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MECHANICAL PROPERTIES ANALYSIS OF CORE FIBER POWDER REINFORCED COMPOSITE

S.Yuvaraj[1], K.V.Poornachandran[2], K.Sudhan[3]

[1]Assistant Professor, [2]Assistant Professor, [3] Assistant Professor

Department of Mechanical Engineering, Dhanalakshmi Srinivasan College of Engineering, Coimbatore.

ABSTRACT

Natural fiber reinforced composites is an emerging material that has great potential to be used in various industrial component and applications. It has raised great attention in recent years due to that the composites give a combination of superior mechanical property, dielectric property, and environmental advantages such as renewability and biodegradability. Natural fiber serves as an important option to manmade fibers because they are in large quantities available, cost-effective, recyclable, ecofriendly and have a high mechanical strength .which has less weight and eco-friendly with the energy conservation system. The woven fabric form of fiber is reinforced with Isopathalic LY556 resin and hardener HY951in different volume ratios by increasing the thickness of fiber material and it is prepared by compression moulding process. This work is to find out the mechanical property like hardness, tensile strength, bend strength, impact and micro structure of the natural fiber reinforced composites and to suit this material for an alternative material for aerospace and ship building industries.

Keywords: Natural Fiber Reinforced composites, Woven fabric, Isopathalic resin.

1.0 INTRODUCTION

Composite materials have been dominant among all emerging materials because of its better mechanical properties. The utilization of composite materials proved that it conquered new markets relentlessly. The mechanical properties of polymers have shortcomings in fulfilling many structural functions. Generally the mechanical strength of polymers is less compared with metals. However such limitations can be overcome by using treated natural fiber reinforced polymeric composites. While focusing on composite materials, the main points to be considered are cost effectiveness and environmental friendliness. The two main phases of composites are, a discontinuous phase called as ‘‘reinforcement’’ and a continuous phase called as ‘‘matrix’’ which is the major constituent of the product. Natural fibers/particle

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have been extensively used seeing that reinforcements into polymer matrices as an alternative to the commonly used synthetic fillers such as carbon, glass or aramid because of their low-density, good mechanical properties, abundant availability and biodegradability [1]. The use of lignocellulosic natural fibers/particles as fillers or reinforcements has been gaining acceptance in commodity polymer applications in the past few years [2,3]. The natural fillers can be obtained from several sources, both from forestry and agricultural assets. Waste from agriculture provides ecological, plentiful, natural materials that serve as fillers for resins, with the benefit of lower cost and improved mechanical properties. Many researchers have been reported on natural filler reinforced thermoplastic composites, which have successfully proved their applicability in various fields [4]. Thermoplastics such as polyethylene (PE), polypropylene (PP) and polyvinylchloride (PVC) enclose subsist compounded with natural fillers such as wood, hemp, core, coir pineapple leaf,.oil palm and core to prepare composites [4–6]. Athijayamania et al. [1] extracted the roselle and sisal fibers by simple manual water treatment process. The experimental tensile and flexural strength results were compared with the Hirsch theoretical model. Later, Bakare et al. [5]. Silva et al. [7] investigated the tensile properties of the sisal fiber for the different fiber gauge length. Herrera-Franco and Valadez-Gonzalez [8] accomplished that the stress distribution between the fibers and matrix for a short discontinuous fiber were better than the continuous fibers. Igor et al. [9] investigated the significance of phormium (flax fiber)/Isopathalic laminated composite with short fiber and long fiber. Various chemical compositions of the fibers were compared with the other natural fibers. Jayabal and Natarajan [10] analyzed the tensile, flexural and impact properties of the non woven coir fiber reinforced composites with various fiber lengths and fiber contents. Reinforcing materials generally survive maximum load and serve the desirable properties. The natural fiber composites can be very cost-effective material especially for building & construction industry (panels, false ceilings, partition boards etc.), packaging, automobile & railway coach interiors and storage.

2.0 Experiments

2.1 Material Selection

In this experiment, for fabricating the composite specimen coir fiber is used. The Raw core and kevlar fiber is collected form of woven from Erode District, Tamil Nadu, India.

2.1.1 Core Fabric

Core is a natural fiber of vegetable origin like linen, jute or hemp Core is a single fiber entity having an average length of 25-40 mm^2. De-seeded core is cleaned, spun, and woven into a fabric. Core is easily spun into yarn as the core fibers flatten, twist, and naturally link for

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spinning. It is used to make clothes and other products, like towels, **carpets.** Every part of the core plant can be used. The long core **fibers** are used to make **cloth**, the short fibers can be used in the paper industry. Woven fabric is a textile formed by weaving. It is twisted on a loom, and made of many threads woven on a warp. Woven cloth only stretch diagonally on the bias directions. The major end uses for core fiber including wearing apparel, home utensils and other industrial uses (such as medical supplies).There are also possibilities of using waste fiber as fillers in cement, latex and other industrial adhesives.

