

Special Issue “International Conference Wood Science and Engineering in the Third Millennium—ICWSE 2023”

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1. Introduction

Every two years, the Faculty of Furniture Design and Wood Engineering of the Transilvania University of Brasov organises an international conference on wood science and engineering—ICWSE, which was held for the 13th in November 2023 and hosted over 100 participants from 30 countries worldwide. In this latest edition, some of participants opted to disseminate their work in the journal *Applied Sciences*, via a Special Issue dedicated to the conference. In order to cover a wide range of subjects of interests relevant to the wood industry, the selected topics were deliberately broad and were gathered in eight distinct sections: Wood Structure and Properties (6 papers); Wood Constructions (2 papers); Wood Drying and Heat Treatments (3 papers); Conservation and Restoration of Wooden Objects (1 paper); Wood-Based Materials (4 papers); Mechanical Wood Processing and Surface Quality (4 papers); Wood Preservation, Modification, Gluing and Coating (3 papers); Furniture Design (1 paper). There is a growing demand for wood products in the world today, but to meet future needs for these materials and overcome wood shortages, studies have focused on the best utilization of wood potential, either from less well-known species [1], fast-growing species [2], subfossil woods [3] or alternative and competitive composites [4,5], all deserving thorough investigation in order to promote the production of high-added-value products, without neglecting wood waste and its potential as a source of energy [6]. The domain of wood constructions has gained attention due to new developments in connectors that have the potential to meet all code requirements in terms of load-bearing capacity and dimensional stability [7–9]. The challenges of wood drying pose questions which must be considered by researchers, especially for species prone to drying defects [10]. At the same time thermal treatments continue to be interesting due to their potential to improve some of the properties of wood [11]. Manufacturers need to select the most suitable coating material for wood and wood-based panels in order to obtain finished products with the best performance and properties. Among the topics covered, the rise of digital printing in the wood industry [12] or the use of nanotechnologies and various treatments for wood modification [13] have drawn particular attention. The optimization of mechanical wood processing [14] and the flexibility in design offered by 3D printing [15], together with a reliable evaluation of the resulting surface quality [16], represent a subject intended to improve the marketing and appeal of finished wood products and their inspirational design [17]. The cultural heritage of wood was also not neglected, since the methods and techniques used to conserve works of art are part of the same scientific endeavours [18]. The following section provides an overview of the research papers contained in the Special Issue of the ICWSE conference, covering in their diversity the comprehensive range of topics outlined above.

2. An Overview of the Published Articles

2.1. Wood Structure and Properties

The work by Terzopoulou et al. (Paper 1) provides a review of the most important characteristics of *Ailanthus* wood, also called “tree-of-heaven”, originating from China, but



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now spread to Europe and North America as environments become increasingly dry in the context of climate change. The paper presents a comprehensive review of this species in terms of its chemical properties, pharmacology applications, traditional and innovative uses, quality control, biological resistance, potential utilization in bioenergy, biofuels and wood-based products. The challenges and limitations of its uses are also included, in order to comprehensively outline the utilization potential of the “tree-of-heaven”.

An overview of the current state of affairs of European poplar cultures, with a principal focus on Hungary, is offered by Komán et al. (Paper 2). Poplars (*Populus* spp.) from plantations represent a fast-growing wood species with a relatively short cutting age and rotation time meaning that they can produce maximum yields of timber or fibre. The authors provide an overview of the current data on poplars in Hungary, their quantity, species variety, age group composition, areas of use and other topics of interest. The work underlines the importance of this species which provides raw material to the wood industry, successfully replacing wood resources from natural forests.

The paper by Avram et al. (Paper 3) compares some physical and mechanical properties of three homogeneous species—linden, paulownia and balsa—in order to understand their characteristics in a comparative way, their report finally calling for paulownia wood as a replacement of linden wood in many applications.

Marttila et al. (Paper 4) draw attention to the material potential of Norway spruce and Scots pine, which remained standing and were harvested after a large forest fire in Finland. The authors found that the changes to the mechanical properties were mostly negligible, but the colour of the material had darkened in both species. Of the two species, spruce wood was more affected. The researchers recommend this material for mid-quality and low-quality sawn timber and selected end uses where the requirements for quality are moderate and aesthetic or hygienic criteria are not critical.

