Mechanical Behavior and Analysis of Okra and Pineapple Reinforced Composite Materials

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Abstract - The cutting edge dynamic world can't envision its improvement without getting the idea of progression material composite. Different explores are going on in this field to accomplish the ideal standard. Characteristic fiber fortified polymer composite has an immense liking to supplant the composite made up of manufactured fiber. This is essentially a result of the favorable circumstances like light weight, non-harmful, non-rough, simple accessibility, minimal effort, and biodegradable properties. The manufactured strands have higher end of mechanical properties like rigidity and pliable modulus anyway the particular mechanical properties like explicit malleable modulus and other explicit (properties/explicit gravity) of common fiber gives a wonderful outcome for composites when contrasted with engineered fiber based composites.

Expanded ecological mindfulness and cognizance, has built up an expanding enthusiasm for normal strands and its applications in different fields. Common fiber fortified composites assumes a key job in building applications like car parts, vehicle entryways, furniture and so on. The present work expects to decide the mechanical conduct of the pineapple/okra fiber strengthened in Epoxy LY-556 sap. Pineapple and Okra filaments are separated from the bast of the Okra plant, pineapple leaf of the Tiliaceae family. Their utilization as a potential support in polymer composites requires the comprehension of their mechanical properties. Their utilization in the application world is enormous.

The composites of the Pineapple/Okra filaments fortified with the epoxy sap are made into examples and tried for their mechanical properties. The properties of hardness, sway, elasticity and pressure test are estimated. The malleable test is led on examples made by ASTM D-638-1.

Keywords: Pineapple Fiber, Okra Fiber, Epoxy Resin, Mechanical Properties.

1. INTRODUCTION

The improvement of humanity is characterized regarding propels in materials for example the Stone Age. The Bronze Age, and the Iron Age. The present period of material has a place with the composite materials as a result of its lighter weight, higher quality, erosion obstruction, straightforwardness to shape and strength. The composites are not new to the humankind. It has a past filled with over 3000 years. In old Egypt, individuals used to construct dividers from the blocks made of mud with straw as fortifying segment. Another significant utilization of composites can be seen around 1200 AD from Mongols. Mongolians created a bow made up of composites. The word composites, got from the Latin word composites, which means set up together, implying something made by assembling various parts or materials. When all is said in done, composites are materials which comprise of at least two physically unmistakable and precisely divisible parts, existing in at least two stages. The mechanical properties of composites are better than those of its individual constituents, and at times might be one of a kind for explicit properties. More often than not, composites have two stages for example constant and spasmodic. The spasmodic stage is normally more grounded and harder than the ceaseless stage and is known as the fortification, and constant stage is named as the grid. The developing biological concern and administrative guidelines lead to ascend in the interest of the characteristic strands as a substitute of manufactured filaments. The characteristic filaments, for example, hemp, sisal, jute, flax and bamboo are sustainable and biodegradable in nature and have high specialized characteristics,.

1.1 COMPOSITES

In the course of the most recent thirty years composite materials, plastics and pottery have been the predominant developing materials. The volume and number of utilizations of composite materials have developed consistently, entering and overcoming new markets tenaciously. Present day composite materials comprise a noteworthy extent of the designed materials market extending from ordinary items to advanced applications.

While composites have officially demonstrated their value as weight-sparing materials, the present test is to make them financially savvy. The endeavors to create monetarily alluring composite segments have brought about a few inventive assembling systems as of now being utilized in the composite enterprises. It is self-evident, particularly for composites, that the improvement in assembling innovation alone isn't sufficient to conquer the cost obstacle. It is basic that there be a coordinated exertion in planning, material handling, tooling, quality affirmation, fabricating, and even program the board for composites to wind up aggressive with metals. The composites business has started to perceive that the business utilizations of composites guarantee to offer a lot bigger business openings than the aviation segment because of the sheer size of transportation industry. Consequently the move of composite applications from air ship to other business uses has turned out to be unmistakable as of late.

1.2 Characteristic and Classification of Composites:

Composites comprise of at least one irregular stages installed in a nonstop stage. The broken stage is normally harder and more grounded than the nonstop stage and is known as the 'support' or 'strengthening material', though the persistent stage is named as the 'network'.

