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Mechanical behaviour of natural fibers composites from Sansevieria cylindrica and sisal fibers

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Abstract: The natural fibers as used reinforcement in polymeric composites for technical applications have been a research subject of scientists during the last decade. In this paper discussed with sisal and sansevieria cylindrical and sisal fiber composite materials. They are used different type of natural fiber are taken from plant, animal, and mineral sources such as, jute, KENAF, hemp, ramie, seial, coconut, and cotton. This fiber are mixed with the reinforcement natural composite materials are epoxy-resin and epoxy-hardener material. The find out the experimental investigations and mechanical properties of the natural fiber. The synthetic fibers replace with natural fiber in automotive and industrial applications. To find the various strength of tensile, compression and hardness and also compared with jute and hop fiber.

Keywords: sansevieria cylindrica and sisal fiber, mechanical properties, tests applications.

I. INTRODUCTION

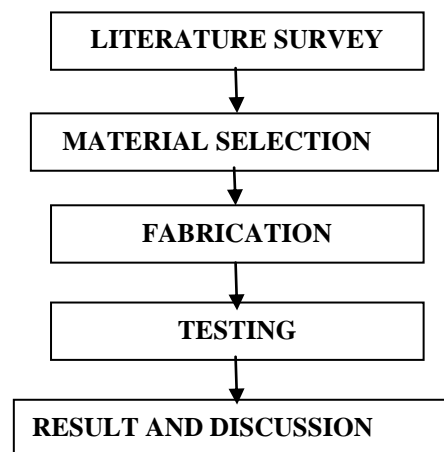
A composite material is made by combining two or more materials often ones that have very different properties. The two materials work together to give the composite unique Properties. However, within the composite you can easily tell the different materials apart as they do not dissolve or blend into each other. For the specific carbon and glass fiber based composite Materials often referred to loosely as composites, Fiber-reinforced polymer. Composites are formed by combining materials together to form an overall structure that is better than the Individual components.

II. LITERATURE SURVEY

However, the main drawbacks of mechanical properties of polymer/fibre composites are affected by the quantity of dispersion of the fibre in the polymer matrix. A number of studies have been carried out on sisal fibre [1,2], bamboo [3-5], jute [6-9], kapok [10] silk fibre [11], Hildegardia fabric [12-15], sansevieria cylindrica and sisal [16],

betel nut [17], oil palm [18], polypropyleneluffa [19], pineapple [20], Ridge Gourd [21], wood saw dust [22-26], Polyalthia cerasoides [27], Hibiscus Sabdariffa [28], Sterculia urens [29], but composites with SCF are scanty. The mechanical properties of composites depend on the orientation of the reinforcement towards the stress direction. If the reinforcement is composed of uniaxial fibres, then their orientation can be achieved accurately with ease. It is also clear from the perusal of the literature that the epoxy systems reinforced with novel and innovative besides differently brought up fibres have been little explored and hence there is a need to explore this aspect. This present effort, therefore, addresses such issues by selecting a novel fibre called short sansevieria cylindrica and sisal Fiber.

III. METHODOLOGY



IV. The objectives of this work are outlined as follows:

- 1) To find mechanical properties using various testing method.
- 2) Validation of the various testing method by measuring the thermal expansion values experimentally.

- 3) Recommendation of these composites for suitable applications.

IV.A) Raw Materials and Formulations:

- 1) Sansevieria cylindrica
- 2) Sisal
- 3) Epoxy Resin (Ly566)
- 4) Hardener
- 5) Sansevieria Cylindrica and Sisal

B) Why sansevieria cylindrica and sisal fiber?

The history and growth in synthesis, characterization and understanding of microscopic structures has given rise to a new chapter, the natural fibers and composites technology. Composite technology gives scientists the ability to create new materials containing fine narrow interfaces and bonds between the fiber and polymers that exhibit mechanical, thermal, physical, chemical, electrical and optical properties different from the same materials. Due to low density, high specific strength and stiffness natural fibers are widely used as reinforcing agent as it is high bio-degradability. Natural fibers are largely divided into two categories depending on their origin viz. plant based and animal based. Therefore, natural fiber can serve as reinforcements by improving the strength and stiffness and also reducing the weight of resulting bio composite materials.

C) Properties:

- 1) Specific Strength
- 2) Low density
- 3) Corrosion resistance
- 4) Impact resistance
- 5) Electrical resistance

C) Epoxy Resin (ly566)

Epoxy resins are polyether resins containing more than one epoxy group capable of being converted into the thermo set form. Two important mechanical properties of any resin systems are its tensile strength and stiffness. These resins on curing are very high strength. Epoxy resins can exhibit outstanding resistance to heat up to 290°C and electrical insulation properties. They can be either liquid or solid form and can be formulated to cure either at room temperature or with the aid of heat.

Epoxy resins have performance advantages over polyester and vinyl esters in five major areas:

- 1) Better adhesive properties (the ability to bond to the reinforcement or core)
- 2) Superior mechanical properties (particularly strength and stiffness)
- 3) Improved resistance to fatigue and micro cracking
- 4) Reduced degradation from water ingress (diminution of properties due to water penetration)
- 5) Increased resistance to osmosis (surface degradation due to water permeability)

D) Hardener

Hardener is mixing with resin is the ratio is 10:1 it give more strength and degrees the resin curing time

V) FABRICATION METHOD:

Fabrication process started with cleaning the sansevieria cylindrica and sisal plate Length and breadth (200mm *20mm) which used as the base of the laminate layers of composite materials. Apply anti-adhesive and sansevieria cylindrica and sisal fiber was put on the sansevieria cylindrica and sisal plate and resin was poured on the fiber.

