
Monitoring Adhesive Curing in Laminated Wood during Bond Development Using the Acousto-Ultrasonic Technique

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ABSTRACT

Laboratory-scale laminated woods with a single adhesive layer were used to determine the wood adhesive condition in bond development during cold-pressing using an acousto-ultrasonic (AU) technique. The manufacturing condition of the laminated wood was set to different pressing pressures and different amounts of curing agent, respectively. The ultrasonic velocity (v) and the maximum amplitude (MA), as well as the static Young's modulus (E) of the bending tests were evaluated. The results indicated that both the ultrasonic velocity ratio (v/v_{10}) and the maximum amplitude ratio (MA/MA_{10}), regardless of the manufacturing conditions, increased rapidly up to about 50 to 80 min of pressing time, and then slowed down toward the end of the measurement, indicated by a Plateau curve. Both the v/v_{10} and the MA/MA_{10} were closely related to E in detecting the pressing time during bond development. After one-way ANOVA and regression analysis, the correlation between either v or MA and E during pressing time was high, as expressed by the high correlation coefficients, $R = 0.94$ for the v and E , and $R = 0.97$ for the MA and E . These results indicate that by using the AU technique, the velocity of the transmitted ultrasonic wave or the attenuation of maximum amplitude can assess the adhesion of the laminated wood during the bond development process.

Key words: Acousto-Ultrasonic (AU), Adhesive Curing, Laminated Wood, Bond Development, Ultrasonic Velocity (v), Maximum Amplitude (MA)

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