

# Experimental Investigation of Natural Fibre Reinforcement Hybrid Composite

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**Abstract:-** Natural fibre have good mechanical properties like flexural, tensile, corrosion resistance, moisture absorption. They are ecofriendly, light weight and cost effective. Our study on Combination of Natural fibre with Synthetic fiber composite proves to provide good strength to cost ratio compared to existing Synthetic fibre composites. Initially for weight considerations of the composite coir fibre are alkali treated with NaOH solution at a particular concentration for 24 hours and is left to shadow dry for several days. This alkali treatment enhances the coir fibre making them smoother with considerable increase in their tensile properties. The alkali treated enhanced coir-glass composite provides higher tensile strength with reduced weight compared to non alkali treated composite of the same.

**Key words:-** Natural fibre, Synthetic fibre, Coir fibre, Glass fibre, Alkali treatment.

## I. INTRODUCTION

Hybrid fibre composite material have both organic and inorganic fibre .Here(1) They compared mechanical properties of coir/epoxy with glass fiber/epoxy. Coir composite values are significantly lower than those measured glass fibre composite. And coir fibers was detached from the resin surface because poor interfacial bonding, with some voids formed on the resin surface to over come this bonding problem of nature fibre treatment process used.(2) Mohit review Effect of fiber treatment increases properties of natural fibre reinforced composite. The different chemical can be used for surface treatment of natural fibers are such as Benzoylation treatment, Cyclohexane modification, Alkali treatment, Fluorocarbon treatment, etc. To enhance bonding between fiber surface. Alkali treatments was used primary treatments for all type of fiber to increases flexural properties.(3) Investigate of glass fibre-coconut fibre hybrid composite material with various concentration of Sodium Hydroxide for treatment of coir fibre reinforcement. If the concentration of NaOH was increases the structure of nature fibre may damage then it will decrease the mechanical properties.(4) mechanical analysis of woven natural fibre composite specifically coir and kenaf natural fibre and Morphological analysis of these two fibre by using a Scanning Electron Microscope (SEM).Woven structure composite reinforcement in turn produced better mechanical properties compared with random orientation reinforcement natural fibre. (5)Hybridization of glass and carbon fibre gives better tensile

strength, flexural strength, wear resistance. woven bidirectional E-glass fiber and 2×2 twill woven bidirectional carbon fiber this structure enhance specific wear properties of hybrid fibre composite. Improvement of wear properties increase performance and operating span of polymer composite based components. (6) this study are fiber volume fraction, curing time and compression load applied during fabrication of the coir fibre reinforcement composite. And cutting time of coir composite improve in influencing the tensile strength.

## II. EXPERIMENTAL METHOD MATERIAL

### A. Coir fibre

Coir fiber extracted from coconut husk according to source extraction it is known as fruit fibre. Woven coir samples were having a density of 3 epi x 18 ppi. Epi means ends per inch point out number of warp yarns per inch then ppi means picks per inch define number of weft yarns in every inch fabric properties of coir shown in table(1)

Properties	Coir
Diameter (micrometer)	100-450
Elongation Max (%)	47
Lignin content (%)	42
Cellulose content (%)	37
UTS (MN/m <sup>2</sup> )	106-175
Elastic Modulus (Gpa)	3-6

Table 1. Coir fibre various properties

### B. Glass Fibre

E-Glass or electrical grade glass fibre are insulators for electrical wiring. It was low alkali glass fibre reinforcement material. Woven fabrics E- glass fibre with 400GSM (grams per square meter) was used. Properties of E-glass fibre shown in table (2)

Properties	E-glass fibre
Tensile strength(MPa)	3445
Density (g/cm <sup>3</sup> )	2.8
Compressive strength (MPa)	1080
Thermal expansion (µm/m·°C)	5.4

Table 2. properties of E-glass fibre



Fig 2:- Fabrication of hybrid reinforcement composites

C. Coir fiber treatment

Before the treatment, coir fibers mat were pre-washed with large amounts of distilled water and coir fibre were immersed in 7% NaOH added in distilled water (5L) solution for 24 hours at room temperature. After treatment coir fibre mat were washing with distilled water and to remove the alkali present in coir fibre mat. Then, the fibers were dried in room temperature in 48 hours. Treatment shown in fig (1)

