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ANALYSIS OF COMPOSITE MATERIAL FORMED BY SUGARCANE BAGASSE AND EPOXY RESIN

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Abstract: In this study, work has been carried out to investigate tensile, hardness and impact properties of composite of material constitutes sugarcane bagasse powder and epoxy resin. These composite are adhered using epoxy resin HY951 resin and LY551 hardener suitably mixed in appropriate volume. Hybrid composites were prepared using sugarcane bagasse powder, while overall powder weight fraction was fixed as 20gram. Here for preparing samples Hand layup method is used, specimens are prepared. This constitute have good tensile & bending strength & their density. These composites can be used in various purposes because of its unique features of waste utilization, environment friendly, bio-degradability, good strength and a good alternative to plastics.

Keywords **– Sugarcane bagasse powder, epoxy resin-HY951, Hardener-LY551.**

1. INTRODUCTION

Requirement for economical and environment-friendly materials has extended an interest in natural fibers. Most of the fibre, like softwood pulp and banana fibers are used as reinforcement materials in cement composite merchandise. During this work, natural sugar cane pulp are used for similar study. Pulp may be a fibrous residue obtained from sugar cane throughout extraction of sugar juice

2. LITERATURE REVIEW

TITLE: Characterisation of Natural Fibres (Sugarcane Bagasse) in Cement Composites
AUTHOR: M. J. Ghazali, C. H. Azhari, S. Abdullah & M. Z. Omar
DESCRIPTION: In this work, Malaysia's natural sugarcane bagasse fibre and Portland cement were used as precursors for composites, with styrene butadiene (SBR) latex as a binding agent. The matrix was Portland cement whilst the filler and reinforcement was bagasse fillers. Various compositions of SBR ratio; ranging between 3 - 18 %wt were prepared for evaluation. These samples were then evaluated for mechanical property measurement as well as morphology. It was found that the composites with 6 % of SBR content showed the highest stiffness. Composites with the highest stiffness .The aim of the present work is to study the influences of and elastic modulus value were then subjected to radiations between 10 - 70 kGy. The electron beam radiation technique at different doses was carried out in order to modify the microstructure of the bagasse/cement composites. It was noted that the elastic modulus was greatly improved by 26.5% with 30 kGy radiation dose. Analyses by the scanning electron microscopy on the microstructures of the irradiated composites indicated that the voids within the matrices were greatly reduced, which therefore increases the mechanical properties of the composites, as a whole, than those of unirradiated ones.

TITLE: Tensile, Flexual, Impact and Water Absorption Properties of Natural Fibre Reinforced Polyester Hybrid Composites
AUTHOR: R. Prasanna Venkatesh, K. Ramanathan, V. Srinivasa Raman
DESCRIPTION: In this paper, tensile, flexural, impact properties and water absorption tests were carried out using sisal/unsaturated polyester composite material. Initially the optimum fibre length and weight percentage are estimated. To improve the tensile, flexural and impact properties, sisal fibre was hybridized with bamboo fibre. This work shows that the addition of bamboo fibre in sisal/ unsaturated polyester composites of up to 50% by weight results in increasing the mechanical properties and decreasing the moisture absorption property. In this research work, the effects of fibre treatment and concentration on the mechanical properties of a short natural fibre reinforced polyester hybrid composite are investigated. The fibres were subjected to 10% sodium hydroxide solution treatment for 24 h. The mechanical properties of composites with treated fibres are compared with untreated fibre composites. The fractured surface of the treated fibre composite specimen was studied using Scanning Electron Microscopy (SEM).The treated hybrid composite was compared with an untreated hybrid composite, with the former showing a 30% increase in tensile strength, 27.4% - in flexural strength, and 36.9% - in impact strength, along with an extreme decrease in moisture absorption behaviour.

TITLE: Mechanical Behaviour of COIR/GLASS Fiber Reinforced EPOXY Based Composites
AUTHOR: MD. Zyaoul Haque1, Sikandar Yadav2, Sunil Kumar3, Sandeep4
DESCRIPTION: Fiber reinforced polymer composites has been used in a variety of application because of their many advantages such as relatively low cost of production, easy to fabricate and superior strength compare to neat polymer resins. Reinforcement in polymer is either synthetic or natural. Synthetic fiber such as glass, carbon etc. has high specific strength but their fields of application are limited due to higher cost of production. Recently there is an increase interest in natural fiber based composites due to their many advantages. In this connection an investigation has been carried out to make better utilization of coconut coir fiber for making value added products. The objective of the present research work is to study the physical and mechanical behaviour of coir/glass fiber reinforced epoxy based hybrid composites. The effect of fiber loading and length on mechanical properties like tensile strength, flexural strength, hardness of composites is studied. Also, the surface morphology of fractured surfaces after tensile testing is examined using scanning electron microscopy (SEM).

