Preparation of Hybrid Polymer Composite Materials

Veena Dinesh, H.K Shivanada, Arasu Kumar, Srinivasa Chari V

Abstract: ***In this project we endured through the natural fibers. As we know the extensive use of fibres in all the fields, so we can't directly use the fibers it needs to-do reinforcement of the composites. We are introducing the new hybrid polymer with light weight and economical composites.***

Keywords: Metal matrix, composites, fibers and reinforcement

I. INTRODUCTION

The industry originated to recognise that the growth and applications of composites even more than aerospace industry to reduce size and weight, as the part of research us found that the decrease in dead weight and also it absorbs vibration and amazement.

II. MATERIAL SELECTION AND TECHNIQUES

Material

- Epoxy resin
- Hardener
- Fibers (Sisal , banana and glass)
- NaOH solution

Methodology

➢ Selection of Matrix form Epoxy resin with grade LY-556 along with HY-951 for hardening.

➢ Banana used to fill as reinforcement and glass fibre were used to enclose the natural fiberes.

➢ Extraction of fibre sisal it is commercially available

Banana fiber: Banana Fiber contains cellulose, hemicelluloses and lignin. Available at reasonable prices, our Banana Fiber is widely appreciated for its characteristics such as high strength, strong moisture absorption, good luster, light weight, fast moisture absorption and release, small elongation, easy degradation and many more.

Fig. 1 Sisal Fiber

Glass fiber: This type of materials is produced fine degree of fibers with light weight .The wide use of this fibers comparatively metals, in complex parts shapes. It is starting to use in 90s.

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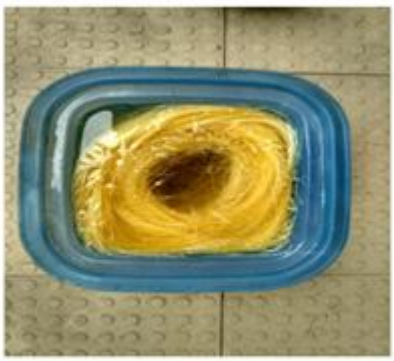
Fig. 2 Banana fiber

Fig. 3 Glass fiber

External Treatment of Fibers

As we know that the natural fibers are basically consists of lot of impurities. It needs to be treat with the some external agents like NaOH of 5% with minimum 3-4 hours next to wan and dried under the condition of normally day light with 1-2 hours.

(a) 5% NaOH solution



(b) Fibers in NaOH Solution

(c) Water Treatment

(d) Drying at room temperature

Fig. 4 Sample grounding for wet hand layup process

III. SAMPLE COMPOSITIONS

Sample

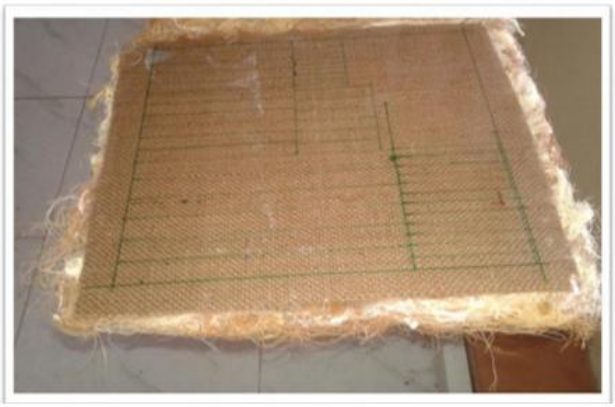


Table. 1 Layer arrangement of the Fibers

Glass Fiber	20%
Sisal Fiber	20%
Banana Fiber	20%
Sisal Fiber	20%
Glass Fiber	20%

IV. TESTING AND RESULTS

Samples Planning According to the ASTM Standards

The specimens are cut as per the ASTM dimensions is as follows

Sl no	Std	Mechanical Test	Dimensions in mm
1	ASTM	Flexural	80*20*3.5

Mechanical Testing of Composite Laminates

Mechanical testing's like ultimate tensile strength, young's modules and flexural strength. Inter laminar shear strength of carbon and glassfiber reinforced vinyl esters are tested in universal testing machine.