Composite materials can be ordered in various ways. Arrangement dependent on the geometry of a delegate unit of fortification is advantageous since it is the geometry of the support which is in charge of the mechanical properties and superior of the composites. A run of the mill characterization is exhibited in Table .The two wide classes of composites are:

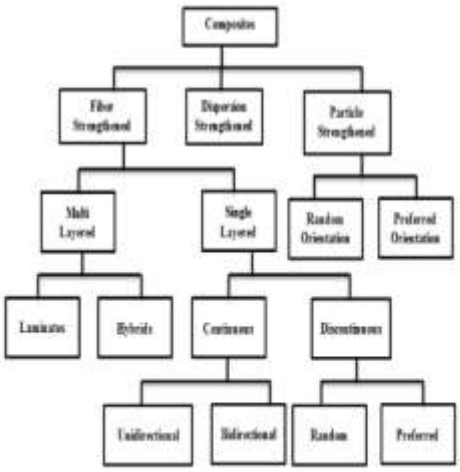


Table 1.1 Classification of composites based on geometry and physical structure of matrix and reinforcement.

1.3: Particulate and Fibrous Composites:

As the name itself demonstrates, the fortification is of molecule nature (platelets are likewise incorporated into this class). It might be circular, cubic, tetragonal, a platelet, or of other ordinary or sporadic shape, yet it is roughly equiaxed. When all is said in done, particles are not successful in improving break obstruction but rather they upgrade the solidness of the composite to a constrained degree.

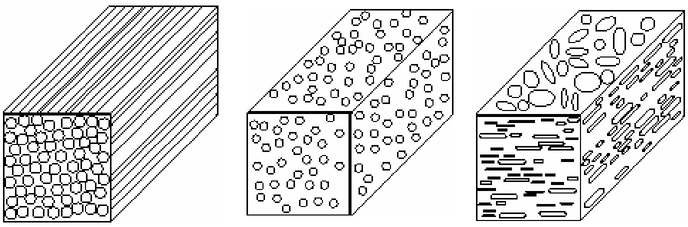
Molecule fillers are generally used to improve the properties of grid materials. A fiber is portrayed by its length being a lot more noteworthy contrasted with its cross sectional measurements. The components of the fortification decide its capacity of contributing its properties to the composite. Strands are extremely viable in improving the break opposition of the network since a support having a long measurement disheartens the development of beginning splits ordinary to the fortification that may some way or another lead to disappointment, especially with fragile grids.

1.4: **Role of matrix in a composite:**

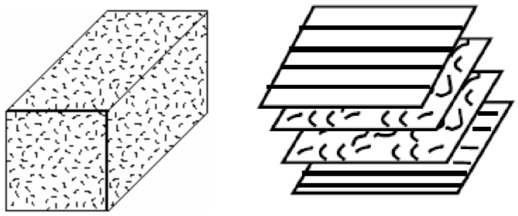
Numerous materials when they are in a stringy structure display excellent quality yet to accomplish these properties the filaments ought to be reinforced by an appropriate framework. The network disengages the filaments from each other so as to anticipate scraped area and development of new surface defects and goes about as a scaffold to hold the strands set up.

1.5: **Materials used as matrices in composites:**

In its most essential structure a composite material is one, which is made out of in any event two components cooperating to deliver material properties that are distinctive to the properties of those components all alone. Practically speaking, most composites comprise of a mass material and fortification or something to that affect, added fundamentally to expand the quality and solidness of the network.



Fig;1.1 (a) Continuous fibre (b) Particulate composites (c) Flake composites



Fig; 1.2 (d)Random fibre composites (e) Laminate Composites

2. LITERATURE SURVEY

2.1 NATURAL FIBER FOR POSSIBLE USE AS A REINFORCEMENT IN COMPOSITE MATERIALS:

In the take a stab at expanding the quantity of species from which plant fibres are removed to be utilized as a filler (perhaps with some fortification impact) for polymers, a substantial alternative might turn nearby fibres, which might be promptly accessible and don't include unsustainable expenses for transportation. Cellulosic fibres separated from the plant bast seem, by all accounts, to be especially appropriate for polymer fortification purposes: in actuality, plant fibres most as often as possible utilized in composites are best extracted. This incorporates e.g., jute, flax and hemp, which are hard fibres and all around misused modernly. The stalk from herbaceous plants can be utilized for this reason as well, in spite of the fact that these plants are less much of the time utilized for the not in every case simple and compelling fibre extraction, through conventional retting.

2.1.1 MATERIALS AND METHODS

2.1.1 Fibre Extraction

Jute (Abelmoschus esculents), whose neighbourhood name is Dherosh, is a monocotyledon plant. The plant has been gathered in Kushtia District (Bangladesh). In the wake of gathering the crisp plant, it was held submerged to permit microbial corruption. Inside 15–20 days the leaves corrupted apparently to permit fibre extraction. The fibres were isolatedfrom the debased leaves by being washed multiple times, utilizing deionised water, at that point tied with ropes, dried in outdoors and kept in dampness evidence holder a short time later.

