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Development of Polymer Matrix Composites using Mercerized Coconut Fiber for Automobile Application

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Abstract - *Fiber-fortified polymer composites have assumed a predominant part for quite a while in an assortment of uses for their high particular quality and modulus. The fiber which serves as a fortification in strengthened polymer is as characteristic filaments. In this association, an examination has been completed to make utilization of coconut fiber which is accessible copiously in India. Normal filaments are solid and lightweight as well as generally exceptionally shabby. The present work depicts the improvement and portrayal of another arrangement of exploration was completed by strengthening the framework (Epoxy sap) with regular material (Coconut fiber). The recently created composites are described concerning their mechanical qualities. The regular filaments were introduction to synthetic treatment (NaOH) before assembling of overlays. Tests of coconut-Epoxy cover were produced utilizing pressure forming strategy were the stacking of strands happens. Examples were cut from the created cover as indicated by the ASTM principles for various analyses. For Tensile test, flexural test and Impact test tests were cut fit as a fiddle. Rigidity, Flexural Strength and Impact Strength were watched and contrasted with one another. Elastic test indicated most extreme rigidity for untreated 80 mm length fiber contrasted with others. Flexural test indicated most extreme flexural quality for untreated 80 mm length fiber contrasted with others. Sway test demonstrated higher effect vitality for treated 40 mm length fiber contrasted with others.*

Keywords – *Coconut Inflorescence, NaOH, Epoxy Resin; Compression shaping, Tensile test, Flexural test, Impact test.*

I. INTRODUCTION TO COMPOSITE MATERIAL

These days, normal fiber composites have increased expanding enthusiasm because of their eco-accommodating properties. A great deal of work has been finished by specialists taking into account these characteristic strands. Regular strands, for example, jute, sisal, silk and coir are cheap, copious and renewable, lightweight, with low thickness, high strength, and biodegradable. Common filaments, for example, jute can possibly be utilized as a substitution for customary fortification materials in composites for applications which requires high quality to weight proportion and further weight diminishment. Bagasse fiber has least thickness so ready to diminish the heaviness of the composite upto less. So by utilizing these strands (jute, bagasse, and lantana camara) the composite created is savvy and impeccable use of waste item. Common fiber strengthened polymer composites have raised incredible considerations and hobbies among materials researchers and architects as of late because of the contemplations of building up an ecological cordial material and incompletely supplanting right now utilized glass or carbon filaments as a part of fiber fortified composites. They are high particular quality and modulus materials, low costs, recyclable, simple accessible in a few nations, and so on.

II. Materials and Methods

1. Materials Used

I. Natural fiber Coconut inflorescence

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II. Epoxy resin –LY 556
III. Hardener –HY 951

2. Coconut Inflorescence

An Inflorescence is a gathering or bunch of blossoms organized on a stem that is made out of a fundamental branch or a muddled plan of branches. Morphologically, it is the part of the shoot of seed plants where blossoms are framed and which is in like manner altered. The alterations can include the length and the way of the Internodes and the phyllotaxis, and also varieties in the extents, compressions, swellings, adnations, connations and diminishment of fundamental and auxiliary tomahawks. Inflorescence can likewise be characterized as the regenerative part of a plant that bears a group of blooms in a particular example. The stem holding the entire inflorescence is known as a peduncle and the primary stem holding the blooms or more branches inside of the inflorescence is known as the rachis. The stalk of every single bloom is known as a pedicel. The fruiting phase of an inflorescence is known as an infructescence. A blossom that is not part of an inflorescence is known as a singular bloom and its stalk is additionally alluded to as a peduncle. Any bloom in an inflorescence might be alluded to as a floret, particularly when the individual blossoms are especially little and borne in a tight group, for example, in a pseudanthium. Fig.1 demonstrates the reasonable picture of coconut inflorescence.

Figure 1. Coconut Inflorescence

3. Fiber Preparation

The different strides in planning of fiber will be fiber extraction, pre-treatment, and slashing as indicated by necessity.

4. Fiber Extraction

The coconut inflorescence contains fiber which is encompassed by thick substance material. With a specific end goal to get the fiber the inflorescence is set in water for around 10 days. At that point the coconut inflorescence is pounded such that fiber leaves the substance. At that point the fiber which is acquired is put in a room without contact with daylight such that the fiber gets isolated independently. At that point the fiber can be arranged for compound treatment.

5. Fiber Treatment

The extracted fibers are to be chemically treated with NaOH for making the surface of the fiber rougher such that bonding will be better during composite fabrication. In this work the fibers were treated with 5% of NaOH. The chemical treatment erodes the material from the fiber. The chemical treatment erodes the cellulose, lignin and wax contents is shown in fig.2.

Figure 2. Chemical Treatment of Coconut Inflorescence

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6. Fiber Chopping

Treated fibers were chopped uniformly for different length of 40mm & 80mm.

7. Fabrication of Composite

The composite example is manufactured by pressure forming strategy.

8. Sizing of Fiber

The fiber treated with 5% of NaOH arrangement, and non treated fiber, both the materials are cutted into a particular sizes that are 40mm and 80 mm. Composite examples of coconut fiber comprise of four kind of fiber material that are.

1. Treated 40mm size fiber with NaOH
2. Treated 80mm size fiber with NaOH
3. Non treated 40mm fiber
4. Non treated 80mm fiber

9. Fabrication of Fiber Plates

Fiber plates are made by utilizing pressure shaping procedure. Required measurement of fiber plates are 270mm square and thickness of 3mm. created picture of fiber plate is appeared in fig.3.

