Mechanical Behavior of Human Hair and Coir Fiber Reinforced Hybrid Composites

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Abstract- *In this project by using a natural fibers of coconut and hair fiber are combined in the same matrix (unsaturated polyester) to make coconut/hair fiber hybrid composites. The Tensile, Flexural, Impact strength and Thermo gravimetric analysis properties of hybrid reinforced composite were described as per ASTM standards. Fabricate the hybrid polyester composite with varying aspect ratio of fibers and Volume fraction (20%, 30% and 40%). The fibers were kept under alkali treatment to improve the mechanical properties of the fiber significantly as compared to untreated fibers. The fibers were extracted from coconut and hair fiber by manual processes and fabrication processes were done by Hand layup method. In this work, water absorption pattern of these fabricated composite at room temperature was to found and also the characterization of fibers are analysed by Scanning Electron Microscope (SEM). Compare the mechanical properties and thermal properties of hybrid reinforced composite with plastics materials, wood and other natural fibers etc.*

I. INTRODUCTION

Fiber reinforced polymeric composites have been used for a variety of structural applications because of their high specific strength and modulus compared to metals. Initially developed for the aerospace industry, high-performance or 'advanced' composites are now found in applications from automotive parts to circuit boards, and from building materials to specialty sporting goods. Most composites currently available on the market are designed with long-term durability in mind and are made using non degradable polymeric resins, such as epoxies and polyurethane, and high-strength fibers, such as graphite, aramids, and glass. Many of these polymers and fibers are derived from petroleum, a non-replenish able commodity. The push now is to use composites in place of common plastics in consumer products to improve performance and reduce weight and cost. With increasing numbers of applications and mass volume uses, in particular, recording double-digit growth worldwide, disposal of composites after their intended life is already becoming critical, as well as expensive. Because composites are made using two dissimilar materials, they cannot be easily recycled or reused. Most composites end up in landfills, while some are incinerated after use, although there are some efforts to recycle and/or reuse them. Both these disposal alternatives are expensive and wasteful, and may contribute to pollution. With growing environmental awareness, this search has particularly focused on eco-friendly materials, with terms such as renewable, sustainable and triggered biodegradable becoming buzzwords.

II. METHODOLOGY

Analyzed fabricate a suitable alternative material for wood products and plastic products which is economically available alternative and should be easy to fabricate.

In this chapter,. Sisal and banana fibers were extracted and washed with distilled water at room temperature to remove dirt. Afterwards fibers were dried for 2 hr under room temperature.Pre dried fibers were soaked in 6% sodium hydroxide solution at room temperature for 2 hr. After treatment, fibers were washed with water to remove any traces of alkali on the fiber surface. The treated fibers were then dried for 2hr under room temperature by using hand layup process

Hand layup process

The hand lay-up technique is the oldest, simplest and most commonly used method for the manufacture of both small and large reinforced products. It is used in applications where production volume is low and other forms of production would be Initially the percentages of resin, fibers, accelerator and catalyst are determined for optimum weight percentages so that strength of the composite is notable and worthy here we found that those percentages are 60% resin, 2% accelerator, 8% catalyst, and 30% of Sisal and banana fibers in equal proportions, first the chopped fibers as per the Aspect ratio is laid over the acrylic sheet where a ASTM rubber of 10mm thickness is placed over the sheet cut down to desired dimensions after laying of fibers are over, another sheet is placed over the rubber and the sides are sealed to protect any leakages using tape then clips are used to hold the sheets

together at a definite pressure once these things are over the resin mixed with the above said % of components has to be poured between the space of two plates and after a curing time of about 5 to 7 hours the composite can be obtained.molding thermosetting resins (polyesters and epoxies) in association with fibers.

Fabricated specimen

Properties of polyester resin

Property	Polyester Resin
Appearance	Pale yellow color
Viscosity(cps)	650
Density(gms/cc)	1.15
Elongation at break (%)	4.8
Tensile strength(MPa)	41
Young"s modulus(MPa)	968
Flexural strength(MPa)	61
Flexural Modulus(MPa)	2461

Mechanical property testing

The following mechanical properties of the Natural fiber hybrid composite materials reinforced with Banana and sisal for different volume of fraction 20-70, 30-70 & 40-60.

1. Tensile Strength
2. Flexural Strength
3. Impact Strength

Tensile test

Tensile test will be carried out by applying tensile load. Tensile test will carried out by using universal testing machine. The specimen size is 165mm*12.7 mm*4mm as per ASTM D 638 (Test method for tensile properties of polymer matrix) were fabricated

Flexural test

Flexural test will carried with the three point load of two side supported and load acting on the centre of the specimen. By continuously increasing the load acting on the specimen calculate the deformation of the different volume of fraction. According to ASTM D790 standard 127mm*12.7mm*4mm of the specimen were made by hand layup method

Impact test

Impact test shall be to carried out for different volume of fraction. According to ASTM D256 standards of 65mm*12.7mm*3 mm impact test specimen were fabricated by hand layup method.

Sem analysis test

A scanning electron Microscope is the instrument used to perform scanning electron microscopy also known as SEM analysis or SEM Microscopy. The SEM uses a focused beam of high energy to generate a variety of signals at the surface of solid specimens. Scanning electron microscopy is performed at high resolution image and precisely measures very small features and objects. The signal generated during analysis produce a two dimensional image and reveal information about the sample including external morphology. The scanning electron microscope (SEM) enables the investigation of specimens with a resolution down to the nanometre scale. Here an electron beam is generated by an electron cathode and the electromagnetic lenses of the column and finally swept across the surface of a sample. The path of the beam describes a raster which is correlated to a raster of gray level pixels on a screen. As a consequence the magnification is simply computed by the ratio of the image width of the output medium divided by the field width of the scanned area

III. CONCLUSION

The aim of this project is to fabricate a suitable alternative material for wood products and plastic products which is economically available alternative and should be easy to fabricate. The polymeric composite materials reinforced with natural fiber are being used as wood substitute. The natural composite materials are very less in weight compare to other materials like wood, plastics etc. In this project, natural fiber composite materials are fabricated by using polyester resin with different volume fraction of (20%, 30% and 40%) for both treated and untreated fibers.

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