raw Materials

A Special Issue entitled "Physicochemical Surface Treatment of Wood Raw Materials" was opened in September 2020 and closed in July 2021. During this 10-month period, 5 manuscripts were submitted and finally accepted for this Special Issue. The papers deal with wood modification methods aimed at increasing the adhesive contact when creating a construction material, as well as to protect the wood surface from environmental impact.

An article titled "The Potential Use of the Pigments from Scytalidiumcuboideum and Chlorociboria aeruginosa to Prevent 'Greying' Decking and Other Outdoor Wood Products" [5] describes the prospects ofusing fungal pigments in wood coatings production. Scytalidiumcuboideum (red pigmentation) and Chlorociboria aeruginosa (blue–green pigmentation) fungi pigments were used in the studies. The fungal pigments were dissolved

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in raw linseed oil. The resulting solution was further applied to the surface of Douglas fir (*Pseudotsuga menziesii*) and white pine (*Pinus monticola*) samples. Then, the samples were placed in a climatic weathering chamber. The experiments revealed that this treatment increases the resistance of the wood surface to ultraviolet rays.

An article titled "Increasing the Strength of the Glue Line in the Production of Thermally Modified Wood Paneling" [6] dwells upon the effect of ultraviolet rays on the activation of the surface of pine wood thermally modified at 180–240 °C, in order to increase the surface roughness, increase the wettability of thermal wood and adhesive strength of glue in the production of furniture panels from wooden blocks. UV treatment adds to a 13 percent increase in the adhesive characteristics of the surface of thermally modified wood, according to studies based on measuring the wetting angle of heat-treated pine wood samples. It was found that the two-stage wood treatment including preliminary volumetric thermal modification followed by ultraviolet radiation surface treatment causes an increase in the moisture resistance of glued wood products by 24%. Based on the findings, a new technology for producing furniture boards for the creation of moisture-resistant wood items is proposed.

An article titled "Sorption of Methylene Blue for Studying the Specific Surface Properties of Biomass Carbohydrates" [7] presents the findings of studies of the effect of methylene blue sorption on the characteristics of the main carbohydrates of biomass: α-cellulose, cellulose of sigmacell, natural gum, β-glucan, and starch. This study was aimed at tailoring the methylene blue sorption method for the analysis of the surface properties of biomass carbohydrates. The results of dye sorption were compared with the data obtained by analyzing the size and shape of the particles using the method of thermal gas desorption. The proposed approach facilitates streamlining the procedure for studying the properties of the surface and assessing the availability of carbohydrates for binding large molecules.

An article titled "A Multi-Technique Approach to Evaluate the Surface Properties of Heat-Treated Chestnut Wood Finished with a Water-Based Coating" [8] describes a study of the surface properties and the effect of Idrolinfo water-based coating on native and heat-treated chestnut wood (*Castanea sativa* Mill.). In particular, color, roughness, microhardness, wear, and wetting angle were measured. The coating showed its effectiveness when applied to native and heat-treated wood at 140 °C and 170 °C. In addition, it has been shown that chestnut wood enhances or retains its properties when treated at these temperatures without significant color change, acquiring good hydrophobicity, both with and without the water-based coating.

An article titled "Improving the Physical and Mechanical Performance of Laminated Wooden Structures by Low-Temperature Plasma Treatment" [9] provides the results of a study of high-frequency plasma effect on the surface of wood samples, in order to increase the adhesion of binders to wood by increasing surface wettability. It was established that low pressure RF discharge treatment gives wood new combinations of properties without changing the chemical composition: increased pore size results in increased wood wettability. In connection with the research results, an improved process for the production of large-span laminated wooden structures is proposed, in which lamellae are treated with radio-frequency plasma on both sides along the glued layers, which allows for high adhesion strength.

3. Perspectives

In the papers presented, much attention is paid to the problem of increasing the efficiency of using wood as a structural material. At the same time, the main criterion characterizing the modern trend in methods for modifying wood materials is environmental friendliness, which is reflected in all the papers. In conclusion, the reported findings can be used as a solid platform for future research and industry applications.

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