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## **Development and characterization of a new bio-adhesive for wood using cassava starch and bio-oil**

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### **Abstract:**

This work presents the development and characterization of a new and environmentally friendly wood bio-adhesive using cassava starch and bio-oil that was from the fast pyrolysis of larch sawdust. Bio-oil contains large amounts of chemicals and is cheap and renewable compared to the traditional modification methods for starch-based adhesives. It will bring great benefits if bio-oil can be used as the chemical additive to improve the quality of the regular starch-based wood adhesive. This study prepared the bio-oil-starch (BOS) adhesive and examined its properties. The structure and thermal decomposition stability were characterized with Fourier transform infrared spectroscopy, scanning electron microscopy, atomic force microscopy and thermogravimetric analysis. Results showed that, compared with a regular starch-based wood adhesive, the BOS adhesive displayed better liquidity, longer storage period (extended from 13 days to 55 days) and higher shear strength (the bonding strength of starch-based wood adhesive with 25% of bio-oil increased 17.4% in the dry state and 50.9% in the wet state, and its water resistance increased by 10.0%). Characterization showed that the improved performance of the BOS adhesive was supported by its strengthened molecular structure and enhanced thermal stability. The introduction of bio-oil significantly improved the properties and modified the structure of the regular starch-based wood adhesive.

**Keywords:** Wood adhesive; Starch; Bio-oil; Starch-based adhesive

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