WoodComp3D

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Enhancing Wood-based Biocomposite with Technical Lignin: A Comparative Analysis of Adhesion Performance

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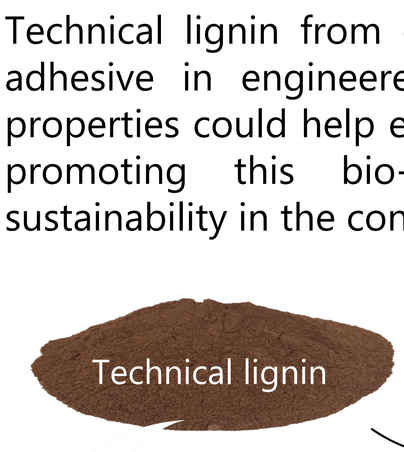
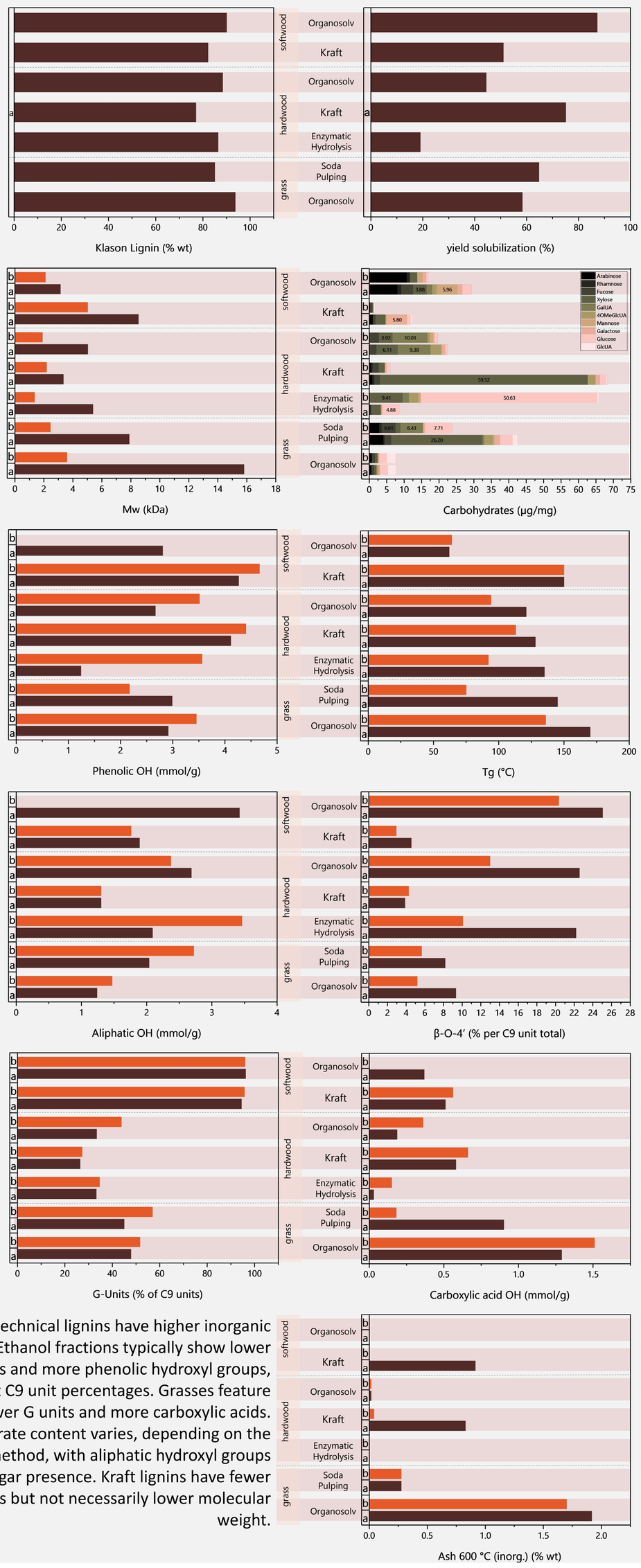
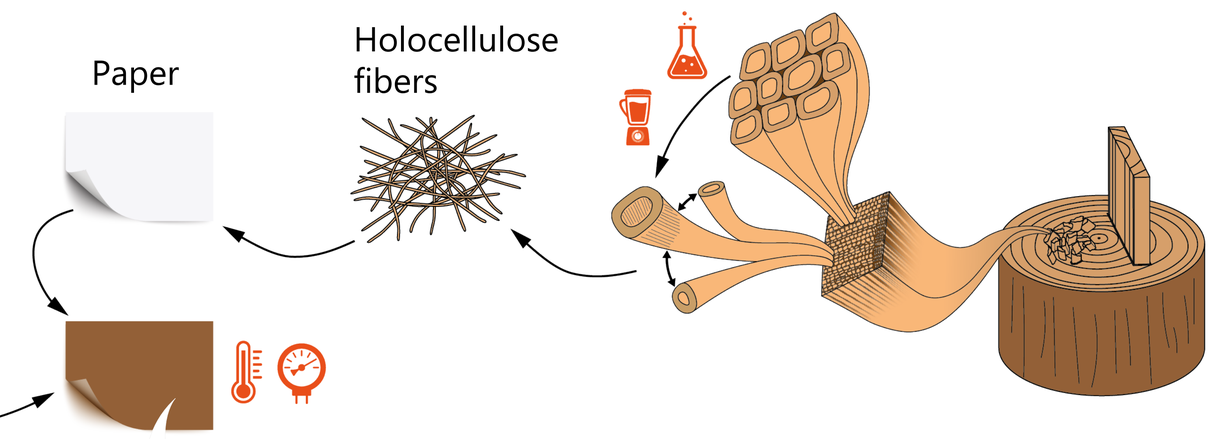
Technical lignin from diverse sources was studied as a bio-adhesive in engineered wood. Understanding its chemical properties could help explain varying mechanical performance, promoting this bio-sourced material, which enhances sustainability in the construction industry.



