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FABRICATION AND TESTING OF HYBRID FIBER COMPOSITES WITH EXPERIMENTATION AND FINITE ELEMENT METHOD USING HAND LAYUP TECHNIQUE

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ABSTRACT

The Aim of task work is to manufacture and assess the mechanical properties of half and half overlaid built up with hemp strands and Carbon fiber with crab powder utilizing hand layup procedure. Cap is fundamental part of a vehicle at the front segment. It is utilized to improve the vehicle and add sumptuous look. The state of the hat is made streamlined to limit the air impact. Cap is by and large used to get to the parts effectively like radiator, motor and numerous different parts. Plan and Static examination of cap utilizing catia v5 and Ansys 16.2 virtual products and material properties are received from after finished creation of different mix of carbon fiber+hemp fiber+crab powder. Composites by shifting the directions of hemp fiber 0°,25°, 50°, 75° and keeping up with the consistent direction of carbon fiber with 0° and variety of Crab shell powder by 3% will be arranged utilizing hand layup strategy since this technique is not difficult to create, This task manages the similar investigation of cross breed composite material comprised of carbon fiber with Hemp fiber and carbon fiber with crab powder which are manufactured by hand layup procedure utilizing Lapox LY556 epoxy and HY951 hardener. The malleable, flexural, hardness and effect strength of the examples will be assessed. At long last dependent on the consequences of stresses, strains, distortions acquired the best appropriate blend for assembling vehicle hood will be chosen.

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1.1 INTRODUCTION OF COMPOSITES:

A composite is by and large characterized as comprising of at least two unique materials. An illustration of a common composite is fiber supported polymer (FRP) where the polymer go about as network and the strands just goes about as the support. The network ties the filaments together to some degree like a glue and makes them more impervious to outer harm. The lattice is here delicate in contrast with the filaments, so when joining both of them mechanical properties (solidness, strength, durability and so forth) is required to build, contrasted with the framework material. The properties are regularly anisotropic as in filaments frequently are situated in same direction (unidirectional), consequently great properties in the fiber heading. It is feasible to accomplish near isotropic properties if the filaments are situated arbitrarily in a complex framework (multidirectional). These kinds of composites made of polymer frameworks are called PMCs (Polymer lattice composites). There is likewise different sorts of composites, like MMCs (metal lattice composites), CMCs (ceramic network composites). Composites are normally utilized for supplanting metals since they are similarly solid however a lot lighter. This proposal is anyway just to examining PMCs.

1.2 CLASSIFICATIONS OF COMPOSITE MATERIALS

Different characterizations exist for composite materials. Since the calculation of the help is answerable for the mechanical properties and incomparability of composites, order dependent on the math of an agent unit of support is favorable.

Figure1. shows an ordinary arrangement of composites, which are partitioned into two classes:

(1) Particulate composites

(2)Fibrous composites

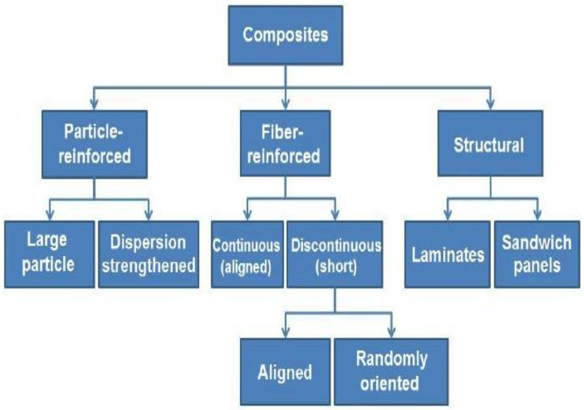

Figure 1 Classifications of Composites

1.2.1 PARTICULATE COMPOSITES

The support is atom based, as the name infers (platelets are remembered for this). It very well might be roundabout, cubic, tetragonal, platelet-molded, or equivalent fit, Particulate-braced composites incorporate those with circles, shafts, drops, and an assortment of other regularly equilibrated states. By and large, particles don't altogether further develop break opposition, however they do work on the composite's robustness somewhat. Molecule fillers are broadly used to upgrade the properties of organization materials, like altering warm and electrical conductivities, improving proficiency at raised temperatures, diminishing grating, expanding wear, and forestalling scratched spots.

1.2.2 FIBROUS COMPOSITES

A fiber is recognized by the way that its length is more noteworthy than its cross-sectional estimations. The components of the support choose how well it will add to the composite's properties. Strands are especially successful in further developing the structure's break deterrent on the grounds that a support with a long measurement debilitate the formation of early breaks that could prompt disappointment, particularly in weak networks.

Since gigantic flaws, which might be available in the mass material, are restricted by the little cross-sectional segments of the fiber, man-made filaments or strands of non-polymeric materials have a lot more excellent along their length. The direction of the sub-sub-atomic construction is answerable for superior grade and solidness in polymeric materials.

Strands are not straightforwardly utilized in development applications because of their restricted cross-sectional measurements. Accordingly, these lines are utilized to shape sinewy composites in matrix materials. The network ties the strands together, transports weights to the fibers, and shields them from normal assault and harm during treatment. Broken built up composites (BCFSCs) are composites that have been supported with broken filaments.

1.3 COMPONENTS OF COMPOSITE MATERIALS

In its most fundamental structure, a composite material is one that is comprised of no less than two components that cooperate to deliver material properties that are unmistakable from those of the individual components. Most composites are comprised of a mass material (the'matrix') and a support or something like that, which is added to further develop the network's quality and firmness.

1.4 CLASSIFICATION OF FIBERS

Strands are parted into two sorts: normal and engineered.

