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PREPARATION AND ESTIMATION OF MECHANICAL PROPERTIES OF SNAKE GRASS AND COIR FIBER HYBRID COMPOSITE USING EPOXY RESIN

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Abstract- Composite material engineering field was one of the emerging field in recent times so the major objective of this materials is to reduce the physical weight and increasing the mechanical property such as tensile, compressive and shear strength in the place where there is a necessity of more loading capacity and having less space of that element such as in space aircrafts and also to increase the load impact capacity of a product.

Key Words: Composites; Coconut Fiber; Snake Grass Fibre; Mechanical properties; Epoxy resin

1. INTRODUCTION:

Composite materials are the result of fabrication of not less than two components with varied physical or chemical properties often coupled by a resin matrix. The formed product exhibits altered properties to that of the individual components. Composite materials yield significantly better physical properties and are economically viable than their traditional counterparts.

1.1 NATURAL FIBERS:

Natural fibers exhibit many advantageous properties as reinforcement for composites they are low-density materials, yielding relatively light Weight composite with high specific properties .Natural fibers also offer significant cost advantages and benefits associated with processing, as compared to synthetic fibers such as glass, nylon, carbon, etc. However, mechanical properties of natural fiber composites are much lower than those of synthetic fiber composites. Another disadvantage of natural fiber composites which makes them less attractive is the poor Resistance to moisture absorption .Hence use of natural fiber alone in Polymer matrix is inadequate in satisfactorily tackling all the technical needs of a fiber reinforced composite.

1.2 MATERIAL SELECTION:

SNAKE GRASS FIBER:

The snake grass Fibre used here was in chopped form. It also has extraction methods of natural fibre like mechanical retting, chemical retting and water retting process. The Fibres used in this work are extracted by water retting process. In this process, long twisted leaves from snake grass plant are crushed and soaked in water for around 2 -3 weeks to separate the Fibre and the pulp. The extracted Fibres are thoroughly washed with distilled water and dried in sunlight to remove the excess moisture. Then they were chopped in uniform length and used in the fabrication.

2. COCONUT FIBER:

Coconut fibre is extracted from the outer shell of a coconut. The common name, scientific name and plant family of coconut fibre is Coir, Cocos nucifera and Arecaceae (Palm), respectively. There are two types of coconut fibres, brown fibre extracted from matured coconuts and white fibres extracted from immature coconuts. Brown fibres are thick, strong and have high abrasion resistance. White fibres are smoother and finer, but also weaker. Coconut fibres are commercial available in three forms, namely bristle (long fibres), mattress (relatively short) and decorticated (mixed fibres). These different types of fibres have different uses depending upon the requirement. In engineering, brown fibres are mostly used. According to official website of International Year for Natural Fibres 2009, approximately, 500 000 tonnes of coconut fibres are produced annually worldwide, mainly in India and Sri Lanka. Its total value is estimated at $100 million. India and Sri Lanka are also the main exporters, followed by Thailand, Vietnam, the Philippines and Indonesia. Around half of the coconut fibres produced is exported in the form of raw fibre. Coconut fibres contain cellulose, hemi-cellulose and lignin as major composition. These compositions affect the different properties of coconut fibres. The pre-treatment of fibres changes the composition and ultimately changes not only its properties but also the properties of composites. Some-times it improves the behavior of fibres but sometimes its effect is not favorable.

2.1PROPERTIES OF COCONUT FIBER:

Property	Values
Tensile Strength (MPa)	28.388
Modulus (MPa)	856.849
Load at Break (N)	1082.634
Tensile Strain at Break(mm/mm)	0.0423

3. METHOD:

In this work, the hybrid composites were made by hand lay-up technique. Here, the composite is prepared by reinforcing coir fibre mat sandwiched between two layers of snake grass mat in a plain epoxy matrix. The composite is prepared in two compositions. Plate is fabricated in the fibre: resin ratio of ***45:55***(By weight).The dimensions of both the plate is 30mm***30mm*8mm**

3.1 HAND LAY-UP PROCESS:

Hand lay-up process is the oldest and the simplest open moulding method for fabricating composites. This method is suitable for fabricating fibre reinforced composite in continuous orientation as well as random orientation. The process consists of building up or placing layers of natural fibres in a sequenced layup using a matrix of resin and hardener. Fibres and resin were added to build up the desired thickness.

