

Abstract

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Effect of Moisture State on Mechanical Behavior and Microstructure of Pulp Fiber-Cement Mortars

• An investigation involving mechanical testing and microstructural characterization was undertaken to examine the influence of moisture state at the time of testing on the performance (i.e., strength, toughness, failure mode) of pulp fiber-cement composites. Samples, prepared with fiber volume fractions of 0, 1.2, and 2.0%, were tested in oven dry, air dry, and wet states. Both compressive and flexural strength were found to be greatest in the oven dry state, presumably due to increased fiber and matrix strength as well as increased fiber/cement bonding which occurs with the controlled removal of water. Flexural toughness, however, was decreased for oven dry samples, and greater fiber fracture (as opposed to the more ductile failure mode of fiber pull-out) was observed in the oven dry samples. It is proposed that this results from differential shrinkage in the fibers' S1 and S2 layers and increased fiber/cement bonding with drying.