EVALUATION OF COMPOSITES MADE FROM BLENDS OF COTTON BURS, COTTON STALKS, KENAF, FLAX, AND SOUTHERN PINE: HEAT TREATMENTS TO IMPROVE PHYSICAL AND MECHANICAL PROPERTIES AND ROT RESISTANCE

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Abstract

Experiments were conducted on composite board blends of cotton burs (B), cotton stalks (S), kenaf (K), flax, (F), and southern yellow pine (P). The composite boards were subjected to heat treatments and rot resistance testing. Heat treatments consisted of heating fibers either pre- or post-board fabrication using an oven at 365 F for 30 min. Board construction was accomplished using a 100-ton capacity oil-heated hydraulic press. Composite boards were produced using the following blend of fibers: 100% B, 50B/50K, 50B/50S, 50B/50F, 50B/50P, 100P, 100H, 100F, 100S, and 100K. Three specimens from each board were subjected to water absorption, thickness swelling, internal bond, and static bending stresses (modulus of rupture [MOR] and modulus of elasticity [MOE]). The testing was performed in accordance with methods described in Part B of the American Society for Testing and Materials (ASTM) D 1037-06a. For the rot resistance testing, three common rot fungi were used on heat treated and untreated boards made from blends of the biomasses previously listed, using ASTM D 2017.

Results indicate heat-treating the fibers post-fabrication improved water absorption in all boards compared to untreated specimens. Heat-treating had mixed effects on MOE, MOR, and internal bond with some fiber composites having improved values while others had lower values. Composites with flax fibers exhibited water resistance equivalent to the 100% P and H composites. For rot resistance testing, there were no significant weight loss differences due to heat treating. Wood blend composites had, on average, less weight loss than other blends, for two of the three fungal species evaluated.