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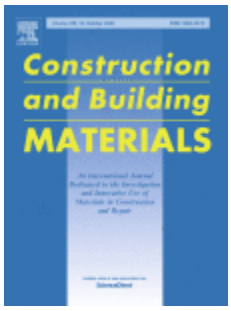

Impact of polyvinyl alcohol/acrylonitrile on bamboo nanocomposite and optimization of mechanical performance by response surface methodology

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Highlights

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- Using Response Surface Methodology to understand properties of polyvinyl alcohol/acrylonitrile on bamboo nanocomposite.
- Characterization and optimisation mechanical properties of polyvinyl alcohol/acrylonitrile on bamboo nanocomposite.
- Modification using chemical improved the properties of polyvinyl alcohol/acrylonitrile on bamboo nanocomposite.

Abstract

Bamboo is a natural resource that has prospect to substitute wood in many engineering applications. In this work, mechanical properties of bamboo nanocomposite based on polyvinyl alcohol (PVA)/acrylonitrile/nanoclay was evaluated using response surface methodology (RSM). The developed nanocomposites were characterized by X-ray diffraction (XRD), Fourier transform infra-red (FTIR), Scanning electron microscope (SEM), Differential scanning colometry (DSC), and Thermo gravimetry analysis (TGA) to study their compositional, morphological and thermal properties. Models were developed to predict modulus of elasticity and modulus of rupture of the nanocomposites. The developed models fitted the experimental values with R^2 close to 1 and residuals normal probability plot fitted to straight line. Optimized values of MOE and MOR were 12.82 GPa and 105.52 MPa respectively at 10 wt% clay loading, 15 wt% PVA/acrylonitrile loading and modification time of 5 min. The melting and decomposition temperature of the nanocomposites have shown significant improvement compared to the raw bamboo.

Keywords

Nanocomposites

Thermal properties Clay Mechanical properties Morphology