2.1.2 Measurement of Tensile Strength of Jute Fibres:

The rigidity estimation is led utilizing a Hounsfield UTM testing gadget outfitted with a 100 N power and the test speed was 5 mm/min. The fibre was wound with fixed measurement. Elasticity of every example was estimated by ASTM D3822-07.

2.1.3 Static Tests on Composites:

Pliable examples were set up as per ASTM D 638-98, following the example type M-II, The test speed was 5 mm/min. Flexural examples were set up as indicated by ASTM D790M, 3 point stacking. The example measurement was 125×10×6–8 mm and bolster range was 96 mm. The test speed was 2 mm/min. The pressure has been determined anytime of the heap deflection bend by methods for the accompanying condition

S=3PL/2BD2

Where S =stress in the external fibres at mid-range in MPa, P =load at a given point on the heap deflection bend, L=support length in mm, B=width of example tried in mm, D=depth of tried example in mm.

Fig. 2.1. Tensile test specimens.

2.1.4: Tensile Strength of Okra & Pineapple Fiber Reinforced Polymer Composites:

Fiber fortified polymer (FRP) materials are composites comprising of strands implanted in polymer grids. These materials are appropriate for countless various applications going from aviation to brandishing gear. The FRP composites fundamentally comprise of manufactured strands like glass, carbon, Kevlar and so on. In spite of the fact that the manufactured fiber fortified composites has phenomenal quality and hardness they are mind-boggling expense and non-biodegradable. As a result of these reasons, in the course of recent years the manufactured filaments have been supplanted with characteristic strands. The developing enthusiasm for utilizing the common strands is because of their accessibility, acceptable explicit quality and modulus, light weight, ease and biodegradability. Likewise the cost of the polymer strengthened regular fiber composite is a few times lower than the polymers fortified composite with glass strands.

2.2.1 EXPERIMENTAL PROCEDURE

Fortification Material Okra filaments removed from okra plant are utilized as support 1 material. New okra stems gathered from ranch are drenched and held in water for 20 days. The microbial debasement enables the stems to corrupt adequately to empower fiber extraction. The extricated strands are washed a few times utilizing water. The washed strands are dried in outside and kept in dampness evidence holder. Two sorts of substance medicines were performed on the strands. First the fiber are absorbed 2% NaOH arrangement at 70oC for about 2.5 hours, washed with water. In the second stage the filaments are absorbed essential sodium sulfate (PH4) for three hours washed with water and dried in outside.

2.3. PHYSICAL, MECHANICAL BEHAVIOUR OF JUTE FIBER REINFORCED POLYMER COMPOSITES:

Jute Fiber Reinforced Polymer Composites Over the most recent couple of decades, there has been recharged enthusiasm for the utilization of regular strands to supplant engineered filaments in composite applications.

Among different characteristic filaments, jute fiber is a promising support for use in composites because of its ease, simple accessibility, inexhaustibility, and much lower vitality necessity for preparing, high explicit properties and no wellbeing hazard. A lot of work has been distributed with respect to the fortifying capability of jute fiber on polymer composites. Properties of FRP composites are dictated by numerous components, for example, properties of the strands, direction of the filaments, and centralization of the strands, properties of the lattice, fiber-network interface quality and so forth. Expanding the volume substance of fortifications can build the quality and firmness of a composite to a point.

2.3.1 Materials

Matrix Material in Composite Materials
The constituent which is ceaseless and present in more prominent amount is called lattice. The primary elements of the lattice are to hold or tie the fiber together, convey the heap equitably between the filaments and shield the fiber from the mechanical and natural harm. The lattice material can be metallic, polymeric or can even be fired. The most ordinarily utilized grid material is polymer. It has favorable circumstances like ease, great concoction and consumption obstruction, low specific gravity, high explicit properties, simple processability, fabricating adaptability and synthetic strength. There are two noteworthy classes of polymers utilized as network materials.

Fiber Material In Composites
The irregular stage is generally harder and more grounded than the persistent stage and is known as the support. In polymer composites, the strengthening stage can either be sinewy or non-stringy (particulates) in nature. In FRP composites, fiber goes about as a strengthening operator. Filaments are the heap conveying individuals which give quality, solidness, warm security and other auxiliary properties. In the event that the filaments are gotten from the normal assets like plants or some other living species, they are called characteristic strands.

2.4 Testing of Physical and Mechanical Properties

Density:

The physical properties of a composite material framework can be as significant as mechanical properties in surveying reasonableness for a specific application. Thickness assumes a key job for structuring a building segment or choosing the use of a material especially where weight is a significant factor. Therefore, it is important to decide the thickness of the composites manufactured for this examination. The hypothetical thickness (ρct) of composites as far as weight part is acquired utilizing the connection given by Agarwal and Broutman.

