

INVESTIGATION ON BALLISTIC MECHANICAL CHARACTERISTICS OF RAMIE-HEMP-KEVLAR BASED VINYL ESTER HYBRID COMPOSITES

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Introduction:

A composite material is made up of two components that have distinct physical and chemical properties. When they are mixed, they form a material that is designed to perform a specific task, such as becoming stronger, lighter, or more resistant to electricity. They can also help with stiffness and strength. They are preferred over traditional materials because they increase the qualities of their basic materials and can be used in a variety of applications

Objectives:

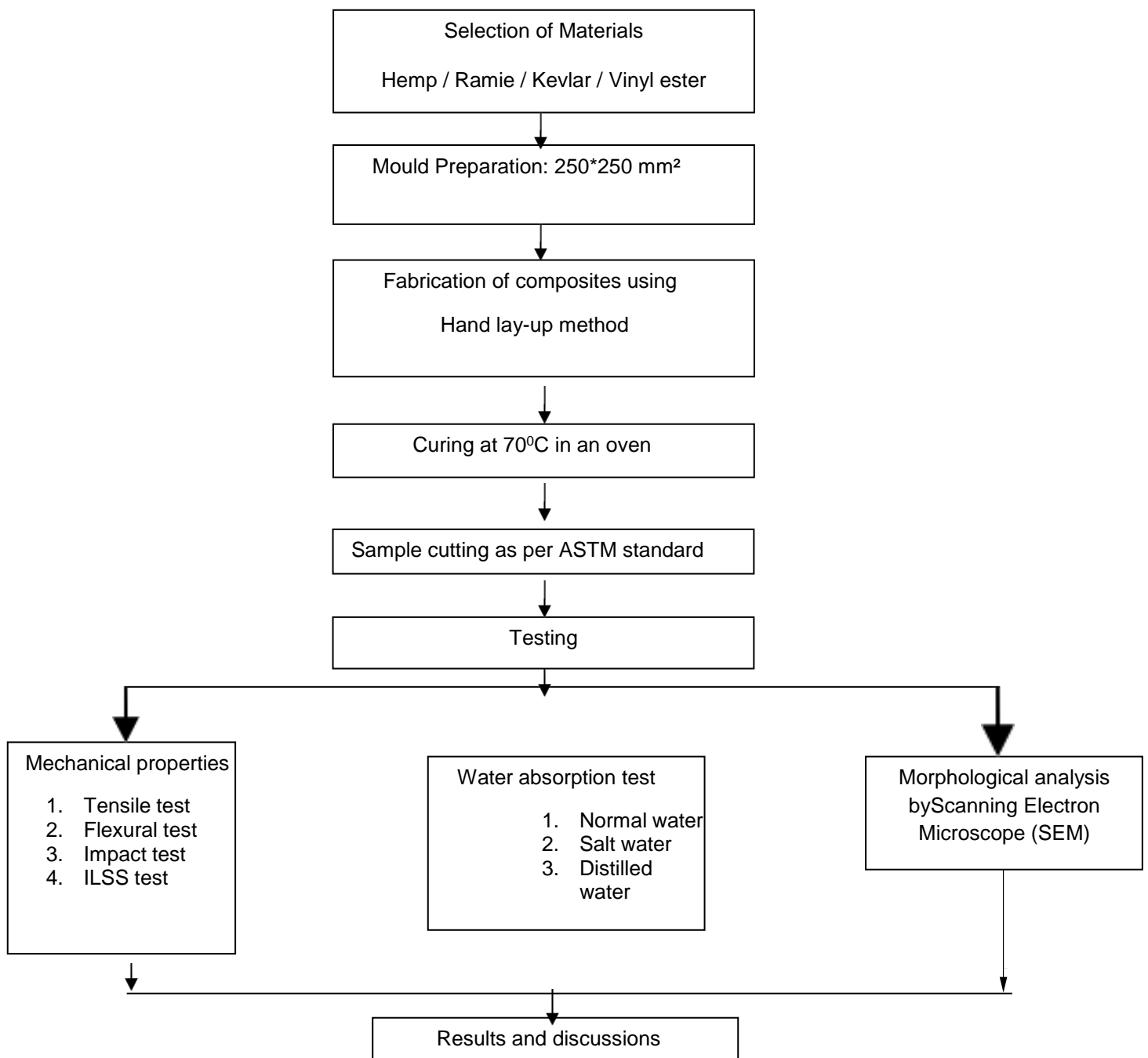
The following objectives made for the present work

1. To fabricate composites using hemp, ramie, kevlar (reinforcement) and vinyl ester (matrix).
2. To study the physical properties such as density and void fraction.
3. To study the mechanical properties such as tensile, flexural, impact, and interlaminar shear strength (ILSS) of the prepared composites.
4. To evaluate water absorption behavior of the prepared composites.
5. To analyze the morphological analysis of the fractured samples.

Methodology:

1. In the present study the composite materials are fabricated by using hand layup method.
2. Preparing a mould of 250 * 250 mm².
3. Resins are impregnated by the hand into fibres which are in the form of woven fabrics.

4. In this technique, the mould is first treated with mould release, dry fabrics are laid on a mould, and liquid resin is then poured and spread onto the fibre bed using brush.
5. After the application of the resin another layer of the material is applied and it is firmly rolled out from a roller and the resin is made to evenly spread.
6. Then it is made such that there are no air bubbles are trapped in the material with the help of the roller.
7. A few layers of fibers are wetted, and laminates are left to cure in the oven for 70°C.
8. After these layers are cured, and weight is applied on the material for compressing material for good adhesion.
9. The cured composite laminates were cut as per ASTM standards for testing



Conclusion:

Ramie/Kevlar/hemp fabrics were successfully reinforced with vinyl ester matrix in this experimental effort, resulting in a unique material in the field of natural fibre polymer composites. The hybrid composite laminates were made using a manual hand layup process, and the prepared laminates were examined for their various physical, mechanical, and microstructural properties. The created Ramie/Kevlar/hemp with vinyl ester reinforced hybrid composite laminates' optimal tensile, flexural, impact, and hardness properties justify their use in several medium load structural applications. The SEM morphological analysis demonstrates robust bonding in composites with lower void contents, resulting in enhanced mechanical characteristics between the textiles and the vinyl ester matrix.

Scope for future work:

This project gives more insight and a chance to explore more investigations in the field of natural fiber reinforced hybrid polymer composites. Some of the recommendations are mentioned below;

1. Hand layup method can be used for economic advantages.
2. Hybridization of Kevlar, ramie, hemp, along vinyl ester with different layering stacking sequence and determination of their effective performance.
3. Various experimentations such as dynamical mechanical properties, water absorption, and morphological analysis can be carried out.