

Experimental Study On Flax And Sisal Hybrid Composites

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Abstract:- *The Aim Of This Study Is To Evaluate Mechanical Properties Such As Tensile, Compression And Bending Properties Of Hybrid Sisal And Flax Reinforced With Epoxy Resin Composites. Strength Of The Material Which Is Prepared Using Epoxy Resin With Natural Sisal And Flax Fibers Is Mainly Depend On The Composition Based On Which Matrix And Reinforcement Being Added.*

I. Introduction

Composite Materials Are The New Generation Materials. It Is Developed To Meet The Request Of Fast Development Of Technological Changes Of The Industry. Composite Materials Or Composites Are Engineering Materials Produced Using Two Or More Constituent's Materials That Remain Separate And Distinct On Macroscopic Level Whereas Forming A Single Component. Physical Characteristics Requirements: Strength, Toughness, Elasticity, Corrosion-Resistance, Wear Resistance, Long Term Dependability Natural Fibers Are A Renewable Resource Material All Through The World Particularly In The Tropics. According To The Food And Agricultural Organization Survey, Natural Fibers Like Jute, Sisal, Flax, Coir, Banana, And So Are Abundantly Available In Developing Countries [1].

II. Methodology

In Methodology Fabrication And Testing Of Composite Material For Mechanical Properties In Manufacturing Has Been Selected As A Broad Field Of Research. The Composite Specimen Is Fabricated According To Astm Standard. The Rule Of Mixture Will Be Calculated For Each Test. The Various Compositions Are Taken As 20% Sisal Fiber 5% Flax Fiber, 75% Epoxy Resin. The Other Composition 20% Sisal Fiber 10% Flax Fiber, 70% Epoxy Resin And In Another Composition 20% Sisal Fiber, 15% Flax Fiber, 65% Epoxy Resin As Taken [2].

1.1 Hand Lay-Up Technique

Hand Lay-Up Is The Least Difficult And Most Seasoned Open Molding Strategy For The Composite Manufacture Forms. It Is A Low Volume, Work Concentrated Technique Suited Particularly For Expansive Segments. For Various Composition The Stages Involved In Hand Lay-Up Process Are As Follows:

Cut Down The Fibers As Per The Required Length. Place The Astm Standard Die. Wax A Releasing Agent Can Be Applied To The Die. Lay Up The Mixture Of Separate Parent Fibers. Sisal Fiber And Flax Fiber Percentage Can Be Taken Placed In The Die. The Epoxy Resin Mixed With A Hardener With A Percentage Can Be Poured On The Die Uniformly. Allow A Curing Time Of About 24 Hours And Then Separate The Composite Plate. These Procedure Continues For Various Combination [3].

III. Experimentation

1.1 Tensile Test

For Tensile Test Astm Standard D3039 Is Selected. The Most Common Specimen For Astm D3039 Has A Consistent Rectangular Cross Segment, 25 Mm Wide And 250 Mm Long And 3mm Thickness.



Fig.1. Tensile Test Specimen

L= Length (250 Mm); W= Width (25 Mm); T = Thickness (3 Mm); P = Load The Tensile Test Can Be Conducted On Universal Testing Machine. For Testing The Specimen Gauge Length Can Be Determined With The Help Of Vernier Caliper. The Specimen Is Fixed Between The Upper Cross Head And Middle Cross Head Of The Utm. After The Crosshead Has Been Fixed Proper Range Of Loading Can Be Selected (0-300kn). As The Load Increases Deformation Increases Up To The Specimen Fails Or Fracture [4].

1.2 Compression Test

For Compression Test Astm Standard D3410 Is Selected. The Most Common Specimen For Astm D3410 Has A Consistent Rectangular Cross Segment, 25 Mm Wide And 140 Mm Long And 3mm Thickness.