The amount of mixing in resin and Hardener ratio is 10:1, sansevieria cylindrica and sisal fiber and resin weight ratio is 65% & 35% will be tacking because they are equal percentage of fiber and resin is doesn't give good mechanical properties.

The fiber is lamination in angle is 0°. and next layer is lamination angle is 45°. the two combination lamination is to give more mechanical strength. They are lamination in four layers (0°/45°/0°/45°) this forming in symmetric laminate it gives more compressive and tensile strength.

This process was carry-on until the resin was enclosed and adhere the whole sansevieria cylindrica and sisal fiber. This is to make sure the resins are totally absorbed by the fibers and provide a good adhesive bonding between fibers and resins. After first layer of the composite laminate is totally wet and adhere by resins, the steps are repeated for

second layer of the laminate until the third and fourth layer. It is left for 24 hours for curing purpose.

Finally the fiber pipe dimensions are 200 mm * 20 mm (Length * breadth). Thickness of the plate is 4 mm. Then the behavior of the composite fiber plate is to be tested under different load conditions.

VI) TESTING:

1. Compression Test
2. Hardness Test
3. Tensile Test
4. Impact Test

1). Compression Test:

Universal compressive testing machines (UTM), Vickers calipers, stop watch, dial gauge. Are used. The structure components such as columns and struts are subjected to compressive load in applications. These components are made of high compressive strength materials. Not all the materials are strong in compression. Several materials, which are good in tension, are poor in compression. Many materials poor in tension are good in compression. Cast iron is one such example. This strength is determined by conducting a compression test. During the test, for ASTM standard the specimen is compressed and deformation Vs. stress the applied is recorded. Compression test is just opposite in nature to tensile test. Nature of deformation and fracture is quite different from that in tensile test. Compressive load tends to squeeze the specimen. Brittle materials are generally weak in tension but strong in compression.



Fig. 1: During the Compression Test

2) Hardness Testing:

Hardness is the property of a material that enables it to resist plastic deformation, usually by penetration. However, the term hardness may also refer to resistance to bending, scratching, abrasion or cutting. Hardness value of plate and *Sansevieria cylindrica* and sisal fiber plate are compared. The values of *Sansevieria cylindrica* and sisal fiber are showing better than plate hardness. This indicates that the *Sansevieria cylindrica* and sisal fiber can be used in similar conditions of plate usage.

VII) RESULT AND DISCUSSION

MATERIAL	COMPRESSION TEST (N/mm ²)	TENSILE TEST MAX. STRESS (Mpa)	IMPACT TEST (J/cm ²)	HARDNESS TEST (hv)
E-Glass plate	31.45	29.58	8.34	22.06
<i>Sansevieria cylindrica</i> plate	29.34	30.87	7.39	29.45
Sisal Fiber plate	28.95	28.9	7.86	30.2

Sansevieria cylindrica + Sisal (hybrid plate)	32.55	33.7	8.97	31.4
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The process of extraction of *Sansevieria cylindrica* + Sisal (hybrid plate) fibre is simple and results in an, quantity and lengthy excellent quality fibre useful for fabrication of large composite modules. The lower density of *Sansevieria cylindrica* fibre is also an interesting parameter in designing lightweight materials compared to other fibres considered in the present study. Because it will be compare the synthetic fiber like E-glass fibre as shown in table the results are lower than natural fiber.

The mean tensile strength of *Sansevieria cylindrica* fibre composite is 32.7 mpa at highest volume fraction of fibre in the present study is much higher than those of *Sansevieria cylindrica* + Sisal composites and comparable to that of composite.

It is also concluded that the mean tensile modulus of *Sansevieria cylindrica* fibre composite is higher than those of synthetic fibre composites and comparable to that of natural composite at highest volume fraction of fibre. The composite the specific tensile strength of *Sansevieria cylindrica* fibre composite is also higher than those of e-glass composites in the present study.

VIII). APPLICATION

- 1) The composite fiber plate are using in home and comesisal application such as window and automobiles.
- 2) *Sansevieria cylindrica* and sisal fiber is high electrical resistance so it will be used in electrical plate line applications.
- 3) They are using composite fiber pipe Automobiles for low weight acting application and also it is a light weight material.
- 4) There is no chemical reaction in any other materials so it will be used for Chemical industry application.
- 5) The composite fiber pipe are using epoxy resin is matrix so it will not form in slag, corrosion, plate deposition of salt are minimizing.

CONCLUSION

Sansevieria cylindrica and sisal fibers reinforced epoxy composites were prepared as a different plates. Mechanical properties like compression and tensile strength tests were optimized by universal testing machine. The tensile test values on Braking point 25.1 KN, Maximum load 28.9 KN, Tensile strength 700.04 KN and compression test values are Breaking load 2.95 KN, load-28.95 KN

and Compression 20 N. The values are compared to jute and hop natural fiber values. *Sansevieria cylindrica* and sisal fibers high strength, less weight, low cost and hardness also high. The *sansevieria cylindrica* and sisal fibers are used various applications of twine and ropes, but competition from polypropylene has weakened demand. But other markets are emerging today, sisal can be found in specialty paper, filters, geotextiles, mattresses, carpets and wall coverings.

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