Table. 1 Specifications of Universal Testing Machine

Parameter	Specifications
Capacity	10 tones
Load frame	Mild steel C channel with double ball screw mechanism pre-loaded ball screw with zero backlash covered with bellow
Mounting	Free standing
Load range	1 kg-1000 kg using 1 ton load cell 1 kg-10000 kg using 10 ton load cell
Length measurements	Rotary encoder mounted on to the screw rod
Length resolution	0.01 mm
Cross head speed	0.1 to 100 mm/min
Controls	Emergency off, up and down key
Input power	220V±10% VAC,50 HZ,1500 VA
Net weight	225 kg
Grippers	Tensile, Compression, Three point Bending
Length accuracy	±0.1 mm

Testing of Composites

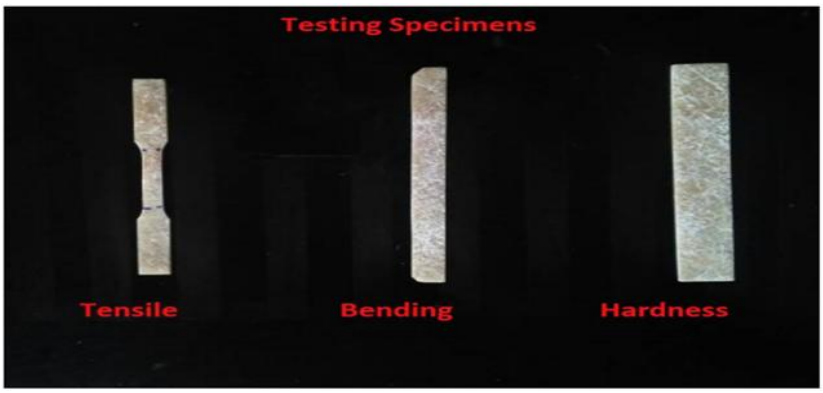


Fig. 5 Test specimens for Tensile, Bending and Hardness tests

Width	12.7mm
Length	127mm
Thickness	6mm

The test is conducted at a strain rate of 0.5mm/minute. The distance between the supports are maintained 100mm andtest results are recorded.

Results

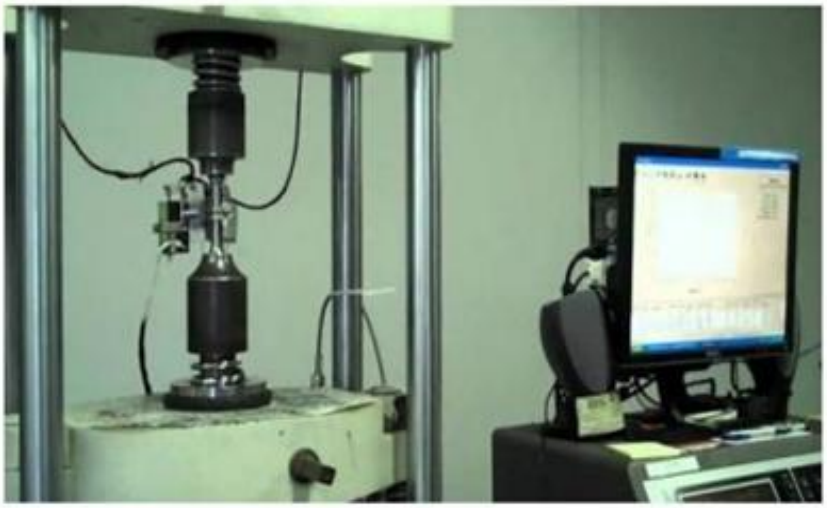
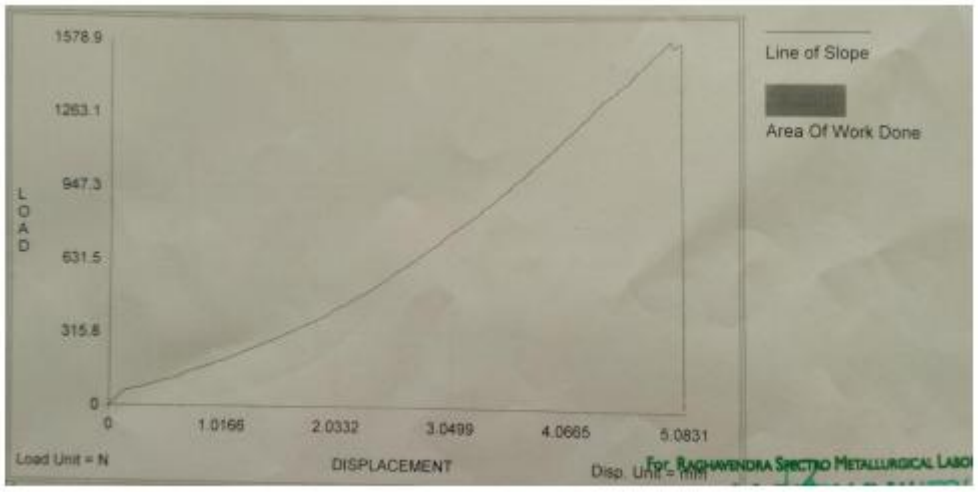


