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Analysing of Composite Material Using Bamboo Fibre with Epoxy Resin

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ABSTRACT: The significant expense of engineered fiber, for example, glass, carbon, kevvars and so on, brings about significant expense of creation and items got from these materials which has required elective methods for materials advancement. This has likewise educated the use regarding locally accessible bamboo fiber for composite materials advancement. Characteristic fiber has developed as an inexhaustible and less expensive substitute to manufactured materials, for example, glass, carbon and apprehensive, which are utilized as fortifications. Right now, objective was to create, research and dissect the mechanical properties of a composite material utilizing bamboo fiber. The long bamboo fiber was separated utilizing compound assimilation and maceration strategies. The creation of the composite was done utilizing epoxy gum as the lattice and the bamboo fiber as support. Test were done to decide the mechanical properties, for example, malleable, hardness and effect qualities. The outcomes were contemplated and contrasted and the traditional materials and it process that the material improvement can be utilized in basic applications with solid reliance on its mechanical properties.

KEYWORDS: Bamboo Fibre, Epoxy resin, Hardener, Laminated cover, Wax, Polyvinyl alcohol, Stainless steel die.

I. INTRODUCTION

Notwithstanding these normally happening composite, there are numerous other building materials that are composite when all is said in done manners and have been being used for quite a while. They incorporate carbon dark in elastic, Portland concrete or black-top blended in with sand, and glass filaments in sap and so on. Since the mid 1960's, there have been expanding requests for materials that are stiffer and more grounded at this point higher in fields as assorted as aviation, vitality, common and mechanical developments. The interest put on materials for better generally execution is so incredible and assorted that nobody material can fulfill them. This constraint has prompted a resurgence of the antiquated idea of consolidating various materials in an incorporate composite materials to fulfill the client prerequisite, this composite material framework bring about an exhibition that can't be achieved by singular constituent which offer an incredible bit of leeway of an adaptable structure. Characteristic strands are presently viewed as a genuine choice to glass fiber for use as fortifications in composite materials. Their points of interest incorporate ease, low thickness, high solidarity to-weight proportion, and protection from breakage during handling, low vitality substance and recyclability. The properties of characteristic fiber-based composites can be influenced or changed by various factors, for example, fiber mixes, preparing technique, strands volume part, viewpoint proportion, water assimilation, and so forth.

Bamboo fiber:

Bamboo fiber is the cellulose fiber extracted from the natural growth of **bamboo**, and is the fifth natural **fibers** following the cotton, linen, wool, and silk. Bamboofiber has good air permeability, instantaneous water absorption, strong wear resistance and good dyeing and other characteristics.

Bamboo is amongst the fastest growing plants some varieties is growing up to 4cm or 1.6inch per hour. In Asia the bamboo good industries in an important source of the revenue for many communities. It also serves has an abundant and quickly replenished the natural resource. Bamboo has a higher compressive strength than wood, brick or concrete. Tensile strength is the ability of a material to resist forces that are trying to pull it apart. This is around 10 times the

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tensile strength of a soft wood such as pine. Bamboo characteristics as a fast growing natural and extremely strong material. High compressive strength, tensile strength, flexibility and hardness.



Fig.1.1.Bamboo fibre

Epoxy Resine:

They are flexible tars, offering especially amazing protection from erosion (solvents, antacids and a few acids), high quality/weight proportion, dimensional strength and attachment properties. They are direct polymers delivered by consolidating epichlorhydrin with biphenyl A. Different definitions are glyceryl esters (for vacuum impregnation, overlay and throwing), glyceryl ethers of novellas gums, and brominated gums. They contrast from polyesters and vinyl esters in that they don't contain any unpredictable monomer part. Various tars are created by changing the proportions of the components. The gums are moderately high in consistency, with the goal that they are normally shaped at temperatures in the locale of 50-100°C, or broke up in a latent dissolvable to lessen thickness to a point where overlay at room temperature gets conceivable. Relieving specialists, likewise alluded to as impetuses, hardeners or quickening agents, are utilized, acting either by synergist activity or straightforwardly responding with the sap. With right added substances, epoxy gums can show remarkable protection from heat (some up excessively 290°C) and electrical protection properties. They can be either fluid or strong frame and can be planned to fix either at room temperature or with the guide of warmth.



