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Editorial

Composites from Recycled and Modified Woods—Technology, Properties, Application

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The intention of efficient processing and use of less valuable wood species, biodamaged logs, sawmill residues, cuttings, chips, sawdust, recycled wooden products, and other lignocellulosic raw materials in the production of wood composites is the focus of several scientific research institutes in the world. Wood composites are mostly produced for a particular application and, therefore, the raw materials, needed additives, production processes, as well as finishing and surface treatments are adapted for these purposes. Research into the optimization of material and technological parameters of the production of wood composites with special properties and applications is still ongoing.

Recycled woods obtained from old buildings, furniture, industrial products, etc., as well as from modified woods prepared by thermal, chemical, or biological processes, have the potential to be a base or complementary raw material for construction and decorative wood composites used mostly in buildings, furniture, and for transport. Typical construction composites are glued prisms and boards (e.g., glulam, blockboard), glued large-area boards from veneers (e.g., plywood, laminated veneer lumber (LVL)), or large-area boards from wood particles and fibers (e.g., particleboard (PB), oriented strand board (OSB), medium density fiberboard (MDF)). More of the large-area boards can obtain a better decorative function usable in furniture and building architecture after veneering, lamination, coating, plasma-treating or other surface-treating technologies.

Within this Special Issue, selected articles related primarily to wood composites prepared from recycled and modified woods are collected in focus on the type and properties of used raw materials, additives, technological processes, including finishing and surface treatments, with an impact on the resulting properties and service-life of wood composites under their different uses. Development of wood and cellulosic composites with specific compositions and properties, coming out from the knowledge of wood material science, timber engineering, physic, and other areas of research, is also to interest of this Special Issue.

The Special Issue comprises ten articles by authors from nine countries—eight from Europe (Bulgaria, France, Germany, Greece, Poland, Romania, Slovakia, and Ukraine) and one from Asia (Iran). These articles represent a wide range of aspects related to: (1) material composition, e.g., species, amount, fraction, and distribution of recycled and modified woods, type of glues, biocides, fire retardants, and other additives; (2) processing and finishing; (3) properties of wood composites for construction and decorative use.

Authors in articles reported about: (a) new sources of the raw material for PBs, such as recycled wood waste generated in wood processing from faulty PBs bonded with urea-formaldehyde (UF) resin or taken from old furniture and other end-of-life wood products, including spruce pallets and thermally modified wood, taking into account the environmental and economic aspects of wood recyclates and obtaining the knowledge that the moisture, strength, and biological properties of PBs can be specifically improved, e.g., the resistance of PBs to swelling in water and to fungal decay increased at using particles from faulty PBs or thermowood cuttings [1–3]; (b) enhancing the use of heterogeneous wood veneers in the manufacturing of maximized-performance LVL panels by veneer grading and optimized positioning, as well as the LVL material mechanical property modeling, with

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a proposed optimization strategy of LVL manufacturing from variable-quality veneers in terms of their optimal stiffness or strength [4,5]; (c) the penetration process of liquids with different polarities and molecular weights through the surface of MDF and PB panels, when the most polar water molecules created strong and stable bonds with the cellulose of wood composites, and therefore, the penetration of water in their structure was the slowest [6]; (d) the effect of birch and black alder veneers' densification temperature and increased density on the mechanical plywood properties made from alternate layers of densified and non-densified veneers, e.g., the increase in the veneer's densification temperature from 150 to 210 °C resulted in a gradual decrease in the plywood's bending strength [7]; (e) the ecofriendly PBs and MDF composites produced from industrial waste fibers and magnesium lignosulfonate adhesive, at which such prepared composites had good mechanical properties but with worsened moisture properties [8]; (f) a CO_2 laser modification of beech and spruce wood surfaces before or after their coating with polyvinyl acetate (PVAc) or polyurethane (PUR) polymers, where the laser beams degraded and carbonized the wood adherent or the synthetic polymer layer and thus worsened the adhesion strength between wood and coating, while the mold resistance of laser-modified surfaces specifically increased [9]; (g) new fire retardants for cellulose and cellulose-modified materials, e.g., the expandable graphite, could be a very effective intumescent and environmentally friendly fire retardant [10].

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