1 .Coir, banana, jute, bamboo, vakka, palm, corn, kenaf, flax, and other regular filaments

2. Synthetic or man-made strands: carbon, boron, glass, Kevlar, graphite, etc.

1.4.1 NATURAL FIBERS

Plants that produce food and fiber assume a significant part in present day culture. Fiber is a primary part found in trees, branches, leaves, roots, and seeds. Strands might come from one or the other essential or auxiliary meristematic tissue, contingent upon the species. Contingent upon the vegetable species, vegetable filaments incorporate cellulose, lignocelluloses, hemicelluloses, and gelatin. Present day manufactured strands and vegetable filaments are sought after worldwide these days for their quality obstruction, toughness, and shine.

Because of the serious rivalry among normal and modern filaments, it is pivotal to dissect the development and usefulness of fiber crops. Since the worth of cotton as a fiber crop has been very much archived, this investigation centers basically around short vegetable strands.

1.4.2 CLASSIFICATION OF NATURAL FIBERS

By and large normal strands are sub partitioned into,

A. Animal strands: fleece, hair, silk separated creature filaments

B. Mineral strands: Asbestos

C. Vegetable strands: woody filaments, seed filaments

1.4.2.1 HEMP:

Hemp is both perhaps the most naturally cognizant and probably the most established fiber. The most seasoned relics of human industry, as per Colombian history, are pieces of hemp texture found in burial places tracing all the way back to around 8,000 BC. Strands are contained in the

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tissues of the hemp plant's stems, which attempt to get the plant erect. Hemp strands high strength and firmness make them a valuable material for use as support in composite materials.

Figure 2 HEMP FIBER

1.4.2.2 CARBON FIBER:

Carbon filaments or carbon strands (then again CF, graphite fiber or graphite fiber) are carbon-based strands with a width of 5 to 10 micrometers (0.00020–0.00039 in). High firmness, high rigidity, low weight, high substance opposition, high temperature resilience, and low warm development are a couple of the advantages of carbon strands. Carbon fiber is usually utilized in aviation, structural designing, military, and motorsports, just as other elite athletics, because of its special properties. In any case, when contrasted with related filaments like glass or plastic strands, they are similarly expensive. To make a carbon fiber, carbon particles are bound together in gems that are pretty much adjusted corresponding to the fiber's long pivot, bringing about a fiber with a high solidarity to-volume proportion (all in all, it is solid for its size). A large number of carbon strands are packaged together to make a tow that can be utilized alone or woven into a texture.

To make a composite, carbon strands are regularly blended in with different materials. As carbon-fiber-built up polymer (otherwise called carbon fiber) is penetrated with a plastic gum and prepared,it frames a carbon-fiber-supported polymer with an exceptionally high solidarity to-weight proportion, and is very inflexible, if somewhat fragile. Carbon filaments can likewise be blended in with different materials including graphite to make fortified carbon-carbon composites with a high warmth resilience.

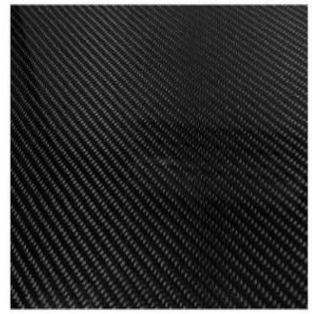

Figure 3 Carbon fiber

CHAPTER 2 LITERATURE REVIEW

2.1 LITERATURE REVIEW

AsimShahzad [1] discovered that hemp fibers have good properties and can be used to replace glass fibers. His research has shown that various surface treatments can improve the mechanical properties of hemp fiber.

B. Senthil Kumar . D. Muraganandam, and J. jayapriya [2]The properties of Kevlar laminated aluminium composite were examined to see if they could be used to replace the commonly used aluminium.

Mohammed Hisham, Mohammed Fahaduddin, and Mohammed Azhar Khan's work The anisotropic nature of Kevlar fibre provides a very high ratio of tensile to compression strength, according to Ashok B C and Prashant Kumar Shrivastava [3]. The mechanical properties of hybrid and treated Kevlar are determined.

The use of biodegradable waste as a composite material is determined in the article by **Gayatri U, Malkapuram R, Vasu AT, Chavali M [4].** A composite material is made from the discarded waste of prawn shell waste. Particulate reinforcement is used in prawn shell powder, and the matrix is LAPATOXY-SP 100 resin, which is also used as a hardener (MYK altercate). The mechanical strength of prawn shells is much greater.

The various compositions of matrix and epoxy are fabricated and compared among composites prepared in the paper by **MS VanasarlaHema, Mr. K. srinivasa Rao [5],** and the results are shown. Composite materials are a good replacement for traditional plastics because they have better mechanical properties

The article by Kishor kumar Gadgey and Dr. Amit Bahekar [6] reviewed and outlined the progress of various scientists' studies of crab shells. Which has properties that are very similar to those of pre-stressed concrete. The mechanical properties of the crab shell material are excellent.

Bhoopathi et al. [7] worked on Banana-Glass-Hemp Fiber Reinforced Composites and they observed that the banana-hemp-glass fibers reinforced hybrid epoxy composites contains superior properties and used as an alternate material for synthetic fiber reinforced composite materials.

Asim [8] worked on mechanical and physical properties of Hemp fiber and find the hemp fiber wears the properties that it can be used as a reinforced material in composite. But it has a problem that it wears moisture.

Subhash [9] worked on bamboo fiber and its mechanical behavior and concludes that the various mechanical properties are highly dependent on the fiber size used. Fiber access reduces the properties.

Avtar & Vishvendra [10] worked on hybrid of Jute-Bagasse-Epoxy & Jute-Lantana camara-Epoxy and comparison between the results of tensile and flexural test.

