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Studieson Mechanical Behavior of Jute Cotton Reinforced in Brahma Resin

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Abstract
Fiber-reinforced polymer composites have played a dominant role for a long time in avariety of applications for their high specific strength and modulus. In this connection, an investigation has been carried out to make use of cotton fiber and Jute fiber , a natural fiber abundantly available in India. Natural fibers are not only strong and lightweight but also relatively very cheap. The present experimental study aims at learning the mechanical behavior of natural fiber composites. Samples of cotton fiber and jute fiber composition and the weight fraction of fiber and matrix was kept at 40%-60%. Specimens were cut from the fabricated according to the ASTM standards for different experiments For Tensile, flexural, compression, impact and hardness test. After that experiment is performed under Universal testing machine (UTM).

From the results it was found that, the mechanical properties of parallel orientation of both cotton and jute fiber is more compared to the cross orientation of both fiber.

Keywords:Reinforcement. Orientations of fiber, etc

1. Introduction

Over the last thirty years composite materials, plastics and ceramics have been the dominant emerging materials. The volume and number of applications of composite materials have grown steadily, penetrating and conquering new markets. Composites have already proven their worth as weight-saving materials; the current challenge is to make them cost effective. the present research work has been undertaken, with an objectives to explore the potential of banana fiber and sugarcane powder as a reinforcing material in natural composites and to investigate its effect on the mechanical behavior of the resulting composites. The present work thus aims to develop this new class of natural fiber based natural composites with different fiber percentage composition also its orientation and to analyze their mechanical behavior by experimentation.J.Santhosh, et. a author has studied natural fiber composites are nowadays being used in various engineering applications to increase the strength and to optimise the weight and the cost of the product. Various natural fibers such as coir, sisal, jute, coir and banana are used as reinforcement materials. In this paper both treated and untreated banana fiber are taken for the development of the hybrid composite material. The untreated banana fiber is treated by sodium hydroxide to increase the wettability. The untreated banana fiber and sodium hydroxide treated banana fiber are used as reinforcing material for both Epoxy resin matrix and Vinyl ester resin matrix.[2]. Der FakultätMaschinenwesen author discussed objective of the investigation is to improve the performance of jute/polypropylene and jute/epoxy composites. The effect of the matrix or fiber surface treatment on the composites performance depends on the type of matrix. For a non-polar polymer matrix, the adhesion occurs through van der Waals interaction only, therefore, a matrix modification is necessary to improve the adhesion strength [8]

2. Materials and experimental work:

The materials which have been used in the present work are shown below. Composites were prepared for two material combinations

Resin -: According to desired properties as mentioned we choose resin which is manmade and abstracted from natural resources. It is invented by Mr. Makarand Kale. It is extracted from ingredients such as wheat, bajra and so on.

Cotton Fiber:-Cotton is a natural fiber that comes from the seedpod of the cotton plant and is usedto make many fabric

types at every price point. The fiber is hollow in the center and,under the microscope, resembles a twisted ribbon.
Cotton fiber has been cultivated for 7,000 years, and it seems to increase in popularityas modern technology blends it with other fibers and gives it special performancefinishes.

Jute Fiber :Jute fiber has not only unique composite microstructure, but also longer continuous length. The jute fiber has low cost, high specific modulus, high impact resistance, good heat and electricity insulation, reusable and recyclable behavior of used products and wastes.The count of twisting jute fiber has more influence on its strength than modulus of its composites. The longitudinal tensile strength of unidirectional twisting jute fiber lamina higher than jute fabrics reinforced composites. That means that twisting jute fiber composite is of more design flexibility and property directionality. The jute fiber possesses natural degradability so that it can be used ideal reinforcement for degradable green composite materials. Therefore, it can be of industrial usable potential.

2.1. Specimen preparation:

The composites which are prepared initially were marked for required dimensions and The cut edges of composites were then rubbed against emery paper in order to bring them to the exact size. Different test requires specimens of different dimensions. The specimens were prepared according to ASTM standards.

The test specimen along with specimen dimensionand standards for different tests are discussed below.

2.1.1. Tensile Test Specimens

Tensile test specimens were prepared according to ASTM D3036 standard. The pictorial view of specimen is shown in Fig.2.1 below. The specimen used is a rectangular bar of length 220mm, width 25mm and thickness 6mm.

Fig 2.1 Tensile test specimen

2.1.2. Compression Test Specimens

Compression test specimens were prepared according to ASTM D695 standard. The photographic view of specimen is shown in Fig.2.2 below. The specimen used is a rectangular bar of length 25.4mm, width 12.7mm and thickness 12.7mm.

Fig2.2Compression test specimen

2.1.3. Flexural Test Specimens

Flexural test specimens were prepared according to ASTM D790 standard. The photographic view ofspecimen is shown in Fig. 2.3 below. The specimen used is a rectangular bar of 130mm length, 25mm width and 6.5mm thickness.

