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A Review on Human Hair and Sisal Fiber Epoxy Based Reinforced Composites

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ABSTRACT

The current paper overviews the exploration work on the reinforced fiber composites that is sisal fiber and human hair. Fiber reinforced polymer composites is a most significant class of underlying material due to their various benefits in present just as future. Mechanical properties, for example, tensile and flexural are viewed as expanding with various layer structure design. Mechanical properties can be accomplished by utilizing treated fibers and appropriate technique. The chemically treated fibers in layers attain the less amount of moisture and have low thickness swelling. Natural fiber composites have good mechanical properties as well as less water absorption properties therefore they are slowly replacing synthetic fibers and are effective in reducing environmental impact caused by synthetic fibers.

Keywords: *Natural fibers, synthetic fibers, sisal, human hair*

INTRODUCTION

The utilization of natural fibers in composites is turning out to be progressively significant because of the great mechanical properties, accessibility, ecological agreeableness, and critical handling benefits. Natural fibers are lighter, more affordable, and inexhaustible just as earth friendly. However, the properties of natural fibers are impacted by ecological conditions they are filled in, extraction and handling strategies bringing about unusualness in their mechanical properties. For natural fiber to become a substitute for synthetic fiber such fluctuation must be measured so that viable expectation of the properties of fibers can be made. A few analysts in the past have directed studies on the tensile behavior conduct of sisal and other natural fibers.

Natural fibers are sustainable assets in many non-industrial nations of the world; they are less expensive, represent no wellbeing perils and, at long last, give an answer for natural contamination by tracking down new uses for squander materials. Besides, natural fiber reinforced polymer composites structure another class of materials which appear to have great potential in the future as a substitute for scant wood and wood based materials in underlying applications.

Sisal Fibers Characteristics Reinforced With Epoxy Resins

A group of scholar has reviewed about the utilization of sisal fiber as building up specialist in polymer based composites were investigated from perspectives of status and future assumptions for regular filaments as a rule, construction and properties of sisal fiber, fiber surface alterations, and physical and mechanical properties of sisal fiber based polymer composites. Sisal strands have great potential as fortifications in polymer

(thermoplastics, thermo sets and rubbers) composites. Because of the low thickness and high explicit properties of sisal strands, composites in light of these filaments might have generally excellent ramifications in the car and transportation industry. More finished, diminished gear scraped area and ensuing decrease of re-tooling costs will make these composites more appealing. The utilization of sisal strands as a wellspring of natural substance in plastic industry gives a sustainable asset, yet could likewise produce a non-food wellspring of monetary advancement for cultivating and provincial regions. Since Brazil is the one of the biggest sisal fiber creating nations on the planet, sisal fiber built up polymer composites and the resulting applications would be extremely alluring according to the monetary perspective. From the above depictions, it turned out to be very clear that more current composites utilizing bounteously accessible sisal strands are on the skyline, this acquires recent fads composite materials.

It is worth referencing that these composites can be utilized as