Hardness
Hardness is a proportion of material's protection from lasting distortion or harm. Hardness is commonly taken as a standout amongst the most significant variables that oversee the wear obstruction of materials. In the present investigation, a Rockwell hardness analyzer is utilized to quantify the hardness of the composite examples according to ASTM D785 test gauges. During the test a minor heap of 10 kg pursued by a noteworthy heap of 100 kg were connected over the smooth surfaces of the examples. The hardness estimation is finished by estimating the profundity of space made by a precious stone indenter.

3. METHODOLOGY:

3.1 REINFORCEMENT

Support expands the quality, solidness and the temperature opposition limit and brings down the thickness of PMC. So as to accomplish these properties the determination relies upon the kind of support, its strategy for generation and compound similarity with the framework and the accompanying perspectives must be considered while choosing the fortification material.

- Size – measurement and perspective proportion
- Shape – Chopped fiber, hair, circular or sporadic particulate, chip, and so on:
- Surface morphology – smooth or layered and unpleasant:
- Poly – or single precious stone
- Structural absconds – voids, impeded material, second stage
- Surface science
- Impurities
- Inherent properties – quality, modulus and thickness.

3.2 FABRICATION METHODS OF PMCs

There are two general divisions of composites assembling forms: open embellishment and shut trim. With open trim, the gel coat and overlay are presented to the climate during the manufacture procedure. In shut trim, the composite is handled in a two-section form set, or inside a vacuum sack. There are an assortment of handling strategies inside the open and shut embellishment classes.

(a) Open Moulding Method

i. Hand Lay-Up,
ii. Spray-Up,
iii. Filament Winding.

(b) Closed Moulding Method

a. Compression moulding,
b. Pultrusion,
c. Vacuum Bag Moulding,
d. Vacuum Infusion Processing,
e. Resin Transfer Moulding (RTM).

3.2.1 Open Moulding Method

Open embellishment procedure is soaking fiber support with gum, utilizing manual rollout methods to unite the overlay and expelling the captured air. A central point in this task is the exchange of tar from a drum or capacity tanks to the shape. The methods used to transport the tar, by and large, portrays the particular procedure strategy.

(a) Hand Lay-Up

Hand expose up is an embellishment strategy appropriate for making a wide assortment of composites items including: vessels, tanks shower product, lodgings, truck/auto parts, compositional and numerous different items going from little to huge. Creation volume per shape is low; in any case, it is practical to deliver considerable generation amounts utilizing numerous molds. Straightforward, single-pit molds of fiberglass composites development are commonly utilized. Molds can go from exceptionally little to huge and are minimal effort in the range of delicate.

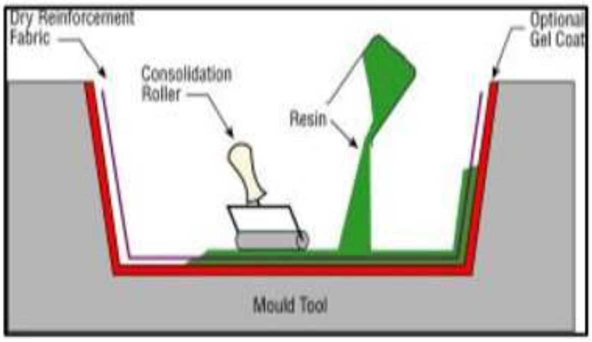


Figure 3.1 Hand Lay-Up Technique

4. PINEAPPLE & OKRAREINFORCED FIBER COMPOSITES

4.1 Pineapple Fiber Reinforced Composites

4.1.1 Pineapple Fiber:

Pineapple fiber is commonly gotten from the steam of a pineapple plant. It is a yearly plant that develops to 2.5-4.5 m and twists in rainstorm atmospheres. Pineapple is a language cellulosic fiber since its real synthetic constituents are lignin and cellulose. The warm and electrical conductivity, natural debasement, inclination to mold and moths, capacity to shield from warmth, cold and radiation, response to sun and light, and so forth are controlled by cell constitution and morphology. The concoction structure of the pineapple fiber has been accounted for by numerous scientists. Among various characteristic strands, pineapple fibers are effectively possible in fiber and texture frames with great warm and mechanical properties. The inherent properties of pineapple fiber

4.1 MOULD PREPARATION:

GI Sheet boxes of size 30*30*5(mm) were utilized for the embellishment procedure. The shaped sheets are changed into a square box with the end goal that the blend of sap and hardener are poured in it. Through the Hand lay-up processtechnique the readied shape was moved to form depression via care that the form cavity ought to be altogether filled.