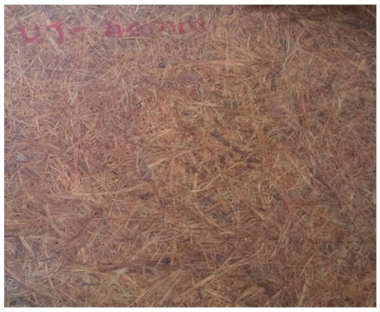

Figure 3. Fabrication of Fiber Plates.

Bites the dust are chosen with exact measurements of required plate size, expansion of freedom 20mm due to pressure power stretch the fiber and it might expand the size. Poly vinyl liquor is pouring on the surface of female pass on and additionally the male kick the bucket to uproot the fiber plate securely. Fiber plate ought to contain Epoxy Resin of 30% to expanding the quality. Pressure weights assume a main part in fiber plate manufactures. Connected Pressure to the male pass on is 1500 psi and the temperature kept up at 70-80 C. Bites the dust are keep in the position and hold it for 2 hours. The four sort of fiber plates are manufactured by utilizing pressure shaping procedure.

10. Sample Dimensions Analyse

Three sort of tests are included in this procedure to quantify the quality of an example. Before testing we made cut examples. Different test require a different measurements that are given underneath, Tensile test needs measurements with the ASTM D638 standard: 19 mm width, 165 mm length and 3 mm thickness and 10 mm min-1 crosshead speed. Flexural tests, a heap were connected on the example at 2.8 mm min-1 crosshead movement rate. It needs measurements with the ASTM D 790 standard: 25 mm width,76 mm length and 3mm thickness. Sway tests needs measurements with the ASTM D 6110 standard: 12 mm with, 63.5 mm length and 3mm thickness to assess its effect quality.

11. Mechanical Testings

Experimental investigation on the mechanical properties of natural fiber.

1. Tensile strength
2. Flexural strength
3. Impact strength

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3. Result and Discussion

1. Results of Tensile Test

The UTS versus Length of fiber fortification is appeared in fig.4 The quality of 80mm untreated fiber support achieve the most extreme substance, contrasted with other. That is 18.179 N/mm2.

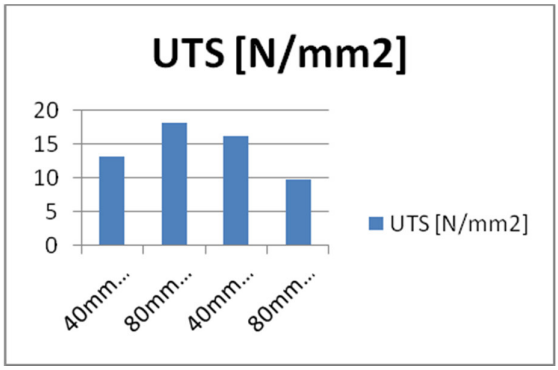

Figure 4. UTS VS Length of Fiber Reinforcement

2. Results of Flexural Test

The flexural properties of the strands/PR composites with various extents were tried and the outcomes are appeared in fig.5. The volume division of filaments and sap was utilized is 70:30.And 80mm untreated fiber fortification achieve the greatest substance, contrast with other. That is 52.049Mpa.

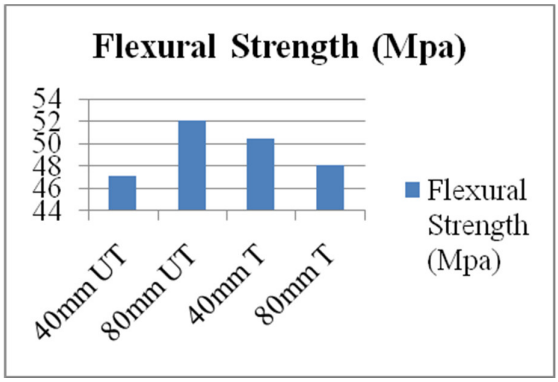

Figure 5. Flexural Strength VS Length of Fiber Reinforcement

3. Results of Impact Test

Izod sway tests were led taking into account ASTM D256 standard is appeared in fig.6. Four examples for every fortification were tried and among them 40 mm treated fiber support has high effect quality of around 0.616 joules.

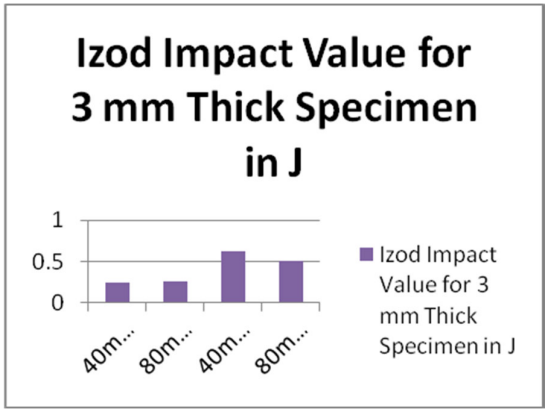

Figure 6. Impact Strength

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IV. Conclusion

The trial examination on the mechanical properties of coconut fiber strengthened polymer network composites prompts the accompanying conclusions:

- Mercerization of coconut inflorescence fiber prompts more slender fiber with higher stretching.
- It is conceivable to make utilization of coconut inflorescence fiber as an other for manufactured strands in the support of polymer framework composites.

1. Composites have been manufactured by length of fiber.
2. According to the ASTM measures, the mechanical properties that have been established are ductile, flexural, &impact test.
3. Tensile test demonstrated most extreme rigidity of 18.179 N/mm2 for untreated 80 mm length fiber contrasted with others.
4. Flexural test indicated most extreme flexural quality of 52.049 N/mm2 for untreated 80 mm length fiber contrasted with others.
5. Impact test indicated higher effect vitality of around 0.616 joules for treated 40 mm length fiber contrasted with others.

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