Visual Abstract

Experimental investigation on the mechanical behavior of concrete reinforced with Alfa fibers

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ABSTRACT. Currently, the reinforcement of ordinary concrete with synthetic fibers poses ecological problems because the manufacturing process of these products is very polluting. Plant fiber composites are a new challenge for environmental protection. The present article aims to investigate the mechanical behavior of concrete reinforced with natural fibers, called alfa fibers. Compression and three-point bending tests have been performed on cubic and prismatic samples, respectively. Different fiber lengths (2.5, 5, and 8 cm) and content (0.6, 1.2, and 1.8 % by volume) of alfa fibers have been used to examine their influence on the mechanical behavior of the fiber-reinforced concrete. The obtained results show that for a volume content of 1.2 % of plant fibers of 5 cm length, the tensile strength of the reinforced concrete increases up to 54.41 % compared to the ordinary concrete (BT). However, for a content of 1.8 % of fibers with 8 cm length, both the compressive and tensile strength of the reinforced concrete decrease slightly. At this level, an excess of both fiber content and their length produces the formation of voids within concrete. Moreover, such an excess made the hydration reaction slower. It is worth noticing that the orientation of fibers also plays a significant role in the nucleation and propagation of microcracks. The fibers arranged both horizontally and obliquely are more resistant to microcracking than those oriented in the loading direction.

KEYWORDS. Fiber-reinforced concrete; Alfa fiber; fiber length; volume

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