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INVESTIGATION OF COIR FIBER REINFORCED EPOXY COMPOSITES

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Abstract

Polymer composites materials are those that don't seem to be degradable by naturally. These material can remain in earth for thousands of years. This leads to the accumulation of pollution to the environment. To address this problem, compound composites are packed with fibre, fillers and resins that are considered as natural sources arebio degradable. Among the assorted natural fibers, fibre fiber are targeted for its before and when pretreatment conditions to getting excellent fiber. In antecedent several researchers have founds varied fibers has been pretreated and that they get its properties and its applications. In this research, fiber is analyzed before and during pre-treating. The assorted pretreatment that appropriate for fiber are dispensed. Fiber is employed as reinforcement, Rice husk is employed as a filler materials and synthetic resin is employed as a matrix to fabricate composites by compression moulding ways and therefore the sensible board are fabricated. The fabricated sensible board are subjected to analyses by mechanical properties. The effects of pretreatment of fiber before and when pretreatment are determined and noted to study the investigation results. The obtained results are compared and therefore the best pretreatment are hand-picked on the idea of the properties of the fiber.

Keywords: **Coir fiber, Epoxy, natural composite**

1. INTRODUCTION

The rising concern towards environmental problems and, on the opposite hand, the requirement for a lot of versatile compound-based materials has semiconductor diode to increasing interest concerning polymer composites stuffed with natural organic fillers, i.e. fillers coming back from renewable sources and perishable. The composites, typically noted as ‘‘green’’, will realize many industrial applications. [1].The development of commercially viable “green products” supported natural resources for each matrices and reinforcements for a good vary of applications is on the increase. This effort includes new pathways to provide natural polymers with higher mechanical properties and thermal stability victimization engineering science and use of natural polymers to form perishable plastics and their composites with lignocellulose fibers [2] Fiber bolstered chemical compound composites are used for a spread of structural applications as a result of their high specific strength and modulus compared to metals. At first developed for the region business, superior or ‘advanced’ composites are currently found in applications from automotive components to circuit boards, and from building materials to specialty sports equipment. Most composites presently accessible on the market are designed with long sturdiness in mind and are created degradable compound resins, like epoxies and ployurethan and high-strength fibers, like Ceramics and glass. The composite was coagulated by the compressive load while not the binder, it did not have the high strength and was terribly brittle, and it had no water resistance. During this study, to enhance these defects, it had been planned that a perishable organic compound as an adhesive and bamboo fibers as bolstered fibers were applied to the woodchip composite. By exploitation wood chips with 2 sorts of the particle size, bamboo fibers with 3 sorts of the length and therefore the biodegradable adhesive, many sorts of specimens modified intermixture magnitude relation of these materials were created by compression molding at the acceptable temperature.[3,4] Recently, the human beings have accomplished that unless atmosphere is protected, he himself are vulnerable by the over consumption of resource likewise as substantial reduction of recent air created within the world. Conservation of forests and best utilization of agricultural and different renewable resources like star and wind energies, and recently, periodic event energy became necessary topics worldwide. In such concern, the utilization of renewable resources like plant and animal primarily based fibre-reinforce compound composites, has been changing into a crucial style criterion for coming up with and producing elements for all industrial product. Analysis on perishable compound composites, can contribute for green and safe environment to some extent [5]. Bamboo fibers recently attracted interest as a property reinforcement fibre in (polymer) composite materials, as a result of specific mechanical properties that are appreciate glass fibres. to attain smart wetting and adhesion of the bamboo fibre with totally different polymers, the fibre surface must be characterized [6-10].

2. PRETREATMENT OF FIBER

Chemical modification, therefore, is a noteworthy as a result of improve the properties of natural organic/polymer composites, although having a primary downside drawn by the prices that, particularly within the case of difficult techniques, will rise to such grade to form this methodology not appropriate for industrial applications. These, in fact, need faster and cheaper methodologies and it necessary to assure constant product quality. It’s so clear that chemical modification of fibers is unlikely to fulfil all of those needs. Additional solutions are therefore preferred to produce green composites with improved matrix- fiber interfacial adhesion and fiber dispersion and to reduce the formation of voids within the material (due to the hydrophilic nature of natural- organic fillers). At present, the popular resolution for industrial applications doesn't depend upon chemical modification of fibers, however rather on the addition of little amounts of a ‘‘third component’’ that, by its intrinsic chemical characteristics, might act as Associate in Nursing adhesion promoter between chemical compound matrix and plastic fillers, by forming chemical bonds (either valence, or Van der Waals kind) . Of course, the adhesion promoter molecule ought to contain a hydrophilic half, able to produce the bonds with the polar teams usually gift on plastic fibers, and a hydrophobic half, which may show higher affinity to the organic compound chains.

