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Effect of Silica Fume on Engineering Performance and Life Cycle Impact of Jute-Fibre-Reinforced Concrete

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Abstract

The brittleness of plain concrete (PC) is a result of its lack of tensile strength and poor resistance to cracking, which in turn limits its potential uses. The addition of dispersed fibres into the binding material has been demonstrated to have a positive impact on the tensile properties of PC. Nevertheless, using new or engineered fibres in concrete significantly increases the overall cost and carbon footprint of concrete. Consequently, the main obstacle in creating environmentally friendly fibre-reinforced concrete is the traditional design process with energy-intensive materials. This study investigated how the engineering properties and life cycle impact of concrete were influenced by varying the volume fractions of jute fibre (JF). The impact of incorporating silica fume (SF) as a partial replacement of Portland cement was also studied. The studied parameters included mechanical behaviour, non-destructive durability indicators, and the life cycle impact of concrete using JF and SF. The efficiency of JF in mechanical performance