A less researched type of raw material, the subfossil oak, originating from the Romanian riverbanks, was studied by Nedelcu et al. (Paper 5) in comparison with aged oak recovered from existing constructions and new oak wood. Apart from the high variability of the properties of the subfossil oak from different trunks and its slightly lower swelling anisotropy, it was found that this material had a lower density, was more dimensionally unstable and had a lower compression strength parallel to the grain compared to the new oak. However, the fossil oak has important value for interior furniture with aesthetic requirements.

The last paper under the “wood structure and properties” topic investigated the tensile mechanical properties of oak (*Quercus robur* L. and *Quercus petraea* L.) sliced lamellae. The authors, Grubii and Johansson (Paper 6), highlighted the correlation between the wood’s check depth ratio, which is influenced by the lamella thickness, and the sliced lamellae strength and strain at failure. The conclusion was that, in the elastic domain, the stiffness was not significantly impacted by slicing check characteristic variations. Other findings indicate that slicing thickness substantially affects the mechanical properties of the modulus of rupture and strain at break. Digital image correlation (DIC) was used to analyse the failure mechanisms in the sliced lamellae, gaining insight into the fracture mechanisms of the tested samples. The study aimed to provide support for appropriate future product design, quality control and further investigations into the quality optimization of sliced lamellae.

2.2. Wood Constructions

The work of Agnantopoulou et al. (Paper 7) explores the windmills on the island of Sikinos and their mechanisms. Evidence of the utility, durability and simplicity of these wooden monuments of cultural heritage, the techniques employed in their construction and the proper application of different wood species ideally serving appropriate points in the construction, in accordance with their properties and characteristics, were recorded. The paper has a historical character, but it also reveals interesting data on the wood species used, which are more diverse than expected, involving red oak, juniper, olive wood, elm, chestnut and ash. Future work envisages comparison with windmills from other Greek islands.

The paper by Pomaroli and Kraler (Paper 8) has a strong innovative character as it presents a new type of wall–ceiling system connector made of wood for cross laminated timber (CLT) constructions. The proposed version is a three-dimensional, statically effective double-dovetail element, made of block-glued laminated veneer lumber (LVL) and manufactured in a CNC milling process. The results of the tests showed the high performance potential of this system connector, which can play an important role in future timber construction.

2.3. Wood Drying and Heat Treatments

The work of Deaconu et al. (Paper 9) approaches the drying of 50 mm thick Turkey oak (*Quercus cerris* L.) lumber. Both air drying and conventional kiln drying were applied in order to establish the optimum drying conditions for this particular wood species, which is denser than common oak (*Quercus robur* L.), and highly prone to cracks and deformations during the drying process. The influence of steaming prior to drying was also taken into consideration. Some recommendations for an optimised drying schedule were formulated.

Hajian et al. (Paper 10) compared the drying behaviour of western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) with that of Norway spruce (*Picea abies* (L.) Karst.) and Scots pine (*Pinus sylvestris* L.) from the green to the oven-dried condition. A CT scanner was used instead of resistance-type pin electrodes in order to assess the moisture content evolution within the specimen, by calculating moisture content based on CT images. Consequently, the reason why hemlock dries much more slowly than the other two species could be identified, this being the presence of large wet pockets. An adapted drying schedule was developed for timber prone to the formation of such wet pockets.

Gomes et al. (Paper 11) investigated the thermal treatment of Teak (*Tectona grandis* L.f.) and the effects of this treatment on the colour and chemical composition of this valuable species. The heat treatment was carried out in two variants, in an autoclave (closed system) at 160 °C and in an electric oven (open system) at 185 °C and at 210 °C. The closed system demonstrated higher efficiency even though it operated with a lower temperature. This resulted in a higher mass loss, a stronger reduction of the hemicelluloses content and an increase of the extractive content for all solvents used.

2.4. Conservation and Restoration of Wooden Objects

This section was represented by the study by Moraru-Avram et al. (Paper 12), who investigated the effect of different solvents used in the process of conservation/restoration of polychrome linden wood panels degraded by xylophagous insects. Among the solvents used—water, acetone, and white spirit—acetone caused the greatest swelling and deformation of the treated panels. This study aimed to contribute to a better understanding of the material properties and their behaviour under restoration treatments.

2.5. Wood-Based Materials

The paper written by Chotikhun et al. (Paper 13) investigates the production and properties of wood plastic pellets (WPP) made from rubberwood sawdust and refuse-derived fuel (RDF). The samples were tested for chemical and physical properties and compared to standard wood pellets. Based on the findings of this research, in terms of heating value, density, mechanical durability, and moisture content, the mixed pellets can potentially be beneficial in alternative sustainable green energy as fuels and could to mitigate global warming.