Leveling was done to consistently fill the depression with the assistance of the rollers support. Before that ensure that the trim gel is to be utilized on the grounds that, it will go about as layer between the form and box without giving any sticky nature to it. Since it prompts changes the properties of the composite material. Restoring was done at room temperature for roughly 24 hrs. In the wake of restoring the shape was opened section removed from the form and cleaned.

Figure 4.1: Mould prepared by using GI sheet

4.1.2 Pineapple in Various Forms

Raw Pineapple:

Pineapple is a long, delicate and gleaming fiber acquired from the bark of jute plant. Monetarily the littlest unit of crude jute is known as reed. Contingent on the evaluation, the length of the reed changes from 1-4.5 m.

Figure 4.1 Raw & Short pineapple fiber

Woven Pineapple Fiber Mat:

Woven tangle fortified composites are accomplishing ubiquity because of its reasonable properties in tangle plane just as their simplicity of dealing with during creation. The woven arrangement of the tangle prompts a synergetic impact on the improvement of the wear opposition of the composites.

Fig: 4.3 Woven pineapple fiber MAT

Needle-punched Nonwoven Pineaple Fiber:
Another type of pineapple is needle-punched nonwoven fiber tangle. In polymer strengthened composites, the utilization of needle-punched nonwoven mats is beneficial as these materials improve the sturdiness and quality with light weight. Moreover, these nonwoven have a significant quality that offers superb z-directional properties that limits the delimitation issue.

The entrapment or interlocking of strands in needle punched nonwoven mats results in a three dimensional fiber fortifying structure. Nonwoven tangle is broadly utilized as geotextile, filtration, therapeutic merchandise, aviation and military applications. These materials have been found for different modern and specialized applications including rough composite materials.

Mechanical Properties
Numerous materials during its administration life are exposed to various loads or powers. In this way, it is essential to comprehend the mechanical conduct of materials with the goal that the item produced using it won't result in any disappointment during its life cycle. A sufficient learning of mechanical properties of material aides in determination of its reasonable applications. For instance lighter and more grounded materials are required for vehicles, for example, bikes, autos, or aviation applications. Pliable, flexural, between laminar shear quality, sway quality and hardness are the significant mechanical properties of the FRP composites.

In basic structure applications, malleable properties are considered as one of the significant material property. The rigidity and modulus of composite is progressively touchy to framework and fiber properties. The rigidity of composites chiefly relies upon the quality and modulus of strands, the quality and compound steadiness of the grid and the viability of the holding quality between the network and filaments in moving worry over the interface.

4.2 Natural Fiber

Regular strands (Abelmoschus esculentus) is the main vegetable harvest of hugeness in the Malvaceae family and is prevalent in the Indo-Pak subcontinent. In India, it positions number one in its utilization however its unique home is Ethiopia and Sudan, the north-eastern African nations. It is one of the most seasoned developed harvests and directly developed in numerous nations and is broadly circulated from Africa to Asia, southern Europe and America.

5. MECHANICAL TESTS

5.1 Experimentation:

The experimentation process, we had already undergone through the different process for the better reinforcement of the materials. We had commercially bought the available ARALDITE LY 556 along with hardener HY 951 was used as matrix material in fabrication of material.

1. Raw Material used:
2. Pineapple & Okra fibbers'
3. Epoxy Resin(LY-556) along with Hardener(HY-951)
4. Silica Mould relief spray
5. Ground Nut Shell Ash

Mould Preparation:
GI Sheet boxes of size 30*30* .05 cm were used for the moulding process. The moulded sheets are transformed into a square box such that the mixture of resin and hardener are poured in it. Through the HAND LAY-UP technique the prepared mould was transferred to mould cavity by care that the mould cavity should be thoroughly filled. Levelling was done to uniformly fill the cavity with the help of the rollers support. Before that make sure that the moulding gel is to be used because, it will act as layer between the mould and box without giving any sticky nature to it. Because it leads to changes the properties of the composite material. Curing was done at room temperature for approx. 24 hrs. After curing the mould was opened slab taken out of the mould and cleaned.

Preparation of Composite
The preparation of the polymer matrix composite was done at room temperature. The required ingredients of resin, hardener and groundnut shell ash were mixed thoroughly in a beaker and the mixer was turned into thick paste. The required mixture of resin & hardener were made by mixing them in (10:1) parts in a beaker by stirring the mixture in a beaker by a rod taking into care that no air should be entrapped inside the solution.

Figure: 6.1 Composite preparation

6.3 Ground Nut shell ash

Groundnut shells were kept in muffle furnace at 500°C temperature for ½ hr to burn completely. After this burned Coconut shells are pulverised into ash. It was sieved to achieve filler particles smaller than 300 μm. Then, the filler was dried in an oven at a temperature of 250 °C for 3hrs.