DeeDee [11] worked on hemp fiber and find that the difference between the hemp fiber and cotton. And conclude that the maximum physical and mechanical properties are same.

Supriya et al. [12] worked on Mechanical Characterization of Graphene based Hybrid Polymer and observed that the Carbon fiber hybrid with graphene sheet polymer composite exhibits special properties on the mechanical section. It is authorize that both graphene and carbon fiber show assure as reinforcements in superior Nano composites. They have prodigality of stiffness, strength, versatile and firm. This means that the Nano composites had prominent mechanical properties. Carbon and graphene based hybrid polymer composites demonstrate superior mechanical properties compared to the neat polymer or traditional composites. Carbon fibers were treated with a simple yet efficient method that resulted in the deposition on their surface of a high density of uniform and well dispersed graphene particles as well as sheet.

Gangadhar et al. [13] worked on „Testing of Polymer matrix Hybrid Composites" and observed that the Polyester performed better with respect to mechanical properties compared to epoxy in tensile & flexural behavior. Kevlar is best suited for impact load applications and gives a better performance, whereas glass and carbon have shown improvement in compression and flexural behavior compared to other hybrids. Varying the fiber stacking sequence w.r.t angle ply at ±45 better properties can be achieved. Variation in forming pressure and coupler concentration has effect on the improvement of properties. Natural fibers such as jute, kenaf, banana and pineapple have shown improvement in the properties compared to a monolithic natural fiber composite. Hybridization of glass and carbon doesn"t improve the hardness properties of composite.

Gupta and Srivastava [14] worked on Hybrid Fibres Reinforced and conclude that the hybrid fibers have the many advantages and can be used in many fields.

Manikandan et al. [15] worked on „Banana/Hemp Fiber and Its Hybrid Composites" studied that the centuries ago usage of composites materials plays important role in industrial revolution. In ancient days Egyptians used straw as reinforcement in clay bricks to build house. With the invented of glass fiber and resins, glass fiber reinforced composites found its application in many areas. Abundance nature and moderate specific strength than most of the organic fibers, low density and biodegradable nature make the natural fiber as attractive reinforcement in polymer matrix .

Sanjay and Arpitha [16] worked on Hemp and E-Glass reinforced fibers and find that the hemp fiber is a good alternative reinforced material.

Yerramsetti et al. [17] „Worked on Jute/Hemp reinforced fiber and find that hemp fiber and jute fiber have properties are very closer of each.

Suresha et al [18] worked on Tensile, Compression and Flexural Behavior of Hybrid Fiber (Hemp, Glass, and Carbon) Reinforced Composites observed that Specimens with varying thickness of laminates are fabricated by simple hand layup technique and they are: Hemp/Glass/Epoxy laminate composite (3mm thickness) Hemp/Carbon/Epoxy laminate composite (3mm thickness) From the composite s the test specimens have been prepared in accordance with the ASTM standards for tensile, compression and flexural strength determination. In the overall study, they found the strength of Hemp/Carbon/Epoxy laminates has higher value than that of Hemp/Glass/Epoxy laminates

M. Muthuvel[19] The aim of the present work was to investigate the hybridization of glass fibers with natural fibers for applications in the aerospace and naval industry. Mechanical properties such as tensile, impact and flexural test of hybrid glass/Hemp fiber reinforced epoxy composites in the forms of lamina and laminates were determined.The lamina prepared with natural fiber mat showed lower mechanical properties compared to laminas with glass mat. For this reason we proposed to use a hybrid design for the various applications which makes use of glass woven fabrics and Hemp fiber mats. The adoption of this design allowed for a cost reduction of 20% and a weight saving of 23% compared to the current commercial solution.

C. Velmurugan[20] In this study, the properties of Hemp fiber is improved by combining it with glass fiber with the help of epoxy resin and its mechanical properties tensile, compression, impact strength and flexural strength is found out and compared. Due to their eco-friendly nature and sustainability, natural fiber reinforced composite are more popular nowadays. Artificial fiber reinforced composite are becoming more valuable due to their better properties. In order to improve the properties of natural fiber, it can be combined with artificial fiber to form hybrid composite

2.2 OBJECTIVES OF THE PRESENT WORK

Following are the objectives that have been outlined:

1.Fabrication of a new class of epoxy-based hybrid composite reinforced with Hemp & Carbon fiber with crab shell powder.

2.Evaluation of mechanical properties such as tensile strength, flexural strength, hardness, Sem Analysis.

3.To study the potential utilization of Hemp & Carbon fiber with crab shell powder as reinforcement material in epoxy-based composites for various applications.

4.To assess whether the fabricated hybrid composite can be used as an alternate material for synthetic fibre reinforced composites.

5.To design and Analysis of car hood using existing dimension.

6.Increase the car hood strength compared to the existing materials .consider the 3 Materials in this project 2 are existing Al6061, Steel 1045 1New Material who is the best properties find out in 4 orientations .

7.Find out the Von-misses stresses, deformations in static analysis . 8.Finally concluded the suitable material for the car hood .

3 SELECTION OF MATERIALS

3.1 SCOPE OF MATERIALS

This part manages the materials that are chosen to set up the mixture composite material dependent on the Properties.

The materials chose are

1.Epoxy tar

2.Hardener

3.Carbon fiber 4.Hemp fiber

4.Crab shell powder

5.The Crab shell are treated with NaOH arrangement, dried and are ready for manufacture measure.