In their paper, Barbu et al. (Paper 14) evaluated the physical and mechanical properties of single- and three-layered solid wood panels made of wood from European Paulownia plantations. A comparison with other similar lightweight commercially available solid wood panels (SWPs) was carried out. The findings of this work recommend Paulownia SWPs to be used as lightweight and sustainable core materials in sandwich structures, replacing balsa wood for various applications in the furniture and packaging industries, or as sport articles or non-load-bearing constructions.

Spirchez et al. (Paper 15) present the importance of the torrefaction process for poplar plywood and medium-density fibreboard, highlighting both the positive and negative aspects of the torrefaction process, such as, respectively, the decrease in water absorption, swelling and shrinkage, and colour on one side, and the mechanical resistance to static bending on the other. The obtained results emphasize that the mass loss increases at high temperatures, this being the main disadvantage of torrefaction.

The last paper of this section, by Zeleniuc et al. (Paper 16), evaluates the physical and mechanical performance of three types of hybrid composites made of date palm (*Phoenix dactylifera* L.), additional layers of cotton and Kevlar fibres. The fibres were formed into flat sheets and employed as reinforcement layers embedded in a polyester matrix. The influences of cotton (a natural and soft fibre) and Kevlar (a synthetic and strong fibre), were also investigated regarding the properties of bending strength and resistance to water and temperature changes in terms of freezing and drying. The results of this work are oriented towards finding an appropriate application for these composites, which are intended to be used in humid environments.

2.6. Mechanical Wood Processing and Surface Quality

In their work, Bedeleian et al. (Paper 17) applied an artificial neural network modelling technique and response surface methodology to model and optimize the drilling process of plywood. Two artificial neural network models were developed to predict the thrust force and drilling torque based on drill tip angle, tooth bite, and drill type. It was found that the drill type significantly influenced the force during drilling, and the most significant factor affecting the drilling torque during the drilling of plywood was the tooth bite. The proposed method could be used as an optimization tool during the design phase of the furniture manufacturing process.

Paper 18, (Barboutis et al.) investigates the possibility of reproducing a precise copy of a carved wood object of medium size and considerable cultural value, which could continue to be used in its original location or could be exhibited in a museum space. 3D scanning, CNC machining and traditional wood carving handwork were applied and discussed. The current work transfers the experience of these reproduction techniques as applied to a 17th-century “Bema Door” element, sharing significant information and details on the tools, materials, process steps, etc., with the aim of being an inspiration for the preservation or reproduction of other highly important cultural heritage monuments.

Nicolau et al. (Paper 19) focus their work on 3D printed connectors for a chair leg-stretcher joint. Larch (*Larix decidua* Mill.) wood was used for the chair components and selective laser sintering (SLS) technology was employed for the 3D printed connector designed to assemble the chair elements. Diagonal tensile and compression tests were performed on the L-type joints with 3D printed connectors, along with the bending moments and micrographs taken of the broken areas of the 3D printed connectors. The results show that the SLS printing technology applied to build the connector does not ensure enough strength for the assembly, and further research on changes in printing parameters, in terms of laser power and scan speed, is needed.

The last paper of this section, written by Brenci and Gurau (Paper 20), is focused on the surface quality of beech wood obtained by profiled milling. In this study, the surface quality was analysed across stratified levels of irregularities differentiating between waviness, tool marks, fuzzy grain, and accidental surface gaps overlapped onto the deep anatomical cavities of the wood, such as pores from earlywood. The findings of the work show that the processing quality measured at different depths does not differ statistically, in spite of local differences in cutting speed. The statistical analysis helped the researchers understand the hierarchy of influencing factors and their significance. In this respect, the most important factor affecting the surface quality is the feed speed.

2.7. Wood Preservation, Modification, Gluing and Coating

Tokarczyk et al. (Paper 21) investigated the influence of selected technological parameters, such as the number of layers, energy doses distributed by the radiators and line speed, on the adhesion of varnish coatings formed in the process of varnishing with a roller. The objective of this paper was achieved by evaluating the phenomenon of wetting of coatings formed on HDF boards and taking into account the impact of surface roughness on this process.

The research performed by Henke et al. (Paper 22) sought to determine the impact of fibreboard (HDF) density, grinding parameters, the amount of basecoat and topcoat applied, the number of coats and different lamp powers on a combined industrial line using LED and mercury lamps at 50 m/min. It was assumed that these factors could significantly impact the coating's resistance and that simply learning about them and identifying the relationship could support entrepreneurs and manufacturing technologists and become a starting point for further work on varnish formulations and LED lamps.

