

ANALYSIS ON MECHANICAL CHARACTERISTICS OF CONCRETE MADE WITH NATURAL FIBRE REINFORCED POLYMER AND SIGNIFICANT DEVELOPMENT USING HYBRID COMPOSITES

¹S. S. RAVISHANKAR, ²V.ABHINAY, ³M. MERCY LYDIA, ⁴S.M. SHAFEE

^{1,2,3,4}Dept of Mechanical Engineering, Sree Venkateswara College Of Engineering, Nellore (Dt), Andhra Pradesh, India.

ABSTRACT

As a reinforcing component for polymer composites, common threads generated from sustainable natural resources are now an option to glass, carbon, and other man-made filaments. Because to its benefits, including its ease of accessibility, low cost of manufacture, and attractive mechanical features, bamboo is the distinctive fiber that is used the most commonly among the many filaments. A composite material's mechanical behavior is influenced by a number of variables, including as the quantity, kind, introduction, length, and other properties of the fibers. In this work, attempts were made to consider how fiber stacking and introduction affected the physical, mechanical, and water retention behavior of bamboo/glass fiber reinforced epoxy-based cross breed composites. Composites made from glass fibers oriented differently, such as (0°, 30°, 45° and 60°) are created utilizing basic hand lay-up system. This investigation deals with the Compressive, Impact and Hardness Properties of Fabricated Hybrid composite using Bamboo, Glass Fiber and Epoxy resin. To study influence of Glass fiber orientation of (0, 30, 45, 60) mechanical properties like Impact strength, Hardness, Compression strength of fabricated composites. During Comparison the Hardness, Compression strength shows Optimum Results in 45 degrees of Glass Fiber Orientation. Izod strength is maximum in 0 degrees of Glass Fiber Orientation.

Keywords: Natural Composites, Hybrid composites, Bamboo Fiber, Mechanical Testing of Natural fiber Hybrid Composites, Water absorption ,hybrid composites

1: INTRODUCTION

One of the most significant achievements ever is the creation of composite materials, combined with improvements in their design and construction. Materials having unique mechanical and physical properties, such as composites, are employed in a wide range of applications. As comparison to conventional materials, composite materials provide a number of benefits, including elasticity, sway, flexural, solidity, and exhaustion properties. Due to their wide range of uses, they are frequently used in a variety of industries, including the manufacturing of aeroplanes, business mechanical designing applications, such as machine segments, vehicles, burning motors, mechanical parts like drive shafts, tanks, brakes, weight vessels, and flywheels, warm control and electronic bundling, railroad mentors, and flying machine structures.

1.1 Applications of natural Fiber composites

The building and construction industry might use the natural fibre composites as a very cost-effective material for the following applications:-Mobile or pre-fabricated buildings that can be used in items of natural calamities such as floods, cyclones, earthquakes, etc. Postboxes, storage bins, biogas storage containers, etc.

2. Objectives of the Present Work

The main objectives of current research work are as follows:

1. Fabrication of bamboo/glass fiber reinforced epoxy resin depending composites.
2. To study influence of fiber loading and fiber direction on mechanical properties like Impact strength, Hardness, Compression strength of fabricated composites.

3. Evaluating the mechanical properties like impact strength, Compression strength, and hardness of fabricated composites.

3. Materials and methods

This part portrays the materials required, manufacture technique and the exploratory systems Pursued for their portrayal. It displays the subtleties of the portrayal and tests which the composite examples are exposed to crude materials utilized in the present research work are

I- Bamboo fiber II- Glass fiber III- Epoxy resin (LY556)IV- Hardener (HY951)

3.1 Fabrication of composite fiber

The hybrid composite is fabricated by hand lay-up method.

3.2 Hand Layup Method

- Mix the resin and hardener in 10:1 ratio for optimum solidification rate.
- Prepare the mould according to the ASTM standards specimen.
- Applying the remover on the surface of the specimen.
- Cutting the e-glass fabric into the mould dimensions.
- Then applying he first layer of epoxy resin in the mould.
- Glass fiber has been laid with changing orientation over the epoxy resin(0, 30,45,60)degrees.
- Then placing the bamboo fiber over the glass fiber filled by epox over it.
- Then pouring epoxy over the bamboo fiber and again place the glass fiber over it.
- Repeating the same steps upto 5-7mmthickness is obtained.
- Placing the load on the mould in between5-15kg and leaving it for 24 hours.