Fig 2.3 Flexural test specimen

2.1.4. Impact Test Specimens

Impact test specimens were prepared according to ASTM D256 standard. The photographic view of specimen is shown in fig.2.4 below. The specimen used is a rectangular bar of 63.5mm length, 12.7mm width and 12.7mm thickness

Fig2.4 Impact Specimen

2.1.5. Hardness Test Specimens

Hardness test specimens were prepared. The photographic view of specimen is as shown in fig.2.5The specimen used is a rectangular thickness.

Fig2.5 Hardness test specimen

3. RESULT AND DISCUSSIONS

3.1. Tensile test :

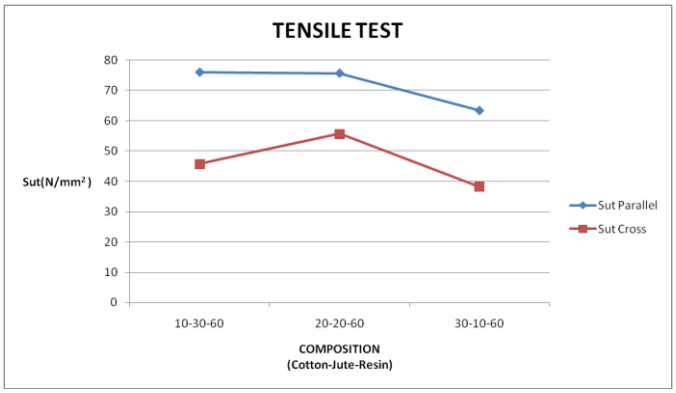

Fig 3.1 Tensile test results

This is a graph of composition(%) versus ultimate stress (N/mm2) with respect to orientation of fiber. According to this graph the tensile strength of the parallel orientation fiber is more than the cross orientation fiber. The tensile strength of the cotton fiber is less than jute fiber. For first composition the percentage of jute is more therefore the tensile strength of the component is more and for third composition the percentage of the jute is less so the tensile strength is less.

3.2. Compression Test:

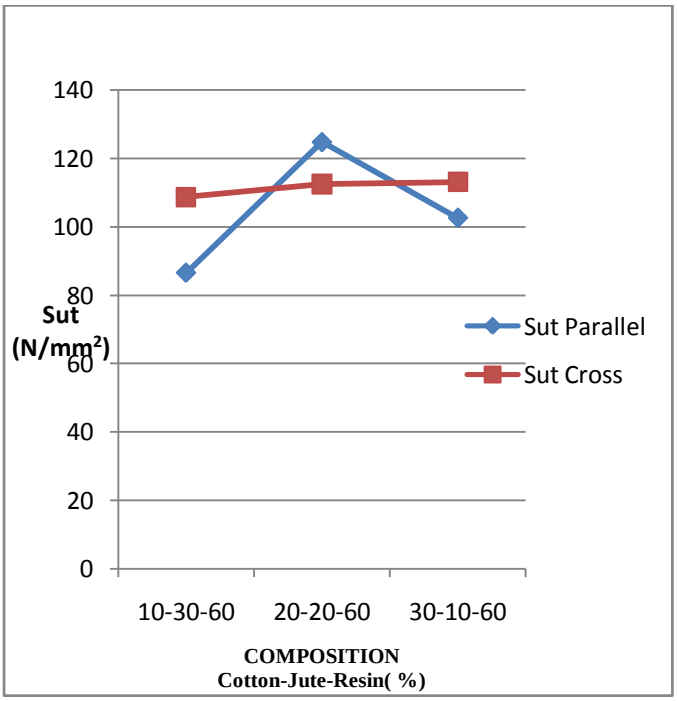

Fig 3.2 Compression test results

This is a graph of composition(%) versus ultimate stress (N/mm2) with respect to orientation of fiber. According to this graph the compressive strength of the parallel orientation fiber is less than the cross orientation fiber. The compressive strength of the cotton fiber is less than jute fiber. For first composition the percentage of jute is more therefore the tensile strength of the component is more and for third composition the percentage of the jute is less so the tensile strength is less