The third paper under this topic, delivered by Torcatoru et al. (Paper 23), compared light-induced colour changes in uncoated and clear-coated wood surfaces with waterborne lacquers, for three hardwood species; namely, European maple (*Acer pseudoplatanus* L.), European ash (*Fraxinus excelsior* L.) and European walnut (*Juglans regia* L.). Highlighting the specific contribution of the wooden support and of the coating films to the total colour changes in the finished surfaces represented one of the main goals of this research.

2.8. Furniture Design

Zhach et al. (Paper 24) designed a versatile storage cube made of birch plywood that integrates magnetic structural components facilitating easy and a quick assembly. It is interesting, that the joint edges between the individual walls are covered with smooth plastic guards manufactured via additive 3D printing of corn fodder-based filament. The authors claim that this item of furniture is portable and can be converted into a table or a stool to serve children's gaming activities and other overall skills, at home or in the pre-primary and primary education spaces. The cubes were verified for their robustness and stability by applying the relevant standards.

3. Conclusions and Future Perspectives

With the publication of this Special Issue, we hope to contribute to a better understanding of the huge scientific potential of the natural and regenerable global reserve that is wood. To achieve this, we selected original works aiming at covering eight topics of research discussed across 24 research papers. The next conference will take place in November 2025, and will be, as usual, a forum for discussion and dissemination of the newest developments in the field of wood science and engineering.

Conflicts of Interest: The authors declare no conflicts of interest.

List of Contributions:

1. Terzopoulou, P.; Kamperidou, V.; Barboutis, I. Utilization Potential of Tree-of-Heaven Species Biomass—A Review. *Appl. Sci.* **2023**, *13*, 9185. <https://doi.org/10.3390/app13169185>.
2. Komán, S.; Németh, R.; Báder, M. An Overview of the Current Situation of European Poplar Cultures with a Main Focus on Hungary. *Appl. Sci.* **2023**, *13*, 12922. <https://doi.org/10.3390/app132312922>.
3. Avram, A.; Lunguleasa, A.; Spirchez, C.; Ionescu, C. Differences and Similarities between the Wood of Three Low-Density and Homogenous Species: Linden, Balsa, and Paulownia. *Appl. Sci.* **2023**, *13*, 10209. <https://doi.org/10.3390/app131810209>.
4. Marttila, J.; Möttönen, V.; Haapala, A.; Ylimäki, P.; Kilpeläinen, P.; Verkasalo, E. Wood Material Properties of Forest Fire-Damaged Norway Spruce and Scots Pine for Mechanical Wood Processing in Finland. *Appl. Sci.* **2024**, *14*, 238. <https://doi.org/10.3390/app14010238>.

