International Journal of Engineering Technologies and Management Research
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MECHANICAL BEHAVIORS OF BANANA AND SISAL HYBRID COMPOSITES REINFORCED USING OF VARIOUS PARAMETER

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Abstract:
To develop and commercialize materials containing vegetal fibers has grown in order to reduce environmental impact. Large amounts of lignocellulosic materials are generated around the world from several human activities and some process. Development of the Polymer Composites with natural fibers and fillers such as a sustainable alternative material for some applications, particularly in aerospace applications and automobile applications are being investigated. Natural fiber composites such as sisal, jute, hemp and coir polymer composites appear more attractive due to their higher specific strength, lightweight and biodegradability and low cost.

Keywords:
Banana, composites, sisal, resin.

Cite This Article: Hemant Patel, Prof. Ashish Parkhe, and Dr P.K. Shrama, "MECHANICAL BEHAVIORS OF BANANA AND SISAL HYBRID COMPOSITES REINFORCED USING OF VARIOUS PARAMETER" *International Journal of Engineering Technologies and Management Research*, Vol. 3, No. 1(2016): 1-4.

1. INTRODUCTION

In this study, sisal, glass and Sic fiber reinforced epoxy composites are prepared and their mechanical properties such as tensile strength and impact strength are evaluated. Natural fibers show superior mechanical properties such as stiffness, flexibility and modulus compared to glass fibers. Some of the natural fibers are sisal, Jute, hemp, coir, bamboo. The main advantages of natural fibers are of low cost, easy production and friendly to environment .Composite materials are intended to combine desired characteristics of two or more distinct materials.

There has been a dramatic increase in the utilization of natural fibers, for example, fiber extraction from sisal, jute, coir, flax, hemp, pineapple and banana for making another environment agreeable and biodegradable composite material. A pack of fibers are mounted or braced on a stick to encourage isolation. Every fiber is divided as per fiber sizes and assembled appropriately. To bunch the fiber, each fiber is separated and knotted to the end of an alternate fiber manually. The partition and knotting is repeated until bundles of unknotted fibers are finished to structure a long persistent strand.

2. PROCESS

The processes are repeated till six layers of glass fiber and five layers of sisal fiber got over. The epoxy resin applied is distributed to the entire surface by means of a roller. The air gaps are formed between the layers during the processing were gently squeezed out. The processed wet composite were then pressed hard and the excess resin is removed and dried. Finally these specimens were hydraulic pressed to force the air present in between the fibers and resin, and then kept for several hours to get the perfect samples. After the composite material dried completely, the composite material was taken out from the hydraulic press and rough edges were neatly cut and removed as per the required ASTM standards. Two types of composites were prepared one is with addition of silicon carbide filler (3, 6, 9 wt. %) and another one is without addition of silicon carbide filler.

3. FIBER ATTRIBUTES AFFECTING POLYMER COMPOSITE PROPERTIES

Large sources are cotton, Flax, jute, sisal, and by products from the cultivation of corn, wheat, rice, sugarcane, pineapple, banana and coconut. The dimensions of unit cells in a Fiber determine the structure and also influence the Fiber properties are affecting consequently the polymeric composite properties. The amount of each element as well as morphology and properties of Fibers are dependent on the plant species, crop production, place of extraction, plant age, plant part chosen and soil conditions. Variables are represent one of the prominent barriers Lignocellulosic. Fibers are characterized by their cellular structures composed by cells that contains crystalline (highly ordered) and amorphous (disordered) regions interconnected through lignin and hemicellulose Fragments.

4. LIGNOCELLULOSIC FIBERS/THERMOSET MATRICES COMPOSITES

The main thermoset resins are used in the production of composite materials are unsaturated polyesters, derived esters, phenolic, amino, epoxy and furans. The physical and mechanical properties of thermoset resins commonly used. The unsaturated polyesters present a wide range of properties and, consequently applications. This material has as advantages, compared with other resins, the ability to cure at room temperature, good mechanical properties and transparency, besides being produced on a large scale. The use of natural fibers as reinforcement for unsaturated polyester has been widely reported in studies involving the sisal, jute, flax, coconut, banana, pineapple, hemp, curaua and sugarcane bagasse fibers. Epoxy resins used for composites have high mechanical strength and environmental degradation resistance and are commonly used in the aerospace and naval industries. Epoxy resin reinforced with natural fibers is widespread in works involving sisal, jute, flax, coconut, banana, pineapple, cotton and hemp fibers.

5. MATERIALS AND METHODS

Fibers

The spesia lampas and Hibiscus cannabinus plants stems are collected from the trees in wet condition are soaked in water and washed totally with distilled water to remove scaling substance and finally dried in sunlight to get clean fine fibers. By retting process thin fibers can be extracted from green and wet condition of the stem for better mechanical properties.

Fiber Surface Treatment

The quality of a fiber reinforced composite depends on fiber-matrix interface because of this acts as a binder and transfers stress between the matrix and fibers. Bonding between fibers and binder can be increased by chemical treatment of fibers using chemical agent like sodium hydroxide (NaOH). Water by volume is added with 2% of NaOH for treatment process. Fibers are soaked in the alkaline solution for 24 hours, then washed thoroughly with distilled water and dried for 24 hours to remove residues of alkali. Bonding property can be improved by wetting of fibers with the matrix. Chemical treatment of fibers is necessary to improve mechanical properties and bonding between fiber and matrix.

Preparation of Hybrid Composite

The fabrication of two composite materials is carried out through the hand lay-up technique. Fiber of required dimension is placed on the surface of above prepared mixture. The mixture of resin, accelerator and catalyst are added proportionally by mixing thoroughly and laid upon the mat. Rollers are used to remove entrapped air and uniform distribution of resin on the fiber. The resin is mixed with suitable proportions of accelerator, promoter and catalyst. The resin-impregnated fiber is laid on the prepared mold to a desired thickness and pressed with hand roller to eliminate any entrapped air bubbles and extra resin there after dried properly.

6. TESTING OF COMPOSITE

Flexural Test

Inclusion of natural fibers in composites increases ability to withstand bending and flexural strength. Flexural strength is the maximum stress in outer specimen at the moment of break. When the homogeneous elastic material is tested with three-point system, the maximum stress are occurs at the midpoint. The dimensions and thickness of specimen were measured and recorded.

Flexural Modulus Test

Flexural Modulus is measured of stiffness during the starting of bending process. Modulus of tangent is the ratio within the elastic limit of stress to corresponding strain.

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ISSN: 2454-1907
Impact Factor: 1.745 (I2OR)

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