3. MATERIALS USED

- Sugarcane bagasse
- Epoxy resin (LY556)
- Hardener (HY951)

3.1 SUGARCANE BAGASSE

Fig.3.1. Sugarcane bagasse

Bagasse is that the dry nonwoody fibrous residue that is still when sugarcane or sorghum stalks area unit crushed to extract their juice. it's used as a biofuel for the assembly of warmth, energy, and electricity, and within the manufacture of pulp and building materials. for each ten tones of sugarcane crushed, a sugar mill produces nearly 3 tones of wet pulp. Since pulp may be a by-product of the cane sugar trade, the amount of production in every country is in line with the amount of sugarcane made.

The high wetness content of pulp, generally 40–50 %, is prejudicious to its use as a fuel. In general, pulp is keep before additional process. For electricity production, it's keep beneath wet conditions, and therefore the gentle energy-releasing method that results from the degradation of residual sugars dries the pulp pile slightly. For paper and pulp production, it's ordinarily keep wet so as to help in removal of the short pith fibers, that impede the paper creating method, similarly on take away any remaining sugar.
A typical analysis of washed and dried pulp may show.
• Cellulose 45–55 %
• Hemicellulose 20–25 %
• Lignin 18–24 %

• Ash 1–4 %
• Waxes <1 %

Bagasse may be a heterogeneous material containing around 30-40 % of "pith" fibre, that comes from the core of the plant and is especially parenchyma material, and "baste", "rind", or "stem" fibre, that makes up the balance and is basically derived from sclerenchyma material. These properties build pulp significantly problematic for paper manufacture and are the topic of an oversized body of literature.

3.2 Epoxy resin

Fig.3.2. Epoxy Resin & Hardener

Properties

- High adhesion to different materials.
- Odourless, tasteless, non-toxic and negligible shrinkage.
- Exhibits excellent mechanical, dynamic and thermal properties.
- It has an excellent chemical resistance especially to acids up to 80°C.

Aspect(visual)	clear ,pale yellow liquid	
Viscosity at 25°C	10000 -12000	[mPa s]
Density at 25°C	1.15 -1.20	[g/cm³]
Flash point	>200	[°C]

3.3 Hardener

A Chemical substance added to something in order to harden Hardener HY-951 is a yellowish-green colored liquid. Especially with paints, resins and varnishes. It has a low viscosity.

4. PROCEDURE FOR PREPARATION OF COMPOSITE

Let the sugarcane bagasse dry for two weeks in the sunlight**.** Then they will be collected and powder the sugarcane bagasse for using double mill flour machine. Now mixing the epoxy resin and the hardener for 15 minutes in the ratio of 10:2 respectively its volume. After this process to stirred the sugarcane bagasse powder in to the prepared epoxy resin and hardener mixture and pour the mold. The specimens are formed by using required dimension of molds in a hand layup process.

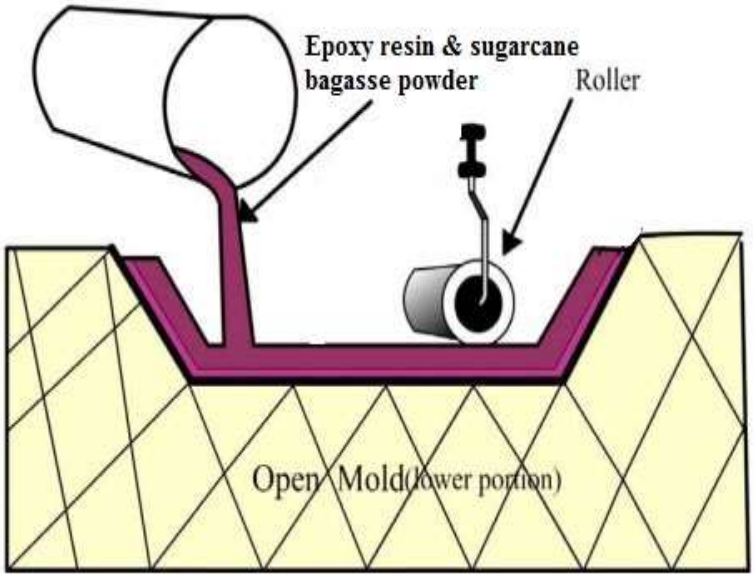


Fig.4.1. Hand layup process

5. TESTING OF COMPOSITES

Analyze the mechanical properties of specimens:

The following testing method is used to determine mechanical characteristics of the composite materials. They are,

- TENSILE TEST
- IMPACT TEST
- SHORE HARDNESS TEST

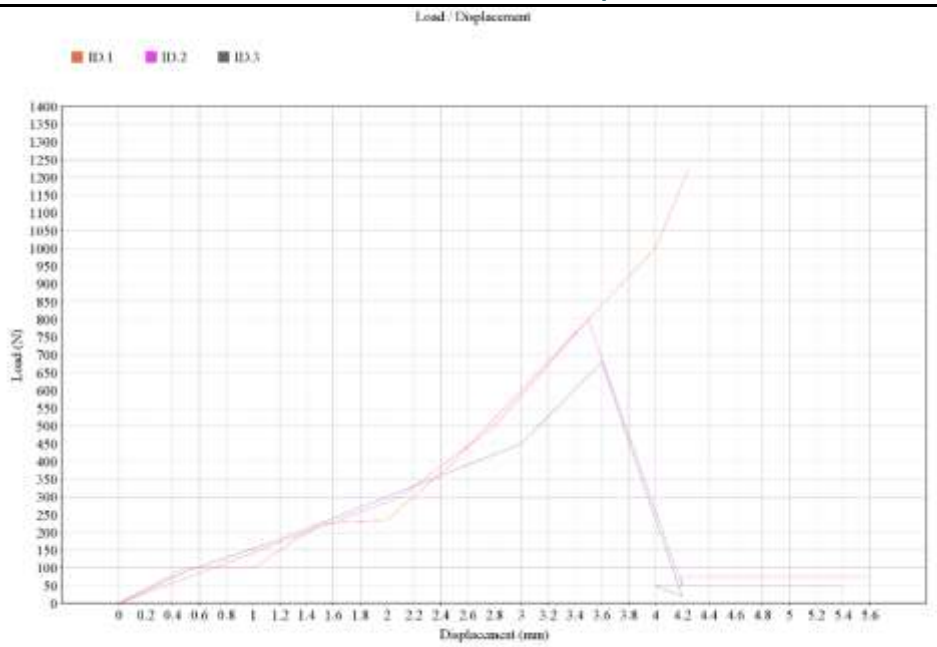
5.1 TENSILE TEST

The tensile test is conducted for to determine the ultimate tensile strength and yield strength of the specimens. It will be conducted by using the UTM (universal testing machine). The observed values of the three specimens are tabulated.

Table.5.1.Tensile Test

Parameter	**ID-1**	**ID-2**	**ID-3**
Ultimate tensile strength (N/mm²)	17.36	13.01	9.74
Yield strength **(**N/mm²**)**	5.51	3.02	2.16

Fig.5.1. Tensile Test Sample



5.2 IMPACT TEST

The Charpy impact take a look at, conjointly referred to as the Charpy V-notch take a look at, could be a standardized high strain-rate take a look at that determines the quantity of energy absorbed by a cloth throughout fracture. Absorbed energy could be a live of the material's notch toughness. it's wide employed in business, since it's simple to organize and conduct and results will be obtained quickly and cheaply. an obstacle is that some results square measure solely comparative.

Fig.5.2. Impact Test Sample

Sample ID	Observed value (J)
1	2
2	2
3	2

Table 5.2. Impact Test

5.3 SHORE HARDNESS TEST

SHORE D hardness tester is used for testing the hardness of hard rubber e.g. thermoplastic, plastic fleur, fibres, hard resins etc

Fig.5.3. Shore Hardness Tester

Sample ID	Observed value
1	75,75,74
2	76,75,78
3	80,77,76

Table.5.3. Hardness Test

6. CONCLUSION

The material selection and properties of sugarcane bagasse reinforced epoxy based hybrid composites has been obtained till now with the help of various journals. Reinforcement preparation and test results are yet to be obtained in future. The present work showed the usefulness of sugarcane bagasse fiber as reinforcement to other natural fiber material. The tensile hardness and compression tests of sugarcane bagasse fiber will be conducted using UTM machine. The composites may become less ductile as sugarcane content is increased. Further work must be done related to fiber surface treatment and residue elimination in recycled HDPE to improve mechanical properties.

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