5. Nedelcu, R.; Timar, M.; Porojan, M.; Beldean, E. Selected Physical and Mechanical Properties of Subfossil Oak (*Quercus* spp.) Compared to Aged Oak and Recent Oak. *Appl. Sci.* **2024**, *14*, 3294. <https://doi.org/10.3390/app14083294>.
6. Grubii, V.; Johansson, J. The Influence of Slicing Thickness on the Perpendicular to Grain Tensile Properties of Oak (*Quercus robur* L. and *Quercus petraea* L.) Lamellae. *Appl. Sci.* **2023**, *13*, 12254. <https://doi.org/10.3390/app132212254>.
7. Agnantopoulou, E.; Barboutis, I.; Kamperidou, V. Wood Utilization in Windmill Mechanisms on Sikinos Island (Greece). *Appl. Sci.* **2023**, *13*, 9216. <https://doi.org/10.3390/app13169216>.
8. Pomaroli, A.; Kraler, A. System Connector “Double Dovetail Tenon”—A Wood–Wood Based Alternative for Connecting CLT-Elements. *Appl. Sci.* **2023**, *13*, 11727. <https://doi.org/10.3390/app132111727>.
9. Deaconu, I.; Georgescu, S.; Campean, M. Drying Behaviour of 50 mm Thick Turkey Oak Lumber. *Appl. Sci.* **2023**, *13*, 10676. <https://doi.org/10.3390/app131910676>.
10. Hajian, E.; Couceiro, J.; Hansson, L.; Sandberg, D. Drying Behaviour of Western Hemlock with Schedules Developed for Norway Spruce and Scots Pine. *Appl. Sci.* **2023**, *13*, 11083. <https://doi.org/10.3390/app131911083>.
11. Gomes, F.; Reis, M.; Rupf, A.; Silves, P.; Ferreira, J.; Dias, L.; Madi, J.; Cademartori, P.; Neto, H.; Paes, J.; Batista, D. Chemical Composition and Color of Short-Rotation Teak Wood Thermally Modified in Closed and Open Systems. *Appl. Sci.* **2023**, *13*, 13050. <https://doi.org/10.3390/app132413050>.
12. Moraru-Avram, A.; Ionescu, C.; Lunguleasa, A. Effects of Solvents Used for Conservation/Restoration Treatments on Damaged Linden Panels of Cultural Heritage Assets. *Appl. Sci.* **2023**, *13*, 11148. <https://doi.org/10.3390/app132011148>.
13. Chotikhun, A.; Laosena, R.; Kittijaruwattana, J.; Lee, S.; Sae-Ueng, K.; Nakason, C.; Pianroj, Y.; Salca, E.A. Elemental Compositions of Wood Plastic Pellets Made from Sawdust and Refuse-Derived Fuel (RDF) Waste. *Appl. Sci.* **2023**, *13*, 11162. <https://doi.org/10.3390/app132011162>.
14. Barbu, M.; Radauer, H.; Petutschnigg, A.; Tudor, E.; Kathriner, M. Lightweight Solid Wood Panels Made of Paulownia Plantation Wood. *Appl. Sci.* **2023**, *13*, 11234. <https://doi.org/10.3390/app132011234>.
15. Spîrchez, C.; Lunguleasa, A.; Popescu, C.; Avram, A.; Ionescu, C. Properties of Un-Torrefied and Torrefied Poplar Plywood (PW) and Medium-Density Fiberboard (MDF). *Appl. Sci.* **2023**, *13*, 11950. <https://doi.org/10.3390/app132111950>.
16. Zeleniuc, O.; Mazaherifar, M.; Coşoreanu, C.; Suci, A. Date-Palm-Based Sustainable Hybrid Composite with Cotton and Kevlar Fibre Participation. *Appl. Sci.* **2024**, *14*, 1008. <https://doi.org/10.3390/app14031008>.
17. Bedeleian, B.; Ispas, M.; Răcăşan, S. Applying the Artificial Neural Network and Response Surface Methodology to Optimize the Drilling Process of Plywood. *Appl. Sci.* **2023**, *13*, 11343. <https://doi.org/10.3390/app132011343>.
18. Barboutis, I.; Kamperidou, V.; Economidis, G. Handcrafted Reproduction of a 17th Century Bema Door Supported by 3D Digitization and CNC Machining. *Appl. Sci.* **2023**, *13*, 11690. <https://doi.org/10.3390/app132111690>.
19. Nicolau, A.; Pop, M.; Georgescu, S.; Coşoreanu, C. Application of Additive Manufacturing Technology for Chair Parts Connections. *Appl. Sci.* **2023**, *13*, 12044. <https://doi.org/10.3390/app132112044>.
20. Brenci, L.; Gurău, L. A Stratified Characterization of Surface Quality of Beech Processed by Profile Milling. *Appl. Sci.* **2024**, *14*, 129. <https://doi.org/10.3390/app14010129>.
21. Tokarczyk, M.; Lis, B.; Salca, E.A.; Krystofiak, T. Adhesion of Varnish Coatings as a Background for Analogue and Digital Printing Technologies. *Appl. Sci.* **2024**, *14*, 304. <https://doi.org/10.3390/app14010304>.
22. Henke, M.; Krystofiak, T.; Salca, E.A.; Lis, B. Gloss Level, Type of Paper and Colour of HDF Boards Finished with the Energy-Saving Acrylic Paint System. *Appl. Sci.* **2024**, *14*, 394. <https://doi.org/10.3390/app14010394>.
23. Torcătoru, M.; Timar, M. Light-Induced Colour Changes in Wood Surfaces in Indoor Conditions Determined by an Artificial Accelerated Test: Influence of Wood Species and Coating Materials. *Appl. Sci.* **2024**, *14*, 1226. <https://doi.org/10.3390/app14031226>.
24. Zach, M.; Tauber, J.; Dohnal, P.; Svoboda, J. Designing Multi-Functional Magnetic Storage Cubes for Use in Modern Homes and Schools. *Appl. Sci.* **2024**, *14*, 829. <https://doi.org/10.3390/app14020829>.