Chemical properties

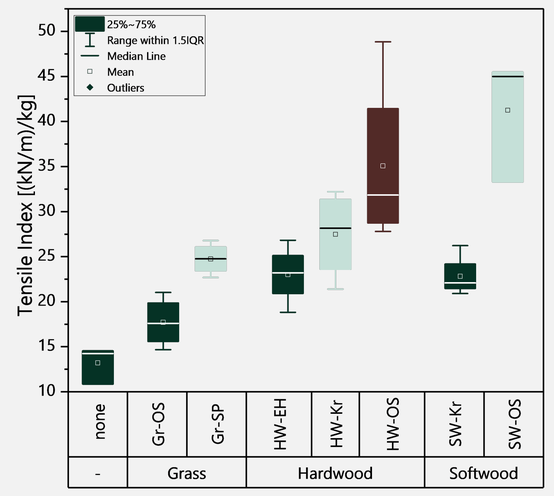


Some technical lignins have higher inorganic content. Ethanol fractions typically show lower molar mass and more phenolic hydroxyl groups, with constant C9 unit percentages. Grasses feature fewer G units and more carboxylic acids. Carbohydrate content varies, depending on the isolation method, with aliphatic hydroxyl groups reflecting sugar presence. Kraft lignins have fewer β-O-4 linkages but not necessarily lower molecular weight.



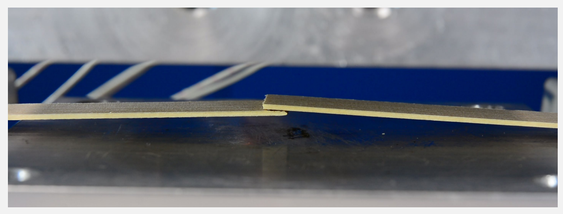
Application

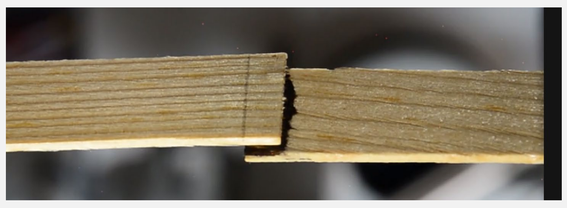
Paper tensile strength

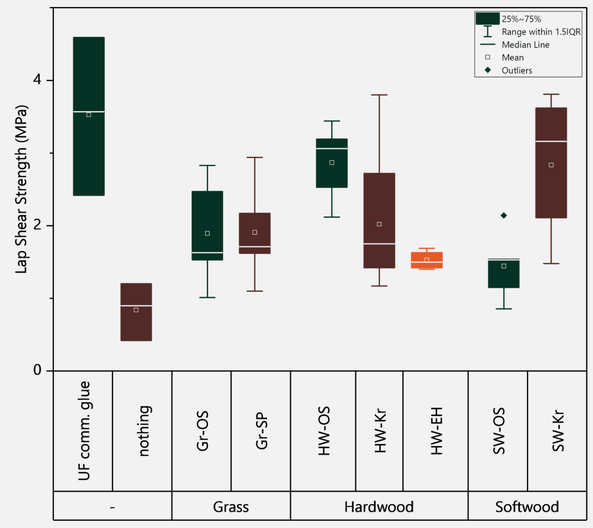


Holocellulose fibers were produced by peracid acid treatment of wood chips. They were used in a dynamic sheet former to form highly oriented paper strips. After swelling with NaOH and washing, they were impregnated with technical lignin in ethanol and hot-pressed. Then the composite paper strips were subjected to tensile tests.

ABES lap shear strength







Technical lignin dissolved and concentrated in ethanol was used as a glue between two spruce wood veneers, hot pressed, and subjected to lap shear strength tests.

Botanical origin	Extraction process
Grass	Organosolv
Grass	Soda Pulping
Hardwood	Enzymatic Hydrolysis
Hardwood	Kraft
Hardwood	Organosolv
Softwood	Kraft
Softwood	Organosolv

Factors that may impact technical lignin bonding strength

- Sugar content
- Phenolic-OH
- Tg (glass transition temperature)
- Molar mass

Acknowledgments

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