Fig.1.2.Epoxy Resine

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Physical properties:

PROPERTIES	EVALUATION
Appearance	A milky white liquid
Specific gravity at 25°C(gm/cc)	1.12
Viscosity at 25°C(centipoises)	550
Gel point in minutes	26
Solid contents (%)	84
Tensile strength (MPa)	6.9
Tensile modulus (MPa)	166
Impact strength (kJ/m ²)	1.1

Table.1.1. Physical properties

II. EXPERIMENTAL PROCEDURE

A set of bamboo strips are blended to give a smaller strips of bamboo. The blended bamboo strips are mixed in a solutions of resin and hardener in the ratio of 10:2. The stainless steel die of (100x60x15 mm) is coated with wax in order to allow the removal of composite sample. The solution is poured into the die and left to dry in the atmospheric temperature. The sample is then removed from the die and PVA (Polyvinyl Alcohol) is applied to smoothen the surface



Fig: 2.1

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The mechanical properties of the sample are tested by performing tensile, hardness and impact test. The values of the test are connected and observed.

PARAMETER	%VALUE
Bamboo straps	40
Epoxy Resin	30
Epoxy hardener	20
Catalyst(wax)	7
PVA(polyvinyl alcohol)	3

III. RESULT AND DISTRIBUTED

Tensile Test:

A tensile test, also known as a tension test is one of the most fundamental and common types of mechanical testing. A tensile test applies tensile (pulling) force to a material and measures the specimen's response to the stress. By doing this, tensile tests determine how much it can elongate. Tensile tests are typically conducted on electromechanical or universal testing instruments, are simple to perform, and fully standardized.



Fig:2.1.Tensile test

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Parameters	Observed Values
Ultimate tensile strength (N/mm ²)	9.67

Table:3.1.

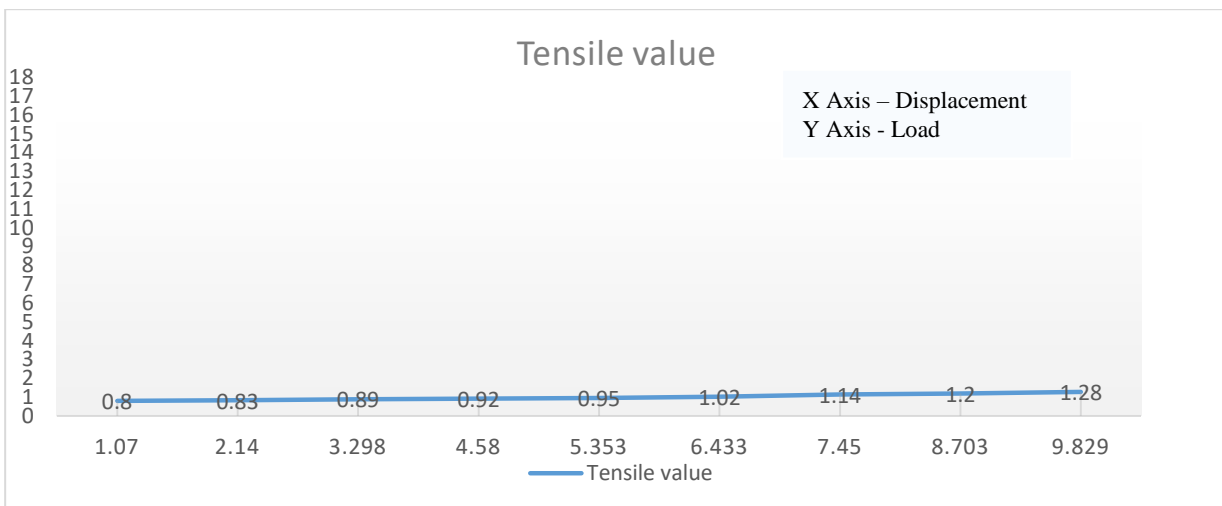


Fig:3.2.