3.3. Flexural test:

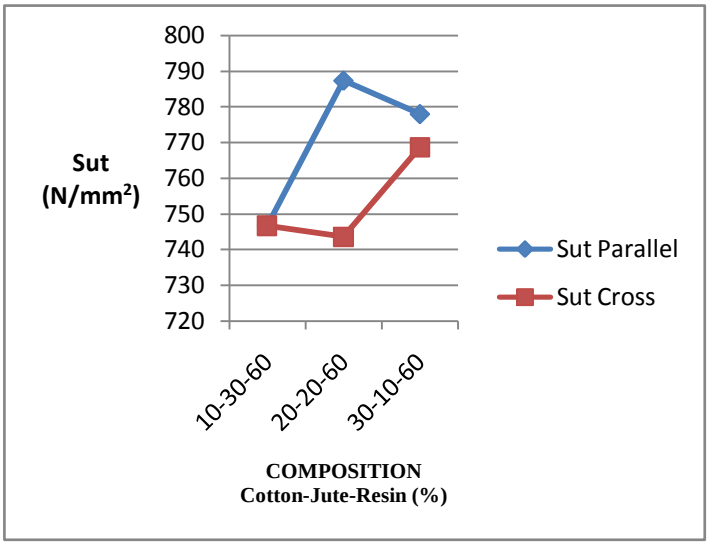

Fig. 3.3 Flexural test results

This is a graph of composition(%) versus ultimate stress (N/mm2) with respect to orientation of fiber. According to this graph the flexural strength of the parallel orientation fiber is less than the cross orientation fiber, along with composition 20%C+20%J+60%R gives higher strength

3.4.Hardness test:

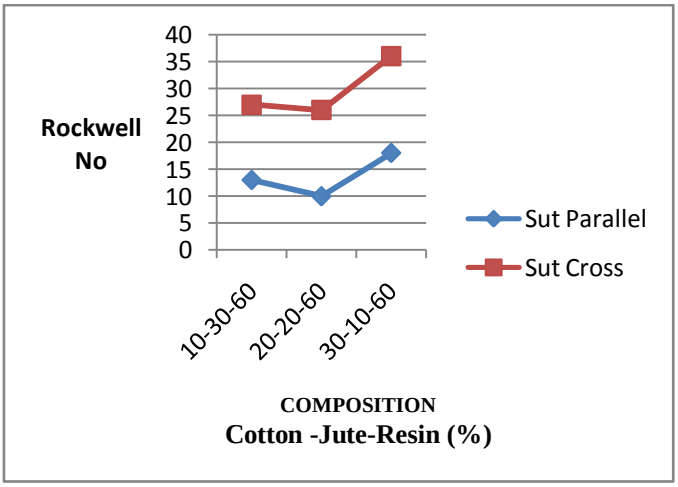

Fig 3.4 Hardness test results

This is a graph of composition(%) versus Rockwell no. with respect to orientation of fiber. According to this graph the hardness strength of the parallelorientation fiber is less than

the cross orientation fiber, along with composition 30%C+10%J+60%R gives higher hardness.

3.5. Impact Test.

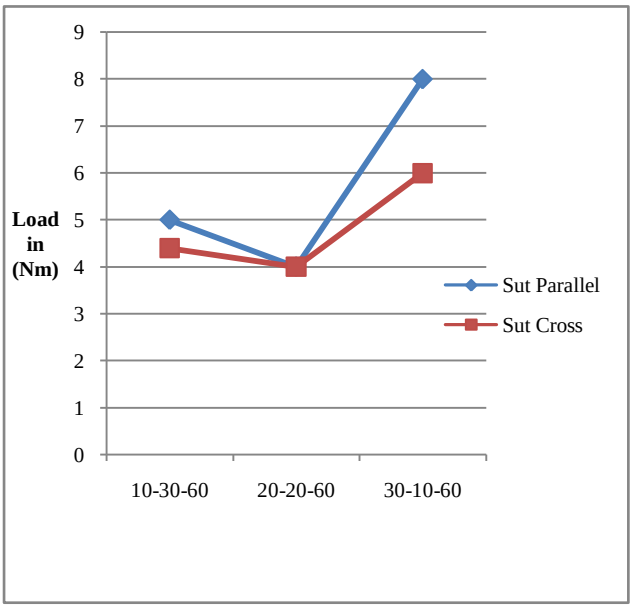

Fig3.5 Impact test results

This is a graph of composition(%) versus load (Nm) with respect to orientation of fiber. According to this graph the impact strength of the parallel orientation fiber is less than the cross orientation fiber, along with composition 30%C+10%J+60%R gives higher impact strength.

4. Conclusions

1. The tensile strength of the parallel orientation fiber is more than the cross orientation fiber. The tensile strength of the cotton fiber is less than jute fiber

2. The compressive strength of the parallel orientation fiber is less than the cross orientation fiber. The compressive strength of the cotton fiber is less than jute fiber.

3. The flexural strength of the parallel orientation fiber is less than the cross orientation fiber, along with composition 20%C+20%J+60%R gives higher strength.

4. The hardness strength of the parallel orientation fiber is less than the cross orientation fiber, along with composition 30%C+10%J+60%R gives higher hardness.

5. The impact strength of the parallel orientation fiber is less than the cross orientation fiber, along with composition 30%C+10%J+60%R gives higher impact strength.

Future scope

In future, composites will be manufactured even more according to an integrated design process resulting in the optimum construction according to parameters such as shape, mass, strength, stiffness, durability, costs, etc. Newly developed design tools must be able to instantaneously show customers the influence of a design change on each one of these parameters.

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