Effect of nano-particle weight percent on the flexural strength of Jute/kenaf/glass fiber composite using RSM

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Abstract

Effective alternatives to synthetic fiber composites have been found in natural fiber composites, which are being increasingly used in a wide range of practical applications. This study focuses on the development and evaluation of a hybrid composite, which involves blending natural and synthetic fibers using a hand lay-up process. Using statistical variance analysis, the study seeks to leverage the unique characteristics of each fiber composite. This article explores the effects of different fiber orientations, sequencing, and the addition of nanoparticles on important mechanical properties, particularly flexural strength. Through the utilization of the response surface approach, mathematical models are developed to analyze these mechanical properties. Through statistical analysis, it has been found that the orientation and sequencing of fibers have a

considerable impact on mechanical parameters. Additionally, the type of nanoparticles chosen also plays a role in determining the strength of the composite material. In particular, fibers aligned at a 90-degree angle demonstrate improved mechanical properties, especially when combined with a 5% concentration of nanoparticles. The latest iteration of the composite material shows significant performance improvement. Specifically, when the fibers are oriented at a 90-degree angle, using sequence 1, and with a nanoparticle content of 5%, the flexural strength is enhanced by an impressive 50%.

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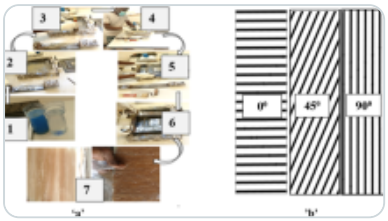

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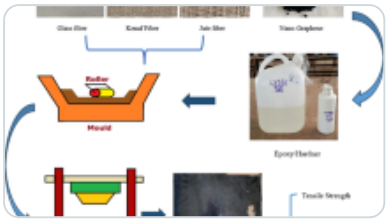

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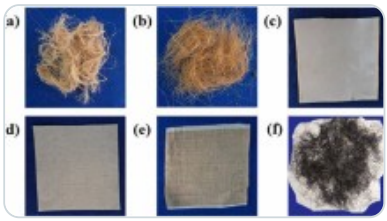

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Data availability

No datasets were generated or analysed during the current study.

Code availability

Not applicable.

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Contributions

S.J.A. and R.S. contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript. T.S. and A.P. wrote the paper with input from all authors.

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Ethics declarations

Ethical approval

Not applicable.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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