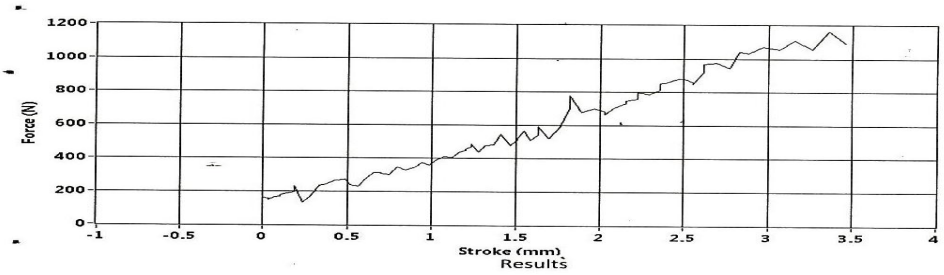
3.2 SEQUENTIAL PROCESS:

- The mold is cleaned with a clean cloth and the release agent (Wax) is spread in the surface of the mold for the easy removal of the composite after curing.
- Epoxy resin and hardener are mixed in a required proportion and it is stirred with a flat stick for about 30 minutes slowly and continuously.

- Since plastic mixing containers may melt during the exothermic reaction, the containers that are specifically made for the purpose of mixing epoxy resin is used.
- An adequate amount of mixed resin and hardener is deposited in the mold and a roller is used to spread it around all surface.
- The mixed resin and hardener and the fibres are weighed before applying in order to ensure that the composite is of the required composition.
- A layer of coconut fibre mat is laid over the resin coat and rolled by a roller for the resin to impregnate the fibre.
- Another coat of epoxy resin is applied, followed by the application of snake grass fibre mat and another layer of epoxy resin.
- The final layer of coconut fiber mat is applied before applying the final layer of resin.
- Then they are rolled for proper impregnation of resin into the fibres.
- A final coat of resin is applied to achieve desired thickness and the mold is closed.
- A weight of 20kg is placed on the mold for proper packing and left to cure at the normal atmospheric conditions for 24 hours.

4. RESULT:

Mode of Test	Tension
Sample Type	Flat
Thickness	7.35 mm
Width	12.71 mm
Area	93.42 mm²
Gauge Length	25.00 mm
Final Gauge Length	0.000 mm



Fmax	1.16 KN
UTS	12.46 MPa

Mode of Test	Tension
Sample Type	Flat
Thickness	7.35 mm
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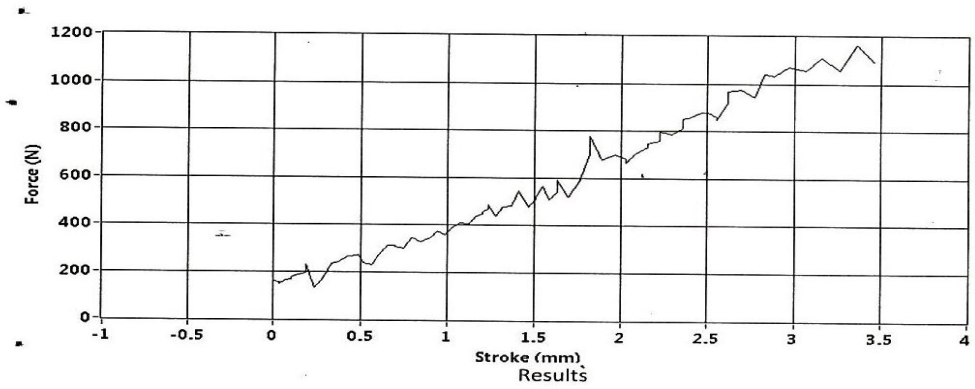
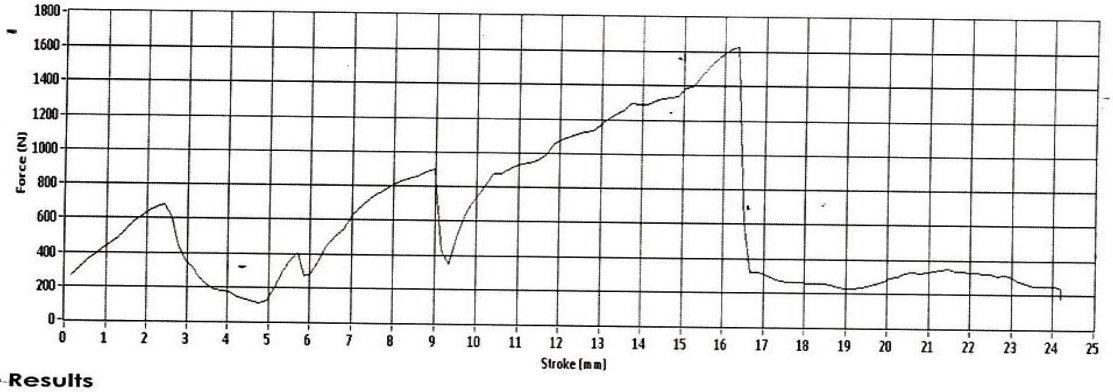


Fmax	1.16 KN
UTS	12.46 MPa

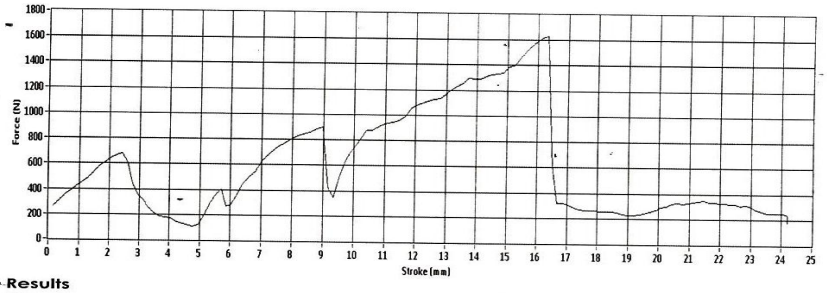
Mode of Test	Tension
Sample Type	Flat
Thickness	6.79 mm
Width	23.86 mm
Area	162.01 mm²
Gauge Length	50.00 mm
Final Gauge Length	0.000 mm
Final Gauge Length	0.000 mm



Results

Fmax 1.63 KN

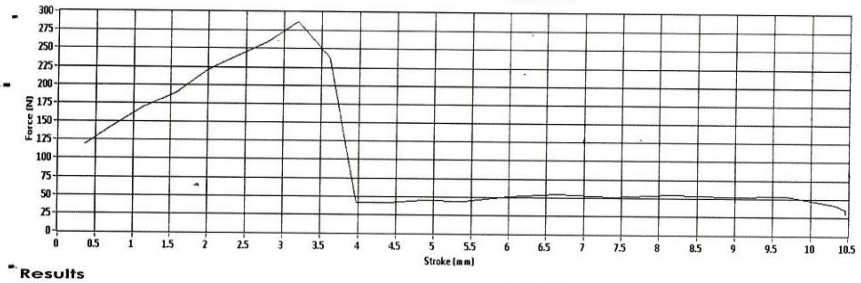
Mode of Test	Tension
Sample Type	Flat
Thickness	6.79 mm
Width	23.86 mm
Area	162.01 mm²
Gauge Length	50.00 mm
Final Gauge Length	0.000 mm
Final Gauge Length	0.000 mm



Results

Fmax 1.63 KN

Mode of Test	Compression
Sample Type	Flat
Thickness	7.21 mm
Width	24.20 mm
Area	174.48 mm²
Gauge Length	50.00 mm
Final Gauge Length	0.000 mm
Final Gauge Length	0.000 mm



Results

Fmax 0.29 KN

Flexural Strength 34.53 MPa

Test Results

NAME : Mr.M.MOHAMED ASHIK, Mr.P.ROMANSHAN, Mr.N.VIKRAM.

EQUIPMENT USED : UTM.Make : FIE. Model : UTN 40.SR No.: 11/98-2450. (R.TEMP : 27°C)

TENSILE STRENGTH IN MPa	:	12.46
FLEXURAL STRENGTH IN KN	:	34.58
SHEAR LOAD IN KN	:	1.63
BARCOL HARDNESS	:	24, 25, 27

4. CONCLUSIONS:

The composite material made of snake grass fiber and coir fiber has obtained

- Tensille strength as 12.46 Mpa
- Flexural strength as34.58 KN and
- Shear load as 1.63KN

It shows high flexure strength so it can be used in the place where the flexibility is required more while operating .

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