PERFORMANCE OF EXTRUDED FIBER-CEMENT COMPOSITES WITH HYBRID REINFORCEMENT OF JUTE FIBERS AND CELLULOSE NANOFIBRILS

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Abstract: The objective of this work was to evaluate the performance of jute fibers and nanofibrils as reinforcement in fiber-cement composites. The jute fibers were subjected to a NaOH-treatment to remove non-cellulose components such as extractives, hemicellulose. From the suspension of NaOH-treated fibers, the jute nanofibrils were generated through 30 cycles of defibrillation in a SuperMasscolloider grinder. Composites extruded with 0.5%, 1.0% and 2.0% (by mass) of the resultant nanofibrils were compared with composites made with the same proportions of the starting jute fibers. The composites were analyzed about their physical properties, static and dynamic bending. Composites with jute nanofibrils showed higher water absorption and apparent void volume than other formulations. The dynamic modulus of elasticity of the weathering exposed composites increased gradually over time, showing that the fiber-cements became stiffer with weathering exposure. Regarding the mechanical properties, it was observed that, in general, formulations reinforced with 2% of fibers and all those reinforced with nanofibrils showed higher values of LOP, MOR and toughness than control (C) composites after 28 days of curing and after natural weathering. In addition, the composites reinforced with 2% of nanofibrils (N2.0) presented the highest average values for LOP, MOR and toughness after 28 days of cure and after natural weathering. Composites reinforced with jute nanofibrils, in general, presented higher mechanical performance, and further developments are needed to improve their potential viability and reduce obtention costs for utilization in fiber-cement composites for civil engineering or other applications.

Keywords: Cement based composites. Vegetable fibers. Nanofibers. Dynamic modulus of elasticity.