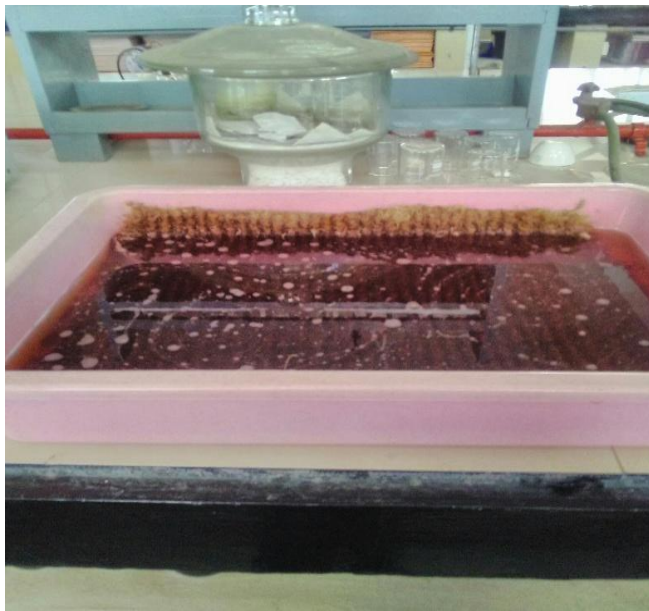
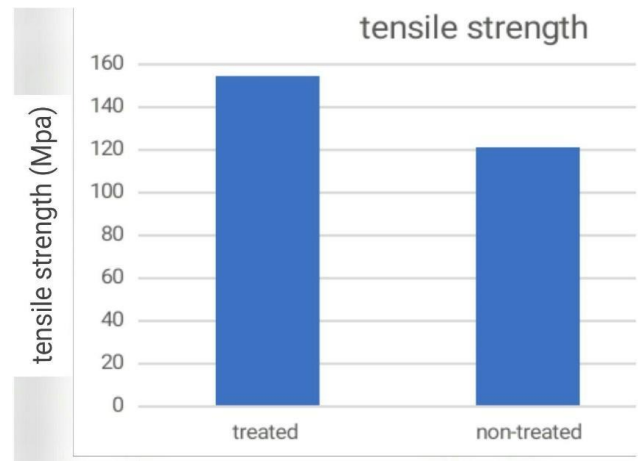


Fig 1:- NaOH treatment process of woven coir fibre

III. RESULTS AND DISCUSSION

A. Tensile test

Tensile test result of shows treated coir hybrid reinforcement composite is increased 25% when compare to Non-treated coir hybrid reinforcement composite . The percentage of increased demonstrate effect of treatment in natural fibre will enhance tensile strength.



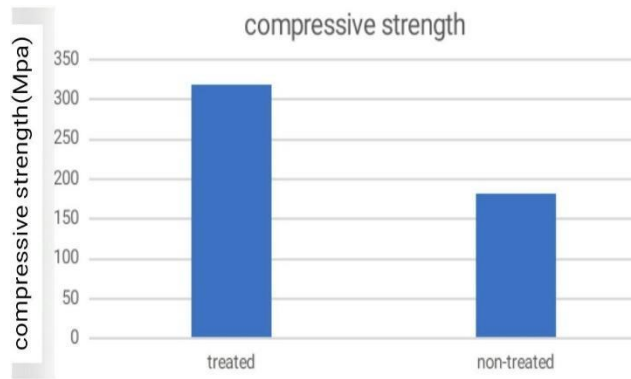
Graph.1 Tensile Strength

D. Fabrication of Composites

Hybrid fibre composite have a synthetic fibre and natural fibre so improve the bonding of these two different fibre compression molding method is better then hand lay up method . Composite laminate is 300×300×10mm size to arrangement of symmetry three ply (GCG). Ratio of reinforcement and matrix is 60:40. Compress pressure is 90 kg/cm<sup>2</sup> at 150 °F shown in fig (2).

B. Compressive test

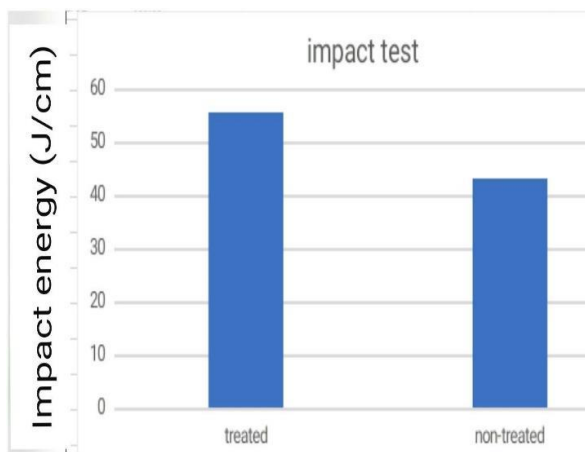
Through this test the hybrid reinforcement composite shows better values and the increasing percentage of treat coir hybrid reinforcement is 69% compared to Non-treated coir reinforcement. This hybrid composite will be applicable for to withstand high crushing load.



Graph. 2 Compressive Strength

### C. Impact test

Impact test done both treated and Non-treated composite material test result indicates improvement of coir fibre properties through treatment process. Increasing percentage treated coir composite is 20% .



Graph.3 Impact Energy

## IV. CONCLUSION

By comparing two different treated and non-treated coir fibre hybrid reinforcement composite. The treated coir shows better mechanical properties. Values of tensile, compressive, impact test increase because of alkali treatment in coir fibre because it will enhance surface smoothness and increase bonding between fibre and resin . And also reinforcement arrangement in woven structure this will enhance the mechanical interlocking of fibre is improve stability .

## V. ACKNOWLEDGMENT

This project was support Mr. C. Dinesh working as an Assistant Professor in Sri Ramakrishna Engineering College, Coimbatore, Tamilnadu for extending his cooperation, guidance, advice and support in carrying out the project.

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