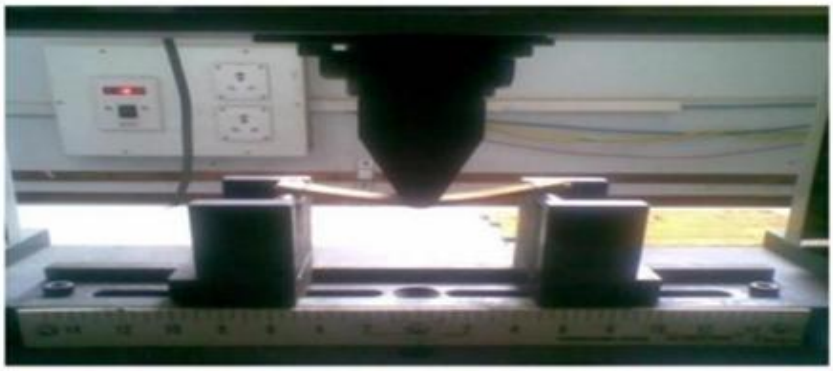
Fig. 6 Tensile Test Setup

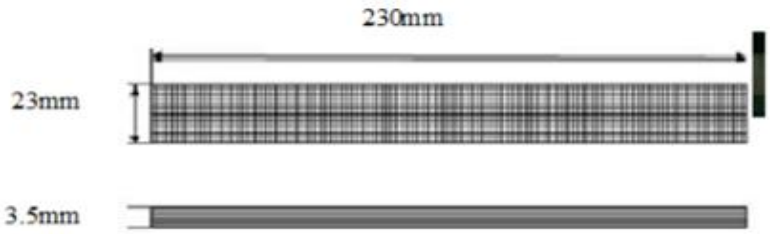


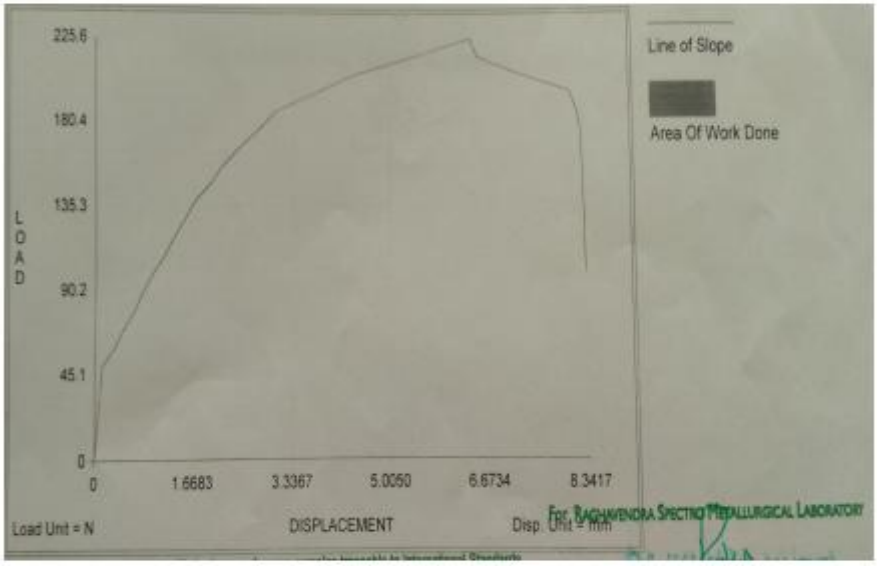
Peak Load	1578.9N
Peak Displacement	4.956mm
Break Load	1569.058N
Break Displacement	5.049mm
Initial Area	48.80sq mm
Final Area	44.30sq mm

Experimental Load Displacement Curve for Tensile Test

Bending Test







Peak Load	225.6N
Peak Displacement	6.415mm
Break Load	98.06N
Break Displacement	8.342mm
Initial Area	80.220sq mm
Final Area	70.428sq mm

Experimental Load Displacement Curve for Bending Test

Applications

The composite obtained can be used mainly for the fabrication of the interiors of the aircraft like:

- Floors
- Ceilings,
- Sidewalls And
- Storage Bins.

V. CONCLUSION

The fiber like banana fiber, glass fiber and sisal fibers are effectively involved to make the new bio composite by changing the percentage of fiber.

Produced new fiber with reinforcement of the natural fibers gives good mechanical properties as compared with the pure matrix.

In n our present work we used three different fibers are fruitfully reinforced with epoxy resin by modest and economical hand layup technique. By the above results we came to know that we can use to make the different type of

Fibers effectively and can use in automobile applications. The reinforcement and synthetic fiber have good mechanical properties compared to conventional composite materials.

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