2.1.2 Kevlar fabric

Kevlar is both a partially artificial fabric, formerly called kevlar rayon, or rayon and a solution of cellulose. The latter is produced by treating dissolving pulp with aqueous sodium hydroxide and carbon disulfide which is used to spin the kevlar rayon. Kevlar rayon fiber is a soft fiber
Commonly used in dresses, linings, shirts, shorts, coats, jackets, and other outerwear. It is also used in industrial yarns (tyre cord).

2.1.3 Isopathalic resin

Commercially available Isopathalic LY556 resin is used for the investigation. The HY951 hardener is used to cure the resin. The Isopathalic resin is one of the economical resins when compare to other resins due to its very low water absorbing capability and excellent bonding tendency as well as mechanical properties.

Fig 1.1. Isopathalic resin and hardener

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3.0 Manufacturing Processes

3.1.1 Die Preparation

A simple die is made; 200mm×200mm rectangular in shape is taken. It is prepared according to ASTM D 638 for tensile testing.

Fig 1.2. Die Preparation

3.1.2 Compression molding

Compression molding is a method of molding in which the molding material, generally preheated with 110°C, is first placed in an open, heated mold cavity The mold is closed with a top force or plug member, pressure of 30 bar applied to force the material into contact with all mold areas, while heat and pressure are maintained until the molding material has cured.

Fig 1.3 Compression moulding process

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4.0 Analysis

4.1.1 Tensile test

Specimens of the composites were prepared according to the ASTM D 638 standards. The specimens were machined to a standard size of 12.77mmX10.88mm.The specimens were tested using universal tensile testing machine.

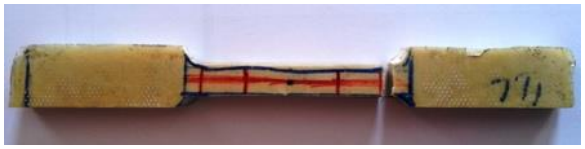

Fig1.4 preparation of tensile test specimen

4.1.4 Flexural test

Flexural test also known as bending test, it provides values for modulus of elasticity in bending, flexural stress-strain response of the material. Advantage of three point bending test is ease of specimen preparation and testing. Specimen 11X25mm at 180˚ angle is prepared and tested according to ASTM D 790 standard.

Fig 1.5. Bending test specimen

4.1.5 Impact test

Izod impact testing is an ASTM standard method of determining the impact resistance of materials 10X10mm and length of 55mm prepared.A V notch cut in the specimen. Impact tests are used in determining toughness of material and it is a factor of ability to absorb energy during plastic deformation

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Fig 1.6 Specimens of izod impact test

5.0 Results and Discussion

The present work has been undertaken, with an objective to explore the potential of the core fiber powder fabric polymer composites and to study the mechanical properties of composite. The tensile strength of the specimen with different weight ratio is Isopathalic resin showed 16.30 KN, 50% of Core fiber powder woven material. The average bending strength of specimen was 4 KN; the izod impact test of specimen was 7 Joules.

6.0 Conclusion

Surface roughness, microstructure of Core fiber powder fabric going to be compared with combination of Coir-core fabrics with addsion of water absorbsion test, Parameter variation on cutting the materials for Surface roughness measure.

References

[1] Bibo GA, Hogg PJ, Kemp M. Mechanical characterization of glass and carbon fiber reinforced composites made with non-crimp fabrics. Composite Science and Technology 1997; 57:1221–41.
[2] Bledzki AK, Gassan J. Composites reinforced with cellulose based fibers. Progress in Polymer Science 1993; 24(2):221–74.
[3] Godwin EW, Matthews FL. Review of the strength of joints in fiber-reinforced plastics: part 1 mechanically fastened joints. Composites 1980; 11(3):155–60.
[4] Casaurang M, Herrera P, Gonzalez I, Aguilar VM. Physical and mechanical properties of henequen fibers. Journal of Applied Polymer Science 1991; 43:749–56.
[5] Joseph K, Thomas S. Dynamic mechanical properties of short sisal fiber reinforced low density polyethylene composites. Journal of Reinforced Plastics and Composites 1993;12(2):139–55.

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[6] Pothana Laly A, Oommenb Zachariah, Thomas S. Dynamic mechanical analysis of core fiber reinforced Isopathalic composites. Composites Science and Technology 2003; 63(2):283–93.
[7] Silva Flavio de Andrade, Chawla Nikhilesh, Filho Ramildo Dias de Toledo. Tensile behavior of high performance natural (sisal) fibers. Compos Sci Technol 2008; 68:3438–43.
[8] Short natural-fiber reinforced composites. Composites: Part B 2005; 36:597–608.
[9] Bos HL, Van den oever MJA, Peters OCJJ. Tensile and compressive properties of flax fibres for natural fibre reinforced composites. J Mater Sci 2002; 37:1683–92.
[10] Kuruvilla Joseph, Romildo Dias Toledo, Beena James, Sabu Thomas, Laur Hecker de Carvalho. A review on sisal fiber reinforced polymer composites. Rev Brasi Eng Agricola Ambiental 1999; 3(3):367–79.