Water absorption behavior of heat-treated and untreated red balau saw dust/LDPE composites: Its kinetics and effects on mechanical properties

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Abstract
The hygroscopic nature of wood limits the use of wood thermoplastic composites (WTC) in outdoor industrial and domestic applications. To reduce this tendency, red balau saw dust was heat treated at 180 and 200°C for 1 h and compounded with Low Density Poly(ethylene) (LDPE) into 20 and 37 wt% and then molded into test specimens by injection molding. Samples were immersed in distilled water at room temperature for 4 months. Heat-treated wood composites showed remarkable water resistance relative to untreated ones. Wood composites made from wood treated at 180 and 200°C exhibited almost similar water absorption pattern. Reduced water absorption of heat-treated wood composites relative to untreated ones indicates that heat treatment has resulted in a degree of modification of the wood. Most of the composites displayed the Fickian mode of water absorption with n values close to 0.5. Also, the diffusion coefficient reduced with wood content in untreated wood composites due to interaction of water with the polar groups in wood through hydrogen bonding. Untreated wood composites exhibited poorer mechanical properties with water immersion as a result of degradation due to moisture. The mechanical properties of the heat-treated wood composites were not adversely affected with water absorption. Therefore, heat

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