6.4 SILICONE SPRAY

Features
- Excellent anti stick \ release property.
- Excellent anti –friction property resistance to moisture, humidity and corrosion.

- Imparts shine on plastic, metal, glass and painted wooden surfaces.
- Compatibility with most plastics and rubber.
- Non staining, non-carbonizing and non-toxic in nature.
- Wide service temperature (-40c to +250c).

Applications

- Used as a release agent in injection moulding process of plastics components.
- Used as a release agent for reproduction of clean moulded articles.
- Provides the necessary lubrication to the moulds to prevent moulding defects.
- Used as a release agent for rubber moulded articles, resin casted products , wax based articles.
- Used as a release agent in metallurgical process.

6.5 CHEMICAL TREATMENT OF PINEAPPLE & OKRA FIBERS

Pineapple and Okra strands were submerged in 5% NaOH for 30 min. The filaments were then cleaned a few times with refined water pursued by drenching the strands in weaken HCl so as to evacuate the NaOH clinging to the outside of the strands. At long last the filaments were again washed a few times with refined water and dried in a broiler kept up at 70°C for 60 minutes.

Table: 6.1 Types of Composites, Type of resin and Hardener used

S.NO	SAMPLE .NO	TYPE OF FIBER	TYPE OF RESIN	TYPE OF HARDENER
1	SPECIMEN 1	Okra + Pineapple Unidirectional	LY-556	HY-951
2	SPECIMEN 2	Okra + Pineapple + GNSA	LY-556	HY-951
3	SPECIMEN 3	Okra + Pineapple Bidirectional	LY-556	HY-951
4	SPECIMEN 4	Okra + Pineapple Bi + GNSA	LY-556	HY-951

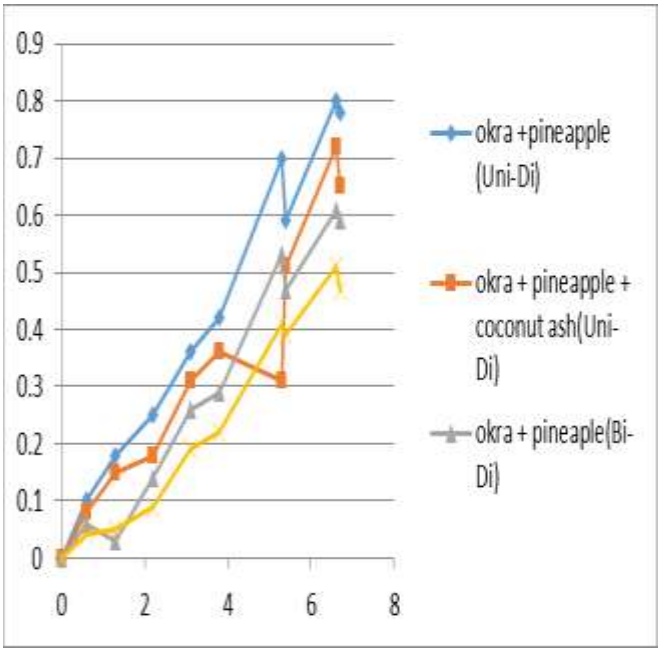
Experimentation:

The widespread testing machine is utilized for to decide the mechanical properties like: quality and the pressure, strain prolongation of the surrendered standard example made of the various mixes. An all-inclusive testing machine is utilized to test the tractable pressure and compressive quality of materials. It is named afterward that it can perform numerous standard tractable and pressure tests on materials, segments, and structures. Here we need to check the quality of the earth and gum composite, which is in the standard round and hollow fit as a fiddle for the estimating of the rigidity. We have taken four examples

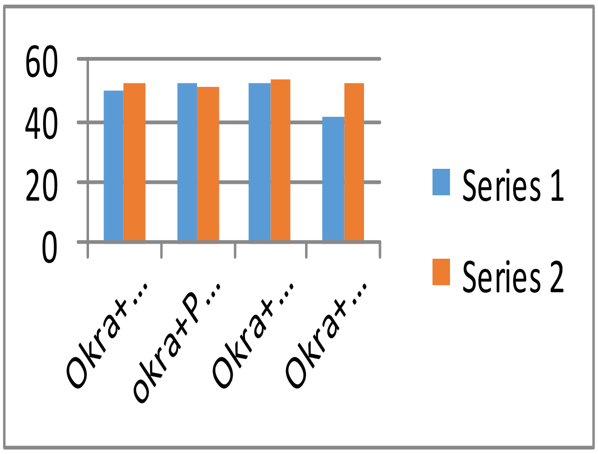
1. Okra + Pineapple Uni-directional using Epoxy Resin(LY-556) along with Hardener(HY-951)
2. Okra + Pineapple Uni-directional + Groundnut Shell Ash Epoxy Resin(LY-556) along with Hardener(HY-951)
3. Okra + Pineapple Orthogonal using Epoxy Resin(LY-556) along with Hardener (HY-951).
4. Okra + Pineapple Orthogonal + Groundnut Shell Ash Epoxy Resin(LY-556) along with Hardener(HY-951)

