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LIGNOCELLULOSIC BIOMASS LIQUEFACTION – AN ECO-BONDING APPROACH TO WOOD-BASED PANELS

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Various wastes and by-products are usually generated by wood processing industries. Small-sized and post-consumer wood waste are often considered as a problematic, however those may also be seen as a valuable source of raw material. Wood waste have become more frequently re-used, recycled and utilized as raw materials for platform molecules. Increased attention is being paid especially to the importance of biomass derived valuable green products, supporting a bio-based industry. Liquefaction of wood and the derived products is one of the most promising technology, possessing a great potential for practical implementations into various bio-resources converting industries. Current state of the art confirms possibility of wood residues transformation, including wood packaging waste, cork dust bark, by means of liquefaction.

In this research different types of post-industrial wood residues including mixed hardwood/softwood powder, bark, pine, and beech sawdust were liquefied at elevated temperature (130°C) with a mixture of solvents including polyhydroxyl alcohols (glycerine and propylene glycol) and p-toluenesulfonic acid as a catalyst. The resulting liquefied wood mixtures were characterized in terms of their physical and chemical properties and then tested as a partial substitute for synthetic urea-formaldehyde (UF) resin in the particleboards production process.

Series of particleboards containing post-consumer wood bonded with the UF resin with addition of the liquefied wood were produced in the laboratory. The standard mechanical and physicochemical properties of experimental particleboards were examined according to the standards (respectively). All tests were performed in comparison to the reference boards, bonded with unmodified urea-formaldehyde adhesive resin. Additionally liquefied products and particleboards were characterized by non-destructive spectroscopic methods, including NIR and XRF.

It was found that the type of wood waste used for liquefaction has relatively little effect on the resulting product. XRF analysis did not detect harmful contaminations both in raw materials and liquefied wood. It's possible to substitute UF resin with 20% of liquefied wood without reduction of the panels properties. Some particleboard properties (swelling, water absorption) were slightly improved when adding the liquefied wood blend to the UF resin. It was demonstrated that liquefaction process can be an alternative method for wood waste utilization.

The research is the subject of the project: "New biopolymer adhesives modified with silanes and ionic liquids for application in wood-based materials technology'' funded by the NCBR under the LIDER VII Programme.

Keywords: *biomass liquefaction, liquefied wood, bio-adhesives, wood-based panels, NIR spectroscopy*

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