MATERIALS

On among various kinds of gums and hardener. Epoxy LY556 and hardener HY951 are picked. The materials taken to create the examples are Hemp fiber, Carbon fiber with Crab shell powder. These are taken in the various proportions and various mixes. The four distinct composites are explored the effect strength, rigidity, flexural strength, Hardness, Sem investigation

3.1.1 EPOXY RESIN

In present work epoxy LY556 is utilized as network material to create mixture fiber epoxy composites. Epoxy LY556 is picked on the grounds that it is a one such network which is broadly utilized on the grounds that it show low shrinkage, higher mechanical properties, simple creation, incredible compound and dampness opposition, great wet capacity. Epoxy saps are the most regularly utilized thermoset plastic in polymer framework composites. Epoxy saps are a group of thermoset plastic materials which don't emit response items when they fix thus have low fix shrinkage. They additionally have great attachment to different materials, great compound and natural opposition and great protecting properties.

Figure 4 fabricate hybrid fibre epoxy composite

3.1.2 HARDENER

Hardener utilized for present examination for starting gel arrangement is hardener HY951 which is displayed in figure.7. The mix of epoxy LY556 and hardener which fixes at room temperature, astounding glue strength, great mechanical and electrical properties.

The proportion of the epoxy and hardener are taken 10:1 that is 10 grams of epoxy and 1 gram of hardener.

Figure 5 combination of epoxy LY556

PROPERTIES OF HARDENER HY-951 :

It's a multipurpose two segment, room temperature relieving, straightforward fluid glue of high strength. It is reasonable for holding wide assortment of metals, pottery, glass, rubbers, unbending plastics, and most different materials in like manner use.

Thickness: 0.95gm/cm^3.

Drying temperature : ordinary room temperature (25° - 30°c). Water solvency: solvent.

Carbon Fiber is a polymer and is now and again known as graphite fiber. It is an extremely impressive material that is additionally exceptionally lightweight. Carbon fiber is five-times more grounded than steel and twice as hardened. However carbon fiber is more grounded and stiffer than steel, it is lighter than steel; making it the best assembling material for some parts. These are only a couple reasons why carbon fiber is supported by specialists and fashioners for assembling.

Carbon fiber is made of dainty, solid glasslike fibers of carbon that is utilized to fortify material. Carbon fiber can be more slender than a strand of human hair and gets its solidarity when contorted together like yarn. Then, at that point it tends to be woven together to frame fabric and if necessary to take a perpetual shape, carbon fiber can be laid over a form and covered in tar or plastic.

- Is high in firmness
- Is high in elasticity
- Has a low weight to strength proportion
- Is high in substance opposition
- Is temperature open minded to exorbitant warmth
- Has low warm extension

Along these lines, carbon fiber is exceptionally famous in numerous businesses like aviation, car, military, and sporting applications.

Figure 6 Carbon fiber material

Material properties:

Carbon Fiber	Values
Density(g/cm^3)	1.77
Tensile Strength(Mpa)	4000
Young's Modulus (Gpa)	235
Elongation(%)	1.6
Possion's Ratio(u)	0.3

3.1.3 HEMP: -

Hemp is normally quite possibly the most naturally agreeable filaments and furthermore the most seasoned. The Colombia history of the world expresses that the most established relics of human industry are pieces of hemp texture found in burial places tracing all the way back to roughly 8,000 BC. In hemp plant, strands are contained with the tissues of the stems which help to hold the plant erect. This high strength and firmness of hemp strands makes them a helpful material to be utilized as support in composite materials.

Figure 7 Hemp Fiber plant

Hemp is usually known as a fiber plant and most evident advancement of the plant on the planet from the seventeenth to mid-20th many years was by virtue of fiber use. Two kinds of strands are gotten from the hemp plant's tail. These are long (bast) strands and the short (principle components). The long, strong bast strands are near long to fragile wood fibers and are low in lignin content (lignin is the "stick" that holds plants together). The short focal components are more similar to hard wood fibers. Right when created as a fiber alter, hemp creates to a height of 6-12 feet without fanning. Thick plantings (as much as 300 plants for each square yard) assist with ensuring that the plant grows straight. An ideal estimated fiber plant has an undefined broadness from a #2 pencil (about ¼ inch or 6 mm). Male plants kick the container in the wake of shedding dust, yet fiber items are typically assembled previously or in the midst of blooming.

3.1.4 HEMP FIBER HARVESTING AND EXTRACTION

Hemp fiber is for the most part filled in a calm environment. It needs around three and a half months with 10-12 crawls of precipitation to develop enough. Hemp plants are likewise thermophilic and heliotropic, implying that they need a decent measure of warmth and sun, without which seed creation and bio-mass are compromised. Beginning in Central Asia, it is presently filled in various nations going from Canada, USA, France, Italy, Germany, Philippines, and India, to give some examples.

Plants developed for fiber are thickly planted and grow up to 2-3 meters tall. They are best collected before long they arrive at development, which is displayed by full blooms and shedding dust of the male plants. The male plants bloom quicker than females and don't deliver as much fiber. Most female hemp fields incorporate some male plants dispersed among them. This is with the goal that the male plants discharge dust for the female plant to deliver seeds. These seeds can be utilized for additional yields and furthermore sold as food.

