Effective Utilization of Bast Fiber in High Density Polyethylene Nanocomposite Enriched by Alumina Nanoparticle: Mechanical Performance Evaluation

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Aims and scope

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Abstract

Hybrid polymer nanocomposite is embraced with natural fiber, promising applications because of better flexural strength, water resistance, lower moisture absorption, and extended life span. Besides, it faces the difficulties of poor adhesive quality and larger moisture absorption nature outcomes, as well as a lack of composite performance. The novel work is to synthesize the hybrid high-density polyethylene (HDPE) nanocomposite by the adaptations of 20 vol% chopped bast fiber, and 2, 4, and 6 vol% of nano-alumina (Al_2O_3) particles through hand layup aided thermal compression route, and its absorption

of moisture, tensile strength, and hardness is measured. The hybrid high-density polyethylene nanocomposite primed with 20 vol% bast fiber and 6 vol% nano-Al_2O_3 attained a low moisture absorption percentage (7 ± 0.2%), a high tensile strength of 48 ± 2 MPa, and better hardness of 45 ± 0.2 HV, which are greater than the HDPE without bast fiber and nano-Al_2O_3 particles.

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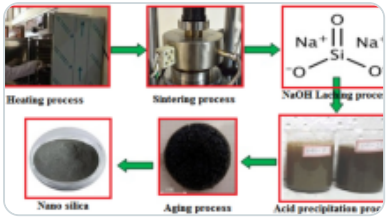

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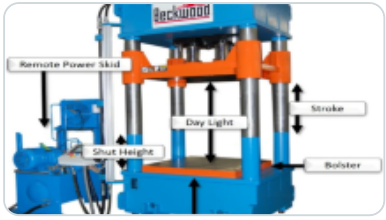

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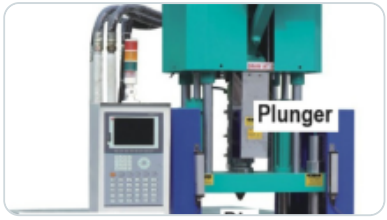

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Data Availability

All the data required are available within the manuscript.

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Ethics declarations

Conflict of interest

The authors have no relevant financial or non-financial interests to disclose. The authors have no competing interests to declare relevant to this article's content. All authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript. The authors have no financial or proprietary interests in any material discussed in this article.

Ethical Approval

This is an observational study. Effective utilization of bast fiber in high-density polyethylene nanocomposite enriched by alumina nanoparticle: mechanical performance evaluation, Research Ethics Committee has confirmed that no ethical approval is required.

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