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RESEARCH ARTICLE

Redeemable environmental damage by recycling of industrial discarded and virgin glass fiber mats in hybrid composites—An exploratory investigation

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Abstract

The fiber industry develops materials with good physical and mechanical characteristics, but it also generates a lot of waste that is difficult to degrade. Glass fibers can be extracted from waste glass fiber reinforced polymers because of advancements in grinding and sorting technologies. The objective of the current paper is to use waste glass fiber along with new woven glass fiber mat in structural application. Composites were manufactured using the hand layup method using virgin and discarded woven glass fiber mats with different fiber weight fractions such as 10%, 20%, 30%, and 40%. Composites were then investigated for the influence of the recycled fiber on mechanical and vibration behavior using appropriate tests. Theoretical models were used to predict the mechanical behavior of the composites. Scanning electron microscopic technique was used to analyze the failure surface morphology of the composite specimen. Results portrayed that the composites with 40 wt% of new woven glass fiber mats exhibited better mechanical strength (tensile and flexural strengths and modulus of 243 MPa, 1752 MPa, and 1244 MPa, 946 MPa, impact strength of 12.13 J). The combined effect of new and recycled glass fiber composites exhibited tensile and flexural strength of 211 MPa and 1734 MPa, modulus of 1222 MPa and 925.7 MPa, impact strength of 10.43 J. The natural frequency of both composites was very close to all other volume fractions. The theoretical model also ended up with the same result and the margin of difference between predicted results and experimental results was very minimum.

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DATA AVAILABILITY STATEMENT

No separate data is not available.

REFERENCES

1 B. Devarajan, R. Lakshmi Narasimhan, B. Venkateswaran, S. M. Rangappa, S. Siengchin, *Polym. Compos.* 2022. <https://doi.org/10.1002/pc.26789>

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2 G. Rajeshkumar, *Polym. Compos.* 2021, 42(12), 6362.