3. PRETREATMENT

- Acetylation
- Alkali treatment

Alkali Treatment

It is sometimes performed on short fibers, by heating at approx. 80 C in tenth NaOH aqueous solution for about 3.5 –4.5 h, washing and drying inventilated oven. It permits disrupting fiber clusters and getting smaller and higher quality fibers. It ought to conjointly improve fiber wetting. Alkali Pre-treatment process shown in fig 1. Untreated coir fiber shown in fig 2. & Alkali treated fiber shown in fig 3. Acetylation treated fiber shown in fig 4.

Fig.1 Alkali Pre-treatment process

Acetylation

The fibers are sometimes immersed in glacial carboxylic acid for one h, then immersed in a very mixture of anhydride and few drops of focused sulphuric acid for some min, then filtrated, washed and dried in oxygenated kitchen appliance. This is associate degree esterification methodology that ought to stabilize the cell walls, especially with regard to absorption of moisture and consequent variation of dimensions.

Before treatment

Fig. 2 Untreated coir fiber

After Alkali treatment

Fig. 3 Alkali treated fiber

After Acetylation treatment

Fig. 4 Acetylation treated fiber

4. FABRICATION PROCESS

These Composite materials is fabricated by compression moulding processes.

Mixing Ratio

The manufacturing of the specimen is based on the compression moulding process. In this process the coir fiber, rice huskers, epoxy resin and hardener are mixed in the Hooper and is then moulded at a constant load. Different Reinforced Epoxy Composites Particle Board shown in fig 5,6 & 7.

- Coir Fiber - 55%
- Rice Husk - 5%
- Resin - 25%
- Hardener - 15%

The mixing ratio is based on the composite weight percentage. Size of the practical board in 300x300mm and thickness is 3mm.

Fig. 5 Untreated Coir Fiber Reinforced Epoxy Composites Particle Board

Size of the practical board in 300x300mm and thickness is 3mm

Fig. 6 Alkali Treated Coir Fiber Reinforced Epoxy Composites Particle Board

Size of the practical board in 300x300mm and thickness is 3mm

Fig.7 Acetylation Treated Coir Fiber Reinforced Epoxy Composites Particle Board

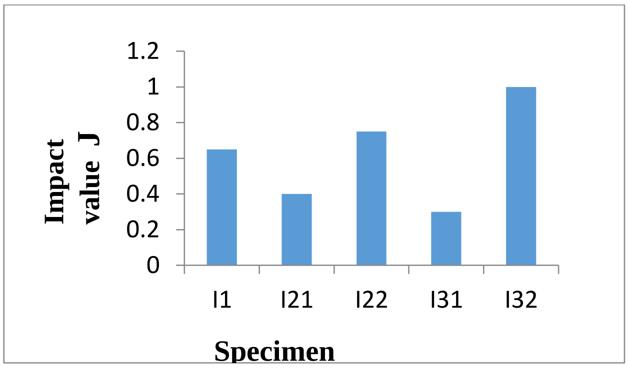

Fig.8 Impact Test Graph

5. RESULTS & DISCUSSION

Table 1. Izod Impact Test

S.NO	SPECIMEN	IMPACT READING J
1	I_1	0.65
2	I_{21}	0.40
3	I_{22}	0.75
4	I_{31}	0.30
5	I_{32}	1.00

From the got outcomes the examination of mechanical properties investigation report acetylene treated fiber having most extreme effect quality, load, strain, extension stress and furthermore having great authoritative of fiber and gum with less pollutions. So acetylene treatment is best decision for coir fiber. Izod Impact Test & Comparison Statement of Mechanical Properties shown in table 1&2.

CONCLUSION

Acetylation is beneficial in reducing the moisture absorption of natural fibers and also improving dimensional stability and environmental degradation. Less moisture content improve the mechanical properties of fiber and furthermore have greater holding among fiber and resin. So Acetylation is best pre-treatment process for coir fiber. And eventually it is evident that the material obtained from the compression moulding with coir fiber as a matrix element is the most suitable replacement in most of the modern equipment.

Table 2 Comparison Statement of Mechanical Properties

	Impact Reading	Maximum Load (N)	Maximum Displacement (mm)	Maximum Strain	Maximum Tensile Stress (N/mm^2)
Untreated fiber	0.65	853.21	2.5382	0.0508	21.88
Alkali treated fiber	0.75	627.65	8.1325	0.1626	16.09
Acetylene treated fiber	1.00	865.63	0.97	1.94	20.382

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