References

1. Barboutis, I.; Kamperidou, V. Properties of two different thicknesses 3-ply plywood of Tree-Of-Heaven veneers. In Proceedings of the 22nd International Scientific Conference “Wood is Good-EU Preaccession Challenges of the Sector”, Zagreb, Croatia, 21 October 2011.
2. Schiberna, E.; Borovics, A.; Benke, A. Economic Modelling of Poplar Short Rotation Coppice Plantations in Hungary. *Forests* **2021**, *12*, 623. [\[CrossRef\]](#)
3. Kolář, T.; Rybníček, M. Physical and mechanical properties of subfossil oak (*Quercus* sp.) wood. *Acta Univ. Agric. Silv. Mendel. Brun.* **2010**, *58*, 123–134. [\[CrossRef\]](#)
4. Copur, Y.; Guler, C.; Akgul, M.; Tascioglu, C. Chemical properties of hazelnut husk and its suitability for particleboard production. *Build. Environ.* **2007**, *42*, 2568–2572. [\[CrossRef\]](#)
5. Nelis, P.A.; Michaelis, F.; Krause, K.C.; Mai, C. Kiri wood (*Paulownia tomentosa*): Can it improve the performance of particleboards? *Eur. J. Wood Prod.* **2018**, *76*, 445–453. [\[CrossRef\]](#)
6. Zawislak, K.; Sobczak, P.; Kraszkiewicz, A.; Niedziółka, I.; Parafiniuk, S.; Kuna-Broniowska, I.; Tanaś, W.; Żukiewicz-Sobczak, W.; Obidziński, S. The Use of Lignocellulosic Waste in the Production of Pellets for Energy Purposes. *Renew. Energy* **2020**, *145*, 997–1003. [\[CrossRef\]](#)
7. Tannert, T. Structural Performance of Rounded Dovetail Connections. Ph.D. Thesis, University of British Columbia, Vancouver, BC, Canada, 2008.
8. Schickhofer, G. *Prüfung und Optimierung von CNC-Gefertigten Schwalbenschwanzzapfverbindungen*; Forschungsbericht Holz-Holz-Verbindungen: Graz, Austria, 2014.
9. Braun, M.; Pantscharowitsch, M.; Kromoser, B. Experimental investigations on the load-bearing behaviour of traditional and newly developed step joints for timber structures. *Constr. Build. Mater.* **2022**, *323*, 126557. [\[CrossRef\]](#)
10. Deaconu, I.; Campean, M. Survey concerning the challenges of industrial drying of *Quercus* lumber. *Pro Ligno* **2022**, *18*, 36–44.
11. Ferrari, S.; Allegretti, O.; Cuccui, I.; Moretti, N.; Marra, M.; Todaro, L. A revaluation of Turkey oak wood (*Quercus cerris* L.) through combined steaming and thermo-vacuum treatments. *BioResources* **2013**, *8*, 5051–5166. [\[CrossRef\]](#)
12. Pawlak, D.; Boruszewski, P. Digital printing in wood industry. *Ann. WULS For. Wood Technol.* **2020**, *109*, 109–115.
13. Spear, M.J.; Curling, S.F.; Dimitriou, A.; Ormondroyd, G.A. Review of Functional Treatments for Modified Wood. *Coatings* **2021**, *11*, 327. [\[CrossRef\]](#)
14. Hazir, E.; Koc, K.H. Optimization of wood machining parameters in CNC routers: Taguchi orthogonal array based simulated angling algorithm. *Maderas Cienc. Tecnol.* **2019**, *21*, 493–510. [\[CrossRef\]](#)
15. Ngo, T.D.; Kashani, A.; Imbalzano, G.; Nguyen, K.T.; Hui, D. Additive manufacturing (3D printing): A review of materials, methods, applications and challenges. *Compos. Part B Eng.* **2018**, *143*, 172–196. [\[CrossRef\]](#)
16. Kilic, M.; Hizioglu, S.; Burdurlu, E. Effect of machining on surface roughness of wood. *Build. Environ.* **2006**, *41*, 1074–1078. [\[CrossRef\]](#)
17. Namichev, P.; Petrovski, M. Wood as a primary selection of material for furniture production. *J. Process Manag. New Technol.* **2019**, *7*, 6–12. [\[CrossRef\]](#)
18. Hunt, D. Properties of wood in the conservation of historical wooden artifacts. *J. Cult. Herit.* **2012**, *13S*, S10–S15. [\[CrossRef\]](#)

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