MATERIAL PROPERTIES OF HEMP FIBER:

HEMP FIBER	VALUES
Density(g/cmm^3)	1.48
Elongation (%)	1.6
Tensile Strength(Mpa)	550-900
Young's Modulus(Gpa)	70
Poisson's Ratio(u)	0.3

3.2. CRAB POWDER:

It is the powder produced using the ex. skeleton of the crab. The shell or ex. skeleton of the crab is dunked in sulphuricacid for 3 to 5 days. Then, at that point the shell is dried and separates in to little pieces. The little pieces are pound to powder. Crab Shell is an astounding dry natural wellspring of supplements, including Calcium (23%) and Magnesium (1.33%). It holds dampness in the dirt and fabricates the natural matter. It additionally gives the roots something to take hold of and fold over, for a food source, making a more profound root framework. Crab Shell ought to be worked in the dirt prior to planting, or top dressed. It very well may be applied to yards with a transmission spreader. It shows stunning outcomes on yards and all plants as displayed in the crab shells have likely significant practical and mechanical applications because of their synthetic arrangement. They have a high substance of protein (34.2%) and fundamental amino acids; they additionally have fat (17.1%), with a high extent of polyunsaturated unsaturated fats. About 28.5% compares to debris (calcium, phosphorous, and magnesium are the significant minerals). The mean convergences of nutrient E, astaxantin, and β-carotene were 23.3, 9.49, and 0.2 mg/100 g, individually.

3.3 EXPERIMENTATION:

Hand Layup Method The current work was finished by utilizing the hand layup technique to create the composite materials. This technique is exceptionally simple to manufacture and having low tooling cost and results in great surface completion. In the hand layup technique, the unmistakable film is set first and epoxy is applied on the film with the assistance of brush. In this undertaking taken all out 4 Orientations .The necessary amount of sap was taken in appropriate proportionate. Weight of the fiber: weight of the pitch: weight of filler = 50: 40: 10 To this deliberate load of the gum, hardener and gas pedal were added to such an extent that the heaviness of the hardener was 10% of the all out weight of the sap. The subsequent combination was appropriately blended to guarantee legitimate blending. Expansion of hardener is done to work with simple solidifying of the composite cover during relieving. A level table with glass laid on it was prepared for the laying of the material by cleaning and cleaning it.

1. A release agent (wax) coat was then applied to the table's surface to make the composite laminate easier to remove.
2. The carbon fibre was first coated with a thin layer of resin.
3. It was then covered with a layer of 360GSM carbon fibre.
4. A previously prepared resin coating was put uniformly on top of the fibre.
5. The resin was propped up by rolling under consistent pressure.
6. The first and sixth layers are made of carbon fibre (200mm x 200mm x 6mm), while the second, third, fourth, and fifth layers are made of hemp fibre. The plate with six layers is created in this manner. Consider applying 3 percent Epoxy and Crab Shell Powder to each coat using a brush. The plate's final dimensions are 200*200*6mm.
7. The technique was continued until four woven fibre mats had been set one on top of the other (with resin in between)
8. Finally, over the top mat, a coat of resin was applied.

9. After curing the laminate for 24 hours, the parameters of tensile, flexural, impact, and hardness were cut according to ASME standards.

3.3.1IN THIS PROJECT CONSIDER TOTAL 4 CASES

CASE 1:

FIRST LAYER CARBON FIBER 0^{O} SECOND LAYER HEMP FIBER 0^{O} THIRD LAYER HEMP FIBER 0^{O}

FOURTH LAYER FIBER 0^{O} + 3% CRAB SHELL POWDER

FIFTH LAYER FIBER 0^{O}

SIXTH LAYER CARBON FIBER 0^{O}

CASE 2:

FIRST LAYER CARBON FIBER 0^{O}

SECOND LAYER HEMP FIBER $+25^{O}$

THIRD LAYER HEMP FIBER -25^{O}

FOURTH LAYER FIBER $+25^{O}$ + 3% CRAB SHELL POWDER

FIFTH LAYER FIBER -25^{O}

SIXTH LAYER CARBON FIBER 0^{O}

CASE 3:

FIRST LAYER CARBON FIBER 0^{O}

SECOND LAYER HEMP FIBER $+50^{O}$

THIRD LAYER HEMP FIBER -50^{O}

FOURTH LAYER FIBER $+50^{O}$

FIFTH LAYER FIBER -50^{O}

SIXTH LAYER CARBON FIBER 0^{O} + 3% CRAB SHELL POWDER

CASE 4:

FIRST LAYER CARBON FIBER 0^{O}

SECOND LAYER HEMP FIBER $+75^{O}$

THIRD LAYER HEMP FIBER -75^{O}

FOURTH LAYER FIBER $+75^{O}$

FIFTH LAYER FIBER -75^{O}

SIXTH LAYER CARBON FIBER 0^{O} + 3% CRAB SHELL POWDER

3.3.2 FABRICATION TECHNIQUES HAND LAYUP TECHNIQUE

The essential primary boundaries that impact the properties of composite materials are (I) sorts of fiber and their length (ii) fiber pressing and direction (iii) sort of grid (iv) Ratio of fiber to lattice and (v) preparing strategy utilized. It is grounded that a higher fiber to framework proportion gives better mechanical properties. Likewise, the mathematical course of action of fiber inside the framework is similarly significant to confer solidness and strength every which way. There are fundamentally two methodologies for handling of composite materials.

There are various techniques used to make the composite material. They are hand layup method.Hand Layup Method The current work was finished by utilizing the hand layup strategy to create the composite materials. Crab shell powder is perfect with hydrogen peroxide .This strategy is exceptionally simple to create and having low tooling cost and results in great surface completion. In the hand layup technique, the unmistakable film is set first and epoxy is applied on the film with the assistance of brush. Then, at that point the Carbon fiber of (200mm*200mm) is set on it as a first layer, of course, the epoxy is applied on carbon fiber, and presently the hemp fiber is put as second layer, Third layer, fourth layer, fifth layer with various orientations(0,25,50,75) and various layers (0,+25,- 25,+50,-50,+75,- 75 degrees) Sixth layer Like this the plate with 6 layers is made. The last components of the plate are 200*200*6mm.

