Abstract

The reinforcement architecture is a key factor influencing the mechanical performance and cracking behavior of fiber-cement composites. This study aims to evaluate the effect of different sisal fiber alignment architectures on the flexural behavior of cementitious plates reinforced with long sisal fibers. Two reinforcement configurations with the same fiber volume fraction (5%) will be investigated: fibers aligned in a single direction and fibers aligned in two orthogonal directions. The plates will be manufactured using the same cementitious matrix to isolate the influence of the reinforcement architecture on the composite behavior. Flexural performance will be assessed through three-point bending tests in accordance with the Brazilian Standards NBR 15498. The study seeks to identify how fiber orientation affects stress transfer, crack propagation, and the overall structural performance of the plates. It is expected that the different fiber alignment architectures will result in distinct mechanical responses due to variations in fiber distribution, interaction between reinforcement elements, and crack-bridging efficiency. The findings will contribute to a better understanding of the role of reinforcement architecture in natural fiber-reinforced cementitious composites and support the development of more efficient and sustainable fiber-cement materials for building applications.