Fabrication and Mechanical Characterization of Epoxy Reinforced Sisal Fibre Composite

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Abstract- **Various samples have been fabricated by varying volume fraction of fibre (25%,50%,75%) using hand layup technique of thickness 6mm and 8mm correspondingly tests such as Rockwell hardness and Charpy impact are conducted and it has been found that high hardness number of 144.3 is obtained for 75% volume of fibre compared to that of 25% and 50% for 8 mm thick specimen, and high hardness number of 121.66 is obtained for 75% volume of fibre of 10mm thick specimen when compared to 25%and 50% and high impact strength of 140j is obtained for 25% volume fiber compared to 50%and 75% for 8mm thick specimen and 80j is obtained for 25% volume fibre compared to 50% and 75% for 10 mm thick specimen.**

Index Terms- Sisal fiber composite, Polymer Matrix Composite, Mechanical Characterization of Epoxy and Sisal fiber Composite.

INTRODUCTION

A composite material can be defined as a combination of two or more materials that results in better properties than those of the individual components used alone, the present work deals with evaluating the mechanical properties such as hardness and impact loading for epoxy and sisal fiber composite of various thickness 8 mm and 10mm by varying volume fraction of fibre (25%, 50%and 75%).

DIE

A die is a specialized tool used in manufacturing industries to cut or shape material mostly using a press. Like molds, dies are generally customized to the item they are used to create. Products made with dies range from simple paper clips to complex pieces used in advanced Technology.

Die for Rockwell Hardness test

Die For Charpy Impact Test

Hand Lay Up technique

Weighing Machine

ROCKWELL HARDNESS TEST

The specimen is prepared according to the required dimension and the test has been carried out using the Rockwell hardness testing machine. The three point hardness test is the most common hardness test and used in this experiment for checking the hardness of the composite material.

SNO	Fibre %	Hardness For Thickness (8mm)	Hardness For Thickness (10mm)
1	25	63.33	60.33
2	50	87.6	70.33
3	75	144.33	121.66

Rockwell Hardness Testing Machine

CHARPY IMPACT TEST

The impact test composite material specimens are prepared according to the required dimensions following the ASTM -A370 standard. During the testing process, the specimen is loaded in the testing machine and allows the pendulum until it fractures. Using the charpy impact test, the energy needed to break the material can be measured easily and can be used to measure the toughness of the material Generally sisal fibre possess good impact properties. The fracture values were calculated by dividing the energy by cross section area of the specimen.

Before Charpy Impact test

After Impact Test of Composite

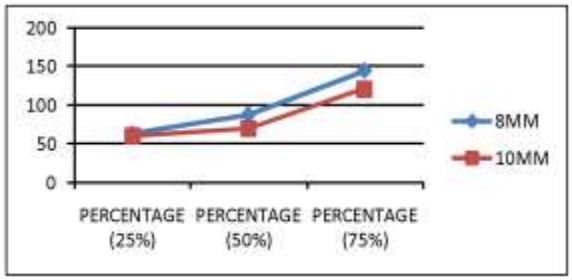
SNO	Fibre%	Energy for thickness (8 mm)	Energy for thickness (10 mm)
1	25	140 j	80 j
2	50	100 j	60 j
3	75	80 j	40 j

RESULTS AND DISCUSSIONS

The Specimens are tested in their corresponding testing machine and the hardness, impact properties are determined. Each specimen is tested three times and the average values are found. The sample graphs generated with respect to applied load are presented below.

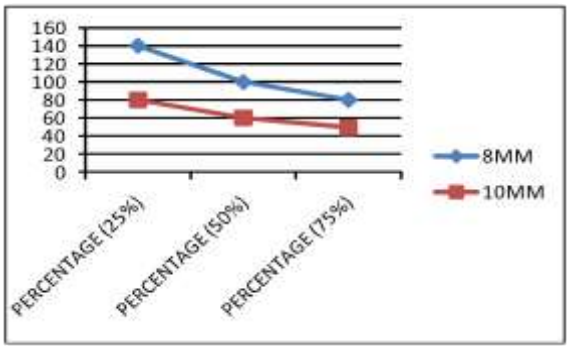
GRAPHS

ROCKWELL HARDNESS TEST:



% of FibreVolume VS Hardness No

CHARPY IMPACT TEST:



% of FibreVolume VS Energy absorbed

CONCLUSION

It has been investigated that high hardness number of 144.3 is obtained for 75% fibre volume compared to that of 25% and 50% for 8 mm thick specimen, and high hardness number of 121.66 is obtained for 75% fibre volume of 10 mm thick specimen when compared to 25%and 50%, and high impact strength of 140 j is obtained for 25% fibre volume compared to 50%and 75% for 8 mm thick specimen and 80 j is obtained for 25% fibre volume compared to 50% and 75% for 10 mm thick specimen which are found to be in good agreement.

REFERENCES

[1] Introduction to composite materials by Autar Kaw.
[2] Mechanics of composite materials by Dr.Saeid Sarrami.
[3] The Impact Toughness and hardness of Treated and untreated Sisal fibre-Epoxy Resin Composites by Wilson Webo.
[4] Investigation of mechanical Properties of Sisal fibre reinforced polymer Composites Manjunath G.Prasad.
[5] An experimental investigation on mechanical properties of Sic Particle Sisal fibre reinforced epoxy matrix composites. M.Kamaraj, E.Muthu.
[6] Testing of Sisal fibre reinforced epoxy composite at different orientations for tensile and compression by B.Mallikarjun, K.Arun,K.NagaRaj A.Ravindar, R.Ashok.
[7] NPTEL Online Course Introduction to composites by Dr: Nachiketa Tiwari Associate Professor Mechanical Engineering at IIT Kanpur.
[8] Manufacturing of Composites www.nptel.ac.in.
[9] Manufacturing of Composites www.Slide Share.net.
[10] Manufacturing Process and applications of Composite www.researchgate.net