Figure 8 Flax fiber

Figure 9 Carbon fiber

Figure 10 Process of crab shell powder

3.2.3 MOULD PREPARATION:

STEPS INVOLVED IN THE FABRICATION OF SPECIMEN:

Readiness the form according to the measurements 200x200mm first palce the glass film after add the hardner and sap with crab shell powder .Now Place the Carbon fiber first layer and second ,third ,fourth fifth layers are add Hemp fiber and sixth layer again add Carbon fiber material with various directions (0,25,50,75).

Figure 11 Film creation and apply resign

Figure 12 Place the first layer carbon fiber

Figure 13 Hemp fiber 2nd ,3rd ,4th 5th,6th layers

3.4TENSILE TESTING OF COMPOSITES

A 2 ton limits electronic tensometer which is displayed in figure 3.13, METM 2000 ER-1 model (Plate II-18), provided by M/S microtech Pune, is utilized to decide the flexibility of composites. Its ability can be changed by trouble cells of 20 kg, 200 kg and 2 ton. A weight cell of 2 ton is utilized for testing composite examples. Self-changed lively handle toss is utilized to hold composite examples. An electronic micrometer is utilized to quantify the necessary thickness and width of composite examples. The check length, width and thickness are estimated with 0.001 mm insignificant count electronic micrometer. This electronic tensometer is fixed with weight and increase pointers, which has a negligible count of 0.01 kg and 0.01mm exclusively. An electronic tensometer is fitted with a modified self changed smart handle throw and other adaptable self changed quick hold throw to hold 165 mm long, 12.5 mm wide and 4 mm thick examples. Examples are set in the holds of a tensometer at a particular grasp division and exposed to stack until disappointment. The power applied is shifted on to measure the stack and development of example. The adaptable toss is additionally moved with the end goal that the load pointer simply starts giving proof stacking on the example.

3.5 FLEXURAL TESTING OF COMPOSITES

Three point bowing test are done according to ASTM-D790M-86 test method 1, framework A to extricate flexural properties, the examples are 100 mm long , 25 mm wide and 4 mm thick . Two undefined examples are oppressed for flexural testing. In three point bowing test, the outer rollers are 70 mm isolated and examples are oppressed at a strain pace of 0.2 mm/min. Flexural stress are controlled by the accompanying relations.

3.6 IMPACT TESTING OF COMPOSITES

Effect test is otherwise called charpy v indent, Impact analyzer was influence analyzer provided by M/S International Equipments, Mumbai, was utilized to test the effect properties of fiber Reinforced composite example. The Impact analyzer has four working capacities of impact quality for example 0-2.71 J.0- 5.42 J,0-10.84 J and 0-21.68 J, with a base assurance on each size of 0.02J, 0.05 J, 0.1 J and 0.2 J separately .Four scales and looking at hammers (R1,R2,R3,R4) are introduced in hardware.

3.7 HARDNESS

Shore D Hardness is a state sanctioned test comprising in estimating the profundity of entrance of a particular indenter. Test techniques used to quantify Shore D Hardness are ASTM D2240 and ISO 868. The hardness esteem is controlled by the entrance of the Durometer indenter foot into the example. Shore Hardness measures are dimensionless. It goes somewhere in the range of 0 and 100. The higher number addresses the harder material.

3.8 BEFORE TESTING SPECIMENS:

3.8.1 FLEXURAL TEST &TENSILE TEST

Figure 14 Before testing of Flexural specimen

3.8.2 HARDNESS TEST & IMPACT TEST

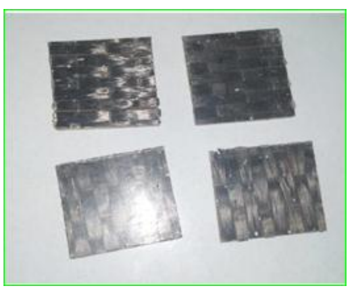

Figure 15 Before testing of Hardness specimens

Figure 16 After testing of Impact specimens

4 SEM ANALYSIS

A Scanning Electron Microscope (SEM) is a kind of electron magnifying lens that produce pictures of an example by filtering it with an engaged light emission. The morphological portrayal of the composite surface is seen in SEM of model JSM-IT 500. The examples to be checked are cleaned, air dried appropriately and are covered with a thick gold JEOL falter particle coater and noticed SEM at 20kv. A slight film of gold is vacuum dissipated onto the composite examples to work on the conductivity before the micrographs are taken. The break surface morphology of the composite examples is seen by the method for Scanning electron magnifying instrument (SEM). Fractography investigations of the cracked example after the malleable test was completed utilizing a Joel checking electron magnifying instrument. Every one of the examples were covered with gold and are kept in ionizer. Pictures of the cracked examples are taken by exposing them to a voltage of 20kv.The disappointment morphology of the mixture composite examples tried in present investigation is inspected through checking electron magnifying lens (SEM) examination. The SEM micrographs of mixture composite examples exposed to elastic stacking and flexural stacking are displayed underneath. From the pictures it tends to be seen that the break of fiber and network because of the applied burden.