Fig. 2 Compression Test Specimen

L= Length (140 Mm); W= Width (25 Mm); T = Thickness (3 Mm); P = Load
Compression Test Is A One Of The Fundamental Type Of Test Is Used To Characterize The Metals, Composites, Wood, Plastic And Many Other Common Materials. A Compressive Strength Is A Maximum Compressive Stress Of A Material Is Capable Of Withstanding Without Fracture.

1.3 Flexural Test

For Flexural Test Astm Standard D790 Is Selected. The Most Common Specimen For Astm D790 Has A Consistent Rectangular Cross Segment, 25 Mm Wide And 125 Mm Long And 3mm Thickness.

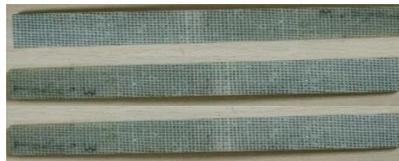


Fig. 3 Flexural Test Specimen

L= Length (125 Mm); W= Width (25 Mm); T = Thickness (3 Mm); P = Load
The Flexural Test Measures The Ductility Of The Materials. The Cross Sectional Area Of The Specimen Can Be Measured With The Help Of Vernier Caliper. The Specimen Will Be Placed Over The Supports As The Loading Comes Exactly At The Centre Of The Specimen. The Load Will Be Applied Very Slowly Until The Specimen Fails [5].

IV. Result And Discussion

1.1 Tensile Test Results

Table.1 Tensile Test Result

Sl.No	Polymer Composite	Matrix	Tensile Load (KN)	Breaking Load (KN)	Tensile Strength (MPa)	Youngs Modulus (GPa)
1	20% Flax+75% Epoxy resin	Sisal+5%	4.980	4.320	65.33	0.0260
2	20% Flax+70% Epoxy resin	Sisal+10%	5.540	4.260	72.66	0.0285
3	20% Flax+65% Epoxy resin	Sisal+15%	6.600	4.320	80.66	0.0309

1.2 Compression Results

Table.2 Compression Test Result

Sl.No	Polymer Composite	Matrix	Compression Load (KN)	Breaking Load (KN)	Compression Strength (MPa)	Youngs Modulus (GPa)
1	20% Flax+75% Epoxy resin	Sisal+5%	4.600	4.400	59.66	0.0073
2	20% Flax+70% Epoxy resin	Sisal+10%	4.740	4.240	62.66	0.0135
3	20% Flax+65% Epoxy resin	Sisal+15%	5.180	4.360	67.66	0.0329

1.3 Flexural Test Result

Table.3 Flexural Test Results

Sl.No	Polymer Composite	Matrix	Flexural Load (KN)	Breaking Load (KN)	Flexural Strength (MPa)	Youngs Modulus (GPa)
1	20% Flax+75% Epoxy resin	Sisal+5%	4.300	4.260	2147	10.18
2	20% Flax+70% Epoxy resin	Sisal+10%	4.340	4.320	2183.3	10.09
3	20% Flax+65% Epoxy resin	Sisal+15%	4.380	4.300	2197	9.97

V. Conclusion

The Mechanical Properties Such As Tensile, Compression, Flexural And Hardness Are Characterized And Studied Through Experimentally, The Key Followings Are Explained Of The Present Work As Follows. This Work Shows That Successful Fabrication Of Different Composition Of Sisal And Flax Hybrid Composite Materials Are Prepared By Using Hand Lay-Up Technique As Per Astm Standard.

- For Each Combination Specimens Are Prepared And Tested For Tensile, Compression, Flexural, Hardness And Damping Test.
- Tensile Strength, Compression Strength And Flexural Strength Is High For The Combination 20% Sisal+15% Flax+65% Epoxy Resin Laminates And Low For The Combination 20% Sisal+5% Flax+75% Epoxy Resin.
- It Is Observed That For Hybrid Composites, When The Percentage Of Sisal Fiber And Flax Fiber Is More, The Tensile Strength, Compression Strength And Flexural Strength S Increases.

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