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Mechanical Properties of Randomly oriented Carbon – Sansevieria Trifasciata Fiber Epoxy Composites.

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Abstract: ***This Research work explains the Mechanical properties of Flexural test, Tensile test, Impact test and SEM analysis of Sansevieria Trifasciata fiber (STF), Carbon fiber (CF) [1] hybrid polymer composites. The Hybrid Composite laminates were created with five different fiber % of STF (0%, 10%, 20%, 30% and 40%) and % of Carbon Fiber (100%, 90%, 80%, 70% and 60%). The manufacturing process was completed by hand layup technique. Mechanical properties of Hybrid Composite laminates were included to Tensile, Flexural and Impact testing. The SEM shows fiber debonding and de-lamination of fiber and resin can be observed. The explanation covers that Flexural, Tensile and Impact quality increases without affecting the extension of the Hybrid Composite with fiber extents***

Keywords: Hybrid polymer composite, Carbon fiber, Sansevieria Trifasciata fiber (STF), Mechanical properties, and SEM analysis.

I. INTRODUCTION

The Carbon fiber [2] cross sectional area is 5 to 10 micrometers. The carbon fiber was made with carbon particles. Carbon fibers [3] are mostly used in various materials to shape a composite. Carbon fiber have more flexibility. Carbon fiber consists of various materials like graphite and carbon composites. That means Carbon fiber reinforced with carbon and graphite. Then it is used in high temperature surface area. Sansevieria Trifasciata [5] is also known as snake plant. Snake plant is used for absorbs the carbon dioxide, suppling oxygen and the plant maintenance is also low. Composite materials [6] are made with two different materials like Sansevieria Trifasciata, Carbon Fiber and Matrix. Composite [7] materials are have less weight. Composite materials are laminated with different percentage compositions, and different directions.

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II. PROCEDURE FOR PAPER SUBMISSION

A. Working Procedure:

In this working procedure, Sansevieria trifasciata (ST) and carbon fiber was used. Sansevieria trifasciata fibers were extracted from sansevieria trifasciata plants. STF have been cut into different lengths. Carbon Fiber (CF) purchased from Go green products Chennai. Hybrid composite laminates preparation was depends on Matrix. In this working procedure, the matrix develops with LY 556, HY 951. The

hybrid composite specimen process includes 8 layers with epoxy and hardener. The thickness of specimen [4] is 3 mm. After complete the laminates working procedure, we have done the three different testing processes like tensile test, Compression test and Flexural test with ASTM standards. In flexural test [9], as per standards the specimen dimensions are 63X12X3. In impact test [10], the specimen dimension are 63.5X12.7X3. In Tensile test [8], the specimen dimensions are 165X13X3.

III. MATH

The percentage of carbon fiber and sansevieria trifasciata fiber % data was given table 1.The results and discussions for tensile strength, flexural strength and impact strength at 40%, 30%, 20%, 10% and 0% data was given in table 2, 3 & 4.

Table 1: STF and CF %

S.No.	CF %	STF %
1	100	0
2	90	10
3	80	20
4	70	30
5	60	40

Table 2: Flexural Strength (Mpa/N/mm^2)

Speciman no./ Percentage of Fiber	S.T.F (40%) C.F (60%)	S.T.F (30%) C.F (70%)	S.T.F (20%) C.F (80%)	S.T.F (10%) C.F (90%)	S.T.F 0% C.F (100%)
1.	407.77	427.97	437.12	472.84	550.68
2.	509.35	277.95	438.21	212.47	545.34

3.	582.65	259.82	405.91	232.31	597.18
4.	317.59	351.52	427.53	438.26	455.92

From Table 2, the maximum Flexural Strength (N/mm^2) depends on maximum force (N).

Table 3: Tensile Strength (Mpa or N/mm^2)

Speciman no./ Percentage of Fiber	S.T.F (40%) C.F (60%)	S.T.F (30%) C.F (70%)	S.T.F (20%) C.F (80%)	S.T.F (10%) C.F (90%)	S.T.F 0% C.F (100%)
1.	117.02	152.73	189.84	223.73	382.80
2.	174.11	137.05	150.04	248.31	344.82
3.	134.87	159.38	218.76	241.68	265.88
4.	147.05	153.66	133.05	259.62	307.58

From Table 3, the maximum Tensile strength (N/mm^2) depends upon maximum breaking force.

Table 4: Impact Strength (KJ/m^2)

* Impact Strength: [Work done / (Thickness X Depth under Notch)] X 1000

Specimens /percentage of fiber	S.T.F (40%) C.F (60%)	S.T.F (30%) C.F (70%)	S.T.F (20%) C.F (80%)	S.T.F (10%) C.F (90%)	S.T.F 0% C.F (100%)
1	39.23	55.25	38.68	42.36	58.9
2	55.23	65.9	48.2	49.68	50.02
3	48.26	30.23	35.5	40.6	60.2
4	42.11	26.8	30.2	32.84	45.29

From table 4, the maximum impact strength depends upon work done by depth under notch with thickness of the specimen.

The Scanning Electron Microscope (SEM) was used to the observation of the hybrid composite materials Microstructure [11] . The microstructure includes the breakdowns and failure's structure directly.

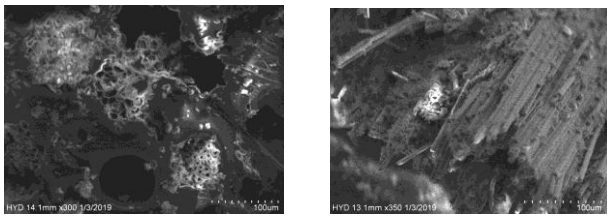

Fig 1& 2 matrix proportions in hybrid composite materials like STF, CF, Epoxy & Hardener at 30 & 40 %

IV. RESULT AND DISCUSSION

- In this research work, the Mechanical properties of Flexural strength, Tensile Strength and Impact strength have been developed with Sansevieria Trifasciata and Carbon Fiber.
- The % of Sansevieria Trifasciata Fiber decreases then Carbon Fiber % increases in Hybrid polymer composite material specimens.
- The additional of 40 % of Sansevieria Trifasciata Fiber with 60% of Carbon Fiber was an improved with the flexural, tensile and impact quality.
- The mechanical properties were increased with Epoxy and Hardener like LY 556 and HY 951in Hybrid polymer composite materials.
- The Hybrid composite polymer materials are capable to use in the aeronautics and vehicle applications.
- With addition of Natural Fiber to be finished with hybrid composites has cheap the price.
- The Scanning Electron Microscope was develops the break down structure and composite structures in Hybrid composite materials.

V. CONCLUSION

- The maximum Flexural strength is 582.68 N/mm^2 at Maximum force 941.2 N.
- The maximum Tensile strength is 174.11N/mm^2 at 1112.4 N/mm^2.
- The maximum Impact strength 55.23 KJ/mm^2.
- The SEM is able to develop the specific areas breakdown structure in hybrid composite materials.

APPENDIX

The research work includes the Hybrid composite materials like sansevieria Trifasciata, Carbon fiber, Epoxy and Hardener.

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