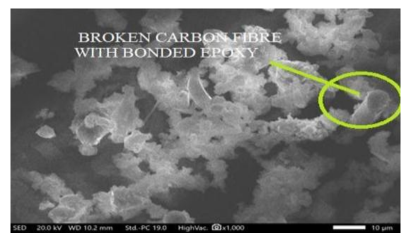

Figure 17 Broken carbon fiber with bonded epoxy

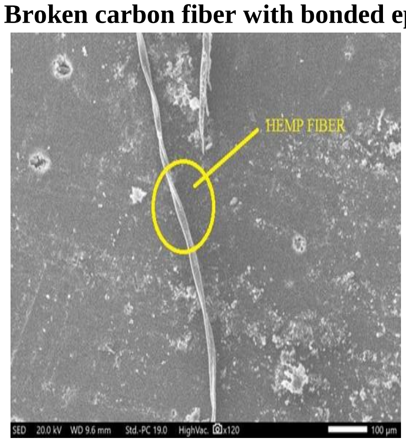

Figure 18 Unbroken Hemp fiber

4.6 DESIGN PROCEDURE IN CATIA:

Go to the Sketcher workbench make the profile according to measurements 1175x1220x1103 get-togethers to the side view make the circular segments point 15º After go to the strong consolidate choice as displayed underneath figure.

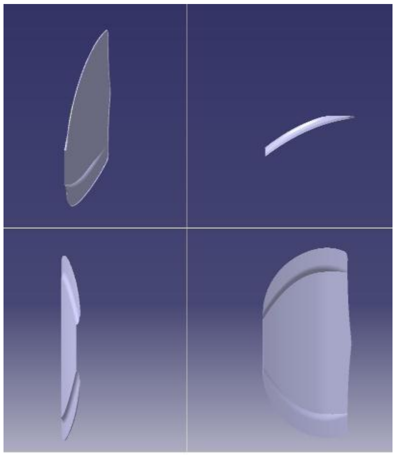

Figure 19 Car bonnet Multiple views in Catia

5. ANALYSIS PROCEDURE IN ANSYS:

Planned part in catia workbench after brought into Ansys workbench currently select the consistent state warm examination .

1.ENGINEEERING MATERIALS (MATERIAL PROPERTIES).

2.CREATE OR IMPORT GEOMENTRY.

3.MODEL (APPLY MESHING).

4.SET UP (BOUNDARY CONDITIONS)

5.SOLUTION

6.RESULTS

MESH:

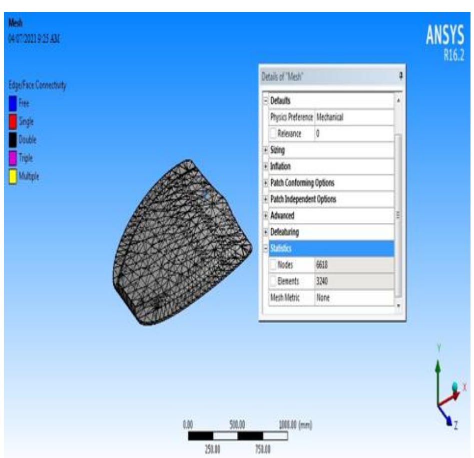

Figure 20 NODES:6618, ELEMENTS 3240

5.1 BOUNDARY CONDITIONS AND LOADS AT STATIC ANALYSIS:

1. Maximum pressing factor load at the top surface of the Bonnet 100N

2. Fixed two face at posterior of the hood levels of opportunity imperatives DX = DY = DZ =0

BOUNDARY CONDITIONS:

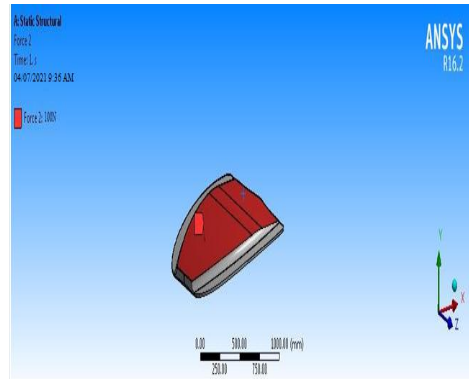

Figure 21 Boundary conditions

The built Bonnet in catia and static investigated utilizing ANSYS V16.2 and the outcomes are portrayed underneath. Apply here power is 100N on top of the hood and fixed base outcome and got with various materials Al6061, Steel, 0o direction $(0^{O}C+0^{O} H+0^{O} H+0^{O}H+0^{O}H+0^{O}C)$

CHAPTER-6 RESULTS AND DISCUSSIONS

6.1MECHANICAL CHARACTERISTICS OF COMPOSITES

The properties of the Hemp and Carbon strands supported epoxy half and half composites with of with Crab shell powder under this examination are introduced in beneath Table. Subtleties of handling of these composites and the tests directed on them have been portrayed in the past part. The mechanical properties of Hybrid built up composites are generally relies upon the compound, primary sythesis, fiber type and soil conditions and furthermore on climatic conditions at the hour of manufacture of the examples.

Tests were directed to decide the rigidity, flexural strength and hardness of the above said material. All exploratory tests were rehashed multiple times to produce the information. The SEM examination has been completed elastic disappointment. In this undertaking completed 4 unique directions 0,25,50,75 utilizing the Hemp and carbon fiber materials with crab shell powder. The outcomes are utilized to anticipate how the material will respond under tractable stacking. A portion of the mechanical properties that are straightforwardly estimated by pliable test are elasticity, Young's modulus, and yield strength.

The aftereffects of different portrayal tests are accounted for here. This incorporates assessment of rigidity, flexural strength, sway strength, Hardness Has been considered and talked about. In light of the organized outcomes, different charts are plotted and introduced in figures for composites.

