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Development of novel building composites based on hemp and multi-functional silica matrix

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Abstract

This study focuses on the development of novel bio-composites using a silica matrix that provides dual functionality: as a hydrophobic surface treatment and as a binder for hemp-shiv. The hydrophilic nature of hemp shiv, a plant based aggregate, results in composites having poor interfacial adhesion, weak mechanical properties and long drying times. In this work, sol-gel process has been utilised to manufacture durable low density hemp based composites. Morphological characterisation by scanning electron microscopy (SEM) showed that hemp shiv was embedded well in the matrix. Detailed chemical analysis using x-ray photoelectron spectroscopy (XPS) and gas chromatography-mass spectrometry (GC-MS) indicate the presence of water soluble and ethanol soluble extractives leached from the hemp shiv which are incorporated into the silica matrix inducing the binding effect. The composites were water resistant and showed good mechanical performance having the potential to develop novel thermal insulation building materials.

Keywords

Hemp; B. Adhesion; D. Chemical analysis; Mechanical testing