Fig.1 Bamboo



Fig.2 Glass Fibre



Fig.3 Hand Layup process

Experimental Tests Conducted

- Compression Test
- Impact Test
- Hardness Test



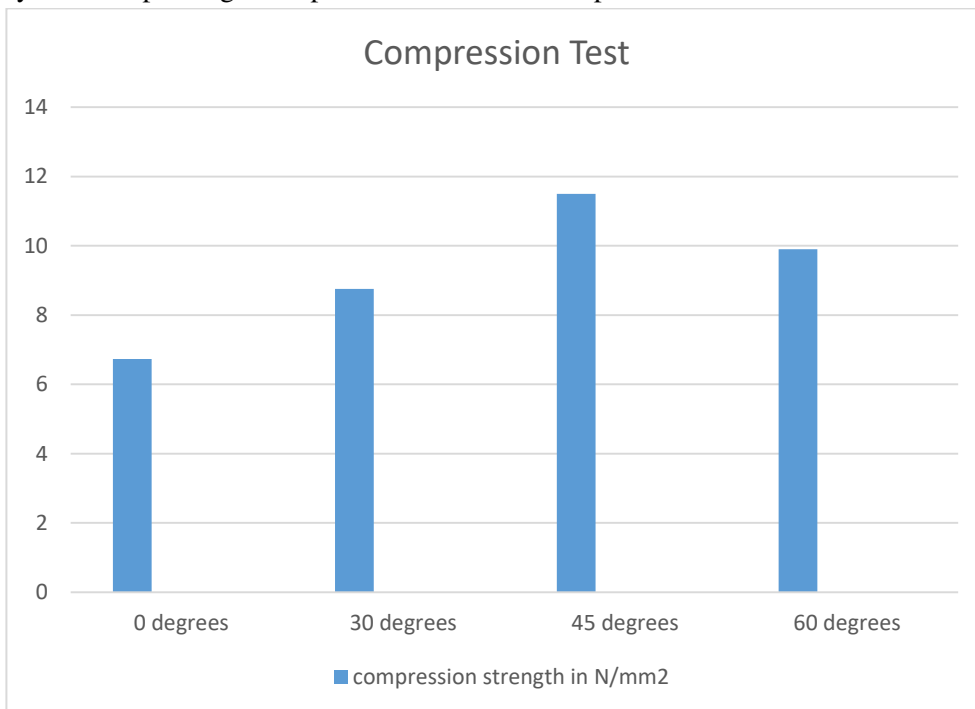
Fig .4 Hardness Test

4. RESULTS

In the present work we discuss the automatic properties of the Bamboo/glass hybrid fiber polymer composite material. In this chapter we calculate the result of various mechanical properties and data of Compression,

Impact, Hardness tests are tabulated now. These comprise the assessment of compressive strength, impact strength and hardness of the sample. The understanding of the outcomes and the examination among different orientations of glass fiber (0, 30, 45, and 60) degrees are introduced.