6.2 SPECIMEN AND TESTING

6.2.1TENSILE TEST:

S.NO	Composite	Tensile test	
		Load in N	Elongation in mm
1	H.F 0^0+C.F 0^0+3%CSP	10335	8.2
2	H.F 25^0+C.F$^0 0^0$+3%CSP	10118	9.2
3	H.F 50^0+C.F0^0+3%CSP	8875	9.8
4	H.F 70^0+C.F0^0+3%CSP	9045	10.3

6.2.2 FLEXURAL TEST:

S.NO	Composite	Tensile test	
		Load in N	Elongation in mm
1	H.F 0^0+C.F 0^0+3%CSP	2433	3.2
2	H.F 25^0+C.F$^0 0^0$+3%CSP	2356	3.3
3	H.F 50^0+C.F0^0+3%CSP	1184	3.2
4	H.F 70^0+C.F0^0+3%CSP	1778	3.9

6.2.3 IMPACT STRENGTH:

S.NO	Composite	Tensile test (Joules)
1	H.F 0^0+C.F 0^0+3%CSP	3.6
2	H.F 25^0+C.F$^0 0^0$+3%CSP	4.5
3	H.F 50^0+C.F0^0+3%CSP	2.7
4	H.F 70^0+C.F0^0+3%CSP	4.3

6.2.4 HARDNESS:

S.NO	Composite	Hardness
1	H.F 0^0+C.F 0^0+3%CSP	28.3
2	H.F 25^0+C.F$^0 0^0$+3%CSP	33.3
3	H.F 50^0+C.F0^0+3%CSP	28.6
4	H.F 70^0+C.F0^0+3%CSP	29.2

6.3 GRAPHS:

6.3.1 STATIC STRUCTURAL ANALYSIS :

The static underlying investigation of Steel 1045, Al6061, 0o direction $(0^{O}C+0^{O}H+0^{O}H+0^{O}H+0^{O}H+0^{O}C)$ Material are done and results are gotten for Equivalent (Von-Misses) stress, all out misshapening. These outcomes are plotted graphically and a correlation is made between these outcomes.

6.3.2 VON-MISESS STRESS (MPA):

we can see that if there should be an occurrence of same (von-misses) stress, Car hat are made of different materials Steel 1045, Al6061, 0^o direction $(0^{O}C+0^{O}H+0^{O}H+0^{O}H+0^{O}H+0^{O}C)$ Material. At last Have 0^o direction $(0^{O}C+0^{O}H+0^{O}H+0^{O}H+0^{O}H+0^{O}C)$ Material is found to have least pressure of 0.018MPa Obtained.

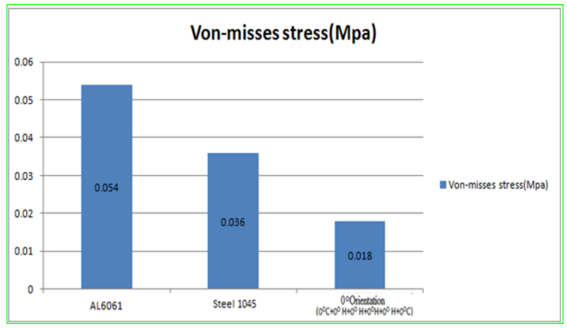

Figure 22 Von-misses stresses

6.3.3 VON-MISESs STRESS (MPA):

we can see that if there should arise an occurrence of Total Deformation, Car hood are made of different materials Steel 1045, Al6061, 0^o direction $(0^{O}C+0^{O}H+0^{O}H+0^{O}H+0^{O}H+0^{O}C)$ Material. At long last Have 0^o direction $(0^{O}C+0^{O}H+0^{O}H+0^{O}H+0^{O}H+0^{O}C)$ Material is found to have least pressure of 0.0001MPa Obtained.

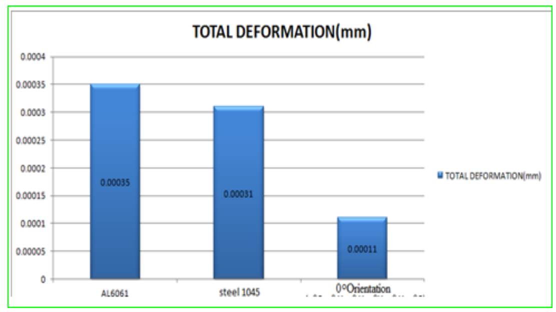

Figure 4 Total deformation

CHAPTER-7 CONCLUSION

Plan ,Fabrication, Testing and Analysis are finished utilizing different half and half materials .These composites have applications in the space of air make, aviation, development industry, against consumption hardware, electrical and electronic industry, farming, tactical armor carriers, flame resistant attire and mechanical assembling.

Subsequent to deciding the material properties of Hemp and Carbon fiber with crab shell powder various materials, the accompanying ends can be made.

1) The Hemp and Carbon fiber with crab shell powder built up epoxy cross breed composites are effectively created utilizing hand lay-up procedure.

2) The Hemp and Carbon fiber with crab shell powder composite different Orientations taken in this undertaking (0,25,50,75) .

3) Tensile test, flexural test, Impact test, Hardness test, SEM Analysis are finished.

4) Tensile test 10335 N at 8.2 mm Flexural test 2433 N at got the 3.2 mm prolongation,

5) The hybridization of these filaments has given impressive improvement of flexural strength when contrasted with singular support. This work likewise exhibits the capability of the half and half regular fiber composite materials for use in various consumable products.

6) Due to the low thickness of proposed this new material strands contrasted with the manufactured filaments (Glass strands, carbon filaments, etc...), the composites can be viewed as a valuable materials in light weight applications.

7) In pressure examination of existing vehicle cap Von-misses pressure and Deformation appropriation of upper board of hood stresses are discovered these materials Al6061, Steel, 0º direction (0ºC+0º H+0º H+0ºH+0º H+0ºC).

8) Finally closed the 0o direction (0ºC+0ºH+0ºH+0ºH+0ºH+0ºC) is the reasonable for the Manufacturing reason since least von-misses pressure and disfigurement.

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