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Processing bamboo for structural composites: Influence of preservative treatments on surface and interface properties

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Abstract

Engineered bamboo is being increasingly explored for structural use in the construction sector. To ensure durability, products such as laminated bamboo undergo essential preservation treatment steps during their manufacture. However, the effects of hygro-thermal *caramelisation* and chemical *bleaching*, two commonly used treatment procedures in industry, on the surface and interfacial properties of laminated bamboo are not yet known. The latter governs the structural quality of the final product. Our dynamic wettability studies through contact angle measurements revealed lower water contact angles, higher total surface energy and a slightly greater polarity ratio for bleached bamboo in comparison to caramelised and untreated bamboo. In addition, lap-joint shear tests and Weibull reliability analysis established the significantly better adhesive bonding performance of bleached bamboo with all five surveyed adhesives. Our observations are explained through the changes in chemical composition and structure of the raw bamboo material upon treatment, where changes in caramelised and bleached bamboo are dominated by hemicellulose degradation and lignin degradation, respectively. The bleaching process is conclusively identified as having favourable effects on bond strength of the glue line.

Keywords: B. composites; B. surface treatment; C. contact angles; C. lap-shear; bamboo

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