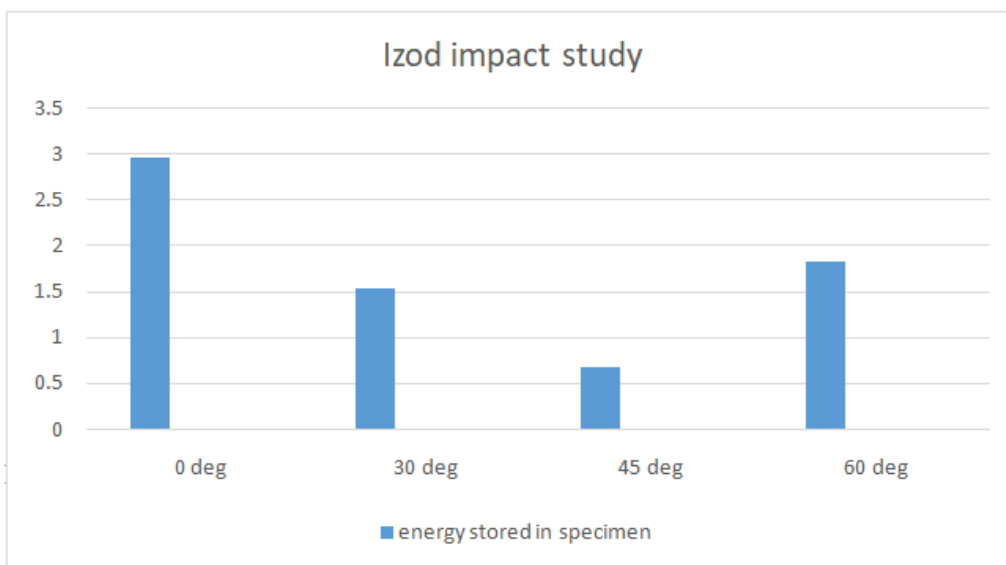
In this investigation, we have concluded that 45 degrees orientation of glass fiber along with the bamboo and epoxy resin Hybrid Composite gives Optimum Mechanical Properties.



Graph.5. Results of Compression Test

Angle of Orientation Vs Compression strength

In this Graph showing 45 degrees of orientation of fiber gives high compression strength. Compression strength is showing in N/mm².

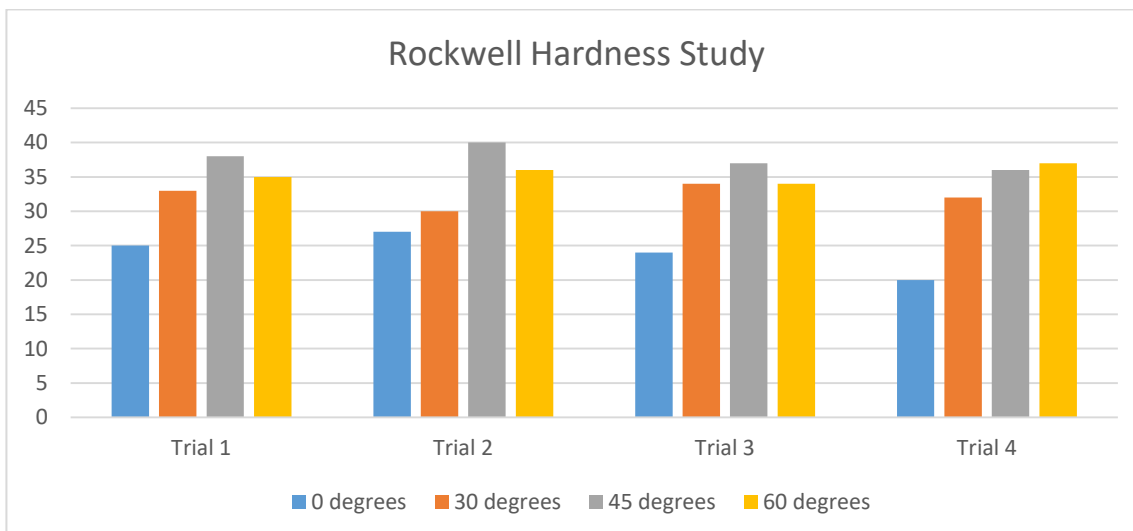


Graph.6. Results of Izod Impact Test

Angle of Orientation Vs Izod Impact strength

Energy stored is in J/mm².

In the above Graph showing gives maximum Impact strength in 0 Degrees Orientation of fiber



Graph.7. Rockwell Hardness Test

Number of Trial Vs RHN.

CONCLUSIONS

This inquiry came to a conclusion after looking at the compressive, impact, and hardness characteristics of hybrid composite materials produced from bamboo, glass fiber, and epoxy resin. To research the possessions of glass fiber orientation on the impact strength, hardness, and compression strength of manufactured composite (0, 30, 45, 60). Glass fibers oriented at a 45-degree angle outperform other fiber orientations in terms of hardness and compression strength. The glass fiber used in this experiment is oriented at a 45-degree angle, which offers the optimum mechanical properties. The maximum izod strength is at absolute zero.

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