

# **Combination of lignin polyol–tannin adhesives and polyethylenimine for the preparation of green water-resistant adhesives**

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## **Abstract**

In this study, a green adhesive from renewable lignin and tannin was developed with polyethylenimine (PEI) with a method to improve the water resistance of the lignin/tannin adhesive. Lignin polyols were prepared through the liquefaction of oil-palm empty fruit bunches. The characteristics of the adhesive samples were compared with those of a commercial phenol–formaldehyde resin. Three plywood specimens bonded with the new adhesive showed a very high tensile strength (63.04 MPa) and were very water resistant. The effect of the solid content of the adhesives on the tensile strength and gel time and various weight ratios of PEI on the tensile strength and water resistance of the plywood specimens were evaluated. Thermal stability tests revealed that the lignin polyol–tannin/PEI adhesives had a high heat resistance