Shore Hardness Test:

Shore hardness is a measure of the resistance of a material to penetration of a spring loaded needle-like Indenter. Hardness of hard elastomers and most other polymer material (Thermoplastics, Thermosets) is measured by Shore D scale. Shore hardness is tested with an instrument called Durometer.



Fig: 3.3 Shore hardness test

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PARAMETERS	OBSERVED VALUES
Shore-D Hardness (I)	64
Shore-D Hardness (II)	66
Shore-D Hardness (III)	64

Table: 3.2.

Impact Test:

Test of ability of a material withstand impact, used by engineers to predict its behaviour under actual conditions. Many materials fail suddenly under impact, at flaws, cracks, or notches. The most common impact tests use a swinging pendulum to strike a notched bar; heights before and after impact are used to compute the energy required to fracture the bar (see strength of materials). In the Charpy test, the test pieces is held horizontally between two vertical bars.



Fig: 3.4 Impact test

PARAMETES	OBSERVED VALUES(JOULE)
Impact Energy	2.0

Table.2.3

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IV. CONCLUSION

Right now have done a mechanical character examination on bamboo fiber with epoxy composite. By doing this undertaking we have increased great information about common strands and the mechanical tests were led in the materials and the outcomes were remembered for this venture report. By observing the test outcomes we here by infer that the bamboo fiber with epoxy gum composite has great mechanical attributes.

REFERENCES

- [1] A. Marot and B. A. Othman, "The potential Use of Bamboo as Green Material for Soft Clay Reinforcement System", 2011 International Conference on Environment Science and Engineering, IPCBEE vol.8 (2011) © (2011) IACSIT Press, Singapore, pp. 129-133.
- [2] D. S. V. Prasad, M. A. Kumar and G. V. R. Prasadaraju, "Behavior of Reinforced Sub Bases on Expansive Soil Sub grade", Global Journal of Researchers in Engineering, 2010, Vol. 10(1), pp. 2-8.
- [3] G. L. Siva Kumar Babu and A. K. Vasudevan, "Strength and Stiffness Response Coir Fiber-reinforced Tropical Soil", Journal of Materials in Civil Engineering, 10.1061/ (ASCE) 0899-1561(2008), Vol. 20:9(571), pp. 571-577.
- [4] G. Manovendra, G. C. Mohankumar and S. Kumarapaa, "Study of Mechanical Properties of Areca and Glass Fibers reinforced Phenol Formaldehyde Composite", International Conference on Frontiers in Design and Manufacturing Engineering, Karunya University, Coimbatore, 2008.
- [5] H. Huang, S. H. Jin and H. Yamamoto, "Study on Strength Characteristics of Reinforced Soil by Cement and Bamboo Chips", Applied Mechanics and Materials, 2011, Vol. 71, pp. 1250-1254.
- [6] L. Yusriah, S. M. Sapuan, E. S. Zainudin and M. Mariatti, "Exploring the Potential of Betel Nut Husk Fiber as Reinforcement in Polymer Composites: Effect of Fiber Maturity, Procedia Chemistry, 2012, Vol. 4, pp. 87-94.
- [7] Md Asaduzzaman and Muhammad Iftiarul Islam, "Soil Improvement By Using Bamboo Reinforcement", American Journal of Engineering Research, 2014, Vol. 03(8), pp. 362368.
- [8] R. Anusha and E. C. Kindo, "Behavior of Bamboo Reinforced Soils-State of Art," In Proceedings of Indian Geotechnical Conference, December 15-17, 2011, Kochi (Paper No H-247), pp. 469-47.
- [9] Shivanand Mali and Baleshwar Singh, "Strength Behavior of Cohesive Soils Reinforced with Fibers", International Journal of Civil Engineering Research. ISSN 2278-3652 Vol. 5(4), 2014, pp. 353-360.
- [10] Y. Cai, B. Shi, C. W. Ng and C. S. Tang, "Effect of Polypropylene fiber and lime admixture on Engineering Properties of clayey Soil", Engineering Geology, 2006, Vol. 87(3), pp. 230-240.