5.2 **Tensile test**

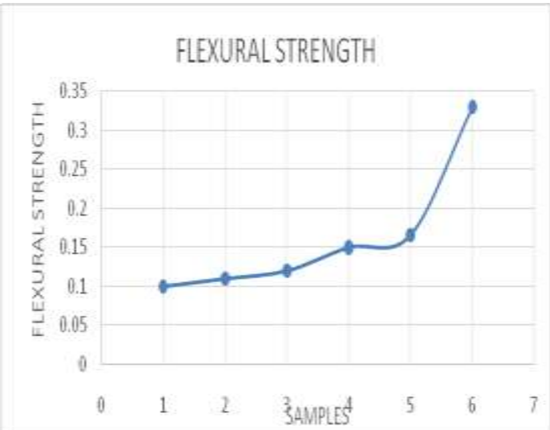
S.NO	SPECIMEN NO.	LOAD AT BREAK(KN)	MAXIMUM LOAD (KN)	UTS (MPa)
1	Okra + Pineapple (Unidirectional)	2.69	2.6989	34.60
2	Okra + Pineapple + Groundnut Shell Powder Ash (Unidirectional)	3.21	3.2171	41.24
3	Okra + Pineapple (Bidirectional)	2.58	2.5898	33.20
4	Okra + Pineapple + Groundnut Shell Ash (Bidirectional)	2.47	2.4701	31.67



5.3 HARDNESS TEST



5.4 FLEXURAL TEST:



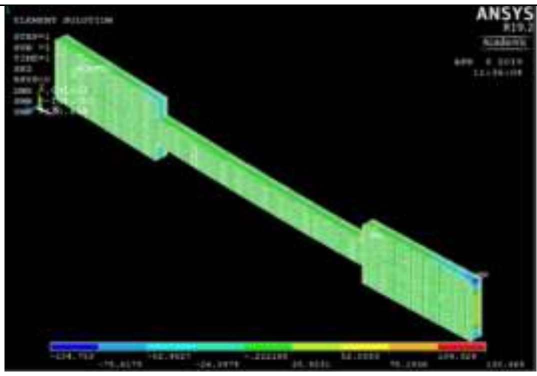
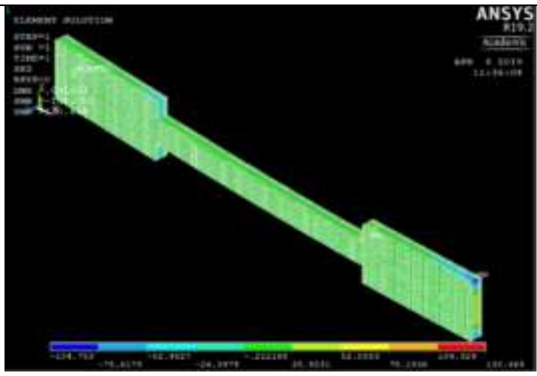
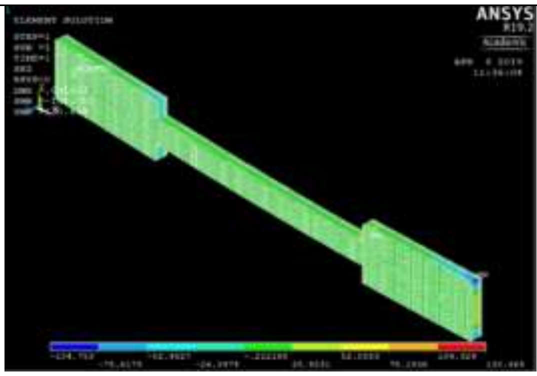
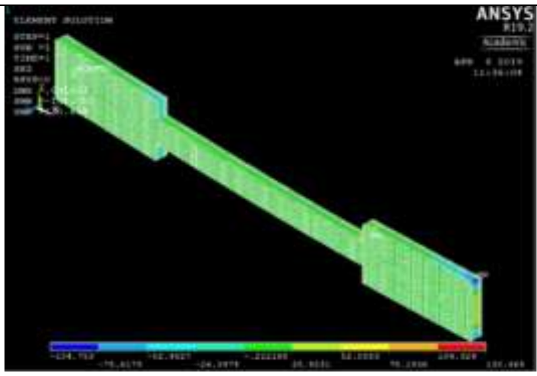
6. ANALYSIS OF COMPOSITEBYUSING ANSYS SOFTWARE

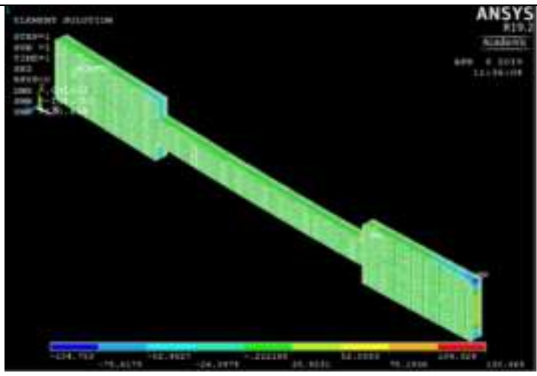
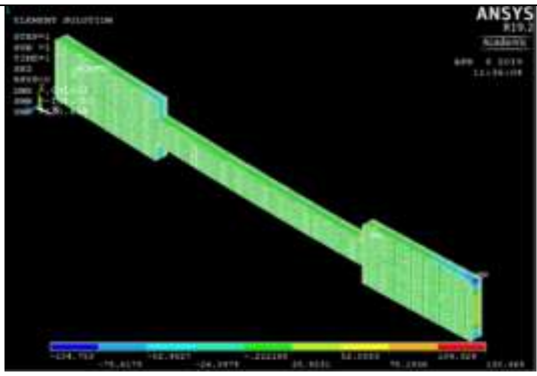
Investigation is one of the limited component examination programming used to mimic designing issues. This product makes reproduced PC models of structures, gadgets or machine segments just as polymer lattice composites, to mimic quality, strength, flexibility, temperature dissemination, electromagnetism, liquid stream, and different properties. Ansys is utilized to decide how an item will work with various detail without structure test items and directing accident tests.

Most investigation recreations are done in an Ansys Mechanical apdl which is one of the significant result of Ansys. A client perhaps characterizing the elements of an article first. Then including weight, weight, temperature and other physical properties.

At long last the Ansys programming reproduces and examinations development, weakness, cracks, liquid stream, temperature appropriation, electromagnetic effectiveness and different impacts over time.

We have played out this investigation utilizing Ansys 19.2 rendition which is one of the higher adaptation of Ansys programming.

orientation		Tensile stress in MPa	Flexural strength in MPa	hardness
30 degres		93.67	15.941	29.54
60 degrees		95.84	18.520	32.98
90 degrees		101.56	21.52	35.21
120 degrees		98.21	19.64	33.68

150 degress		96.63	17.24	31.21
180 degrees		95.28	15.23	29.75

ANALYSIS RESULTS

The Analysis results are obtained of required stress, flexural strength and hardness values in the post processor section.

GENERALPOSTPROCESSOR>PLOTRESULTS>COUNTER PLOT>NODALSOLUTION>STRESS>OK.

The results are then obtained and these results are compared with the theoretical results. The Ansys results are found with respect to the different fibre orientations. The fibre orientations are set according to orientation of the fibre which when prepared using hand lay-up process. We have set the orientation varying every 15 degrees from 0 degrees to 180 degrees. The orientation design of fibre with respect to different tensile stress values is shown below.

6. CONCLUSIONS

- Fabricated of a new class epoxy based composites reinforced with short pineapple and okra natural fibres.
- Evaluated the mechanical properties such as flexural strength, impact strength, tensile strength and micro-hardness of the obtained specimens.
- According to the tensile test experiments, the specimen Okra + Pineapple (Unidirectional) possess maximum stress strain curve and Okra + Pineapple + Coconut Shell Ash (Bidirectional) has minimum stresses
- The compression test for the specimen Okra + Pineapple + Coconut Shell Ash (Bidirectional) has maximum and minimum for Okra + Pineapple(Bidirectional)
- The Hardness test for the specimen Okra + Pineapple (Bidirectional) is maximum and minimum for Okra + Pineapple + Coconut Shell Ash (Bidirectional)
- The Impact Strength for Specimen Okra + Pineapple (Bidirectional) is maximum and minimum for Okra + Pineapple + Coconut Shell Ash (Unidirectional)
- The mechanical properties will be change with change in sythesis of filaments.
- Increase in hardener proportion with epoxy tar mechanical properties will change and over the top hardener will lead towards weakness of composite material.
- As pineapple fiber is known for its amazing smoothness its blend with Okra fiber will lead towards better surface completion of the item with wanted quality.

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