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DEVELOPMENT OF SANDWICH PANELS COMBINING SISAL FIBER-CEMENT COMPOSITES AND FIBER-REINFORCED LIGHTWEIGHT CONCRETE

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ABSTRACT

This research proposes the development of an innovative structural panels based on the use of thin outer layers of Sisal Fiber-Cement Composites (SiFCC) together with a core layer of Polypropylene Fiber-Reinforced Lightweight Concrete (PFRLC).

The influence of sisal fibers was studied in two different ways, short sisal fibers (50 mm) randomly distributed in the matrix, and long unidirectional aligned sisal fibers (700 mm) applied by a cast hand layup technique. Lightweight aggregates and polypropylene fibers were used in the concrete layer forming the panel's core in order to reduce its density and improve its post-cracking tensile strength and energy absorption capacity.

The behavior of the sandwich panels in four-point bending test is described, and the various failure mechanisms are reported. Mechanical properties of both SiFCC and PFRLC were obtained, which were also used in the numerical simulations. Pull-off tests were performed to evaluate the bond strength between the outer SiFCC layers and the core PFRLC. The results revealed that the long sisal fibers were more effective in terms of providing to the panel higher flexural capacity than when using short sisal fibers, long fibers ensured the development of a deflection hardening behavior followed by the formation of multiple cracks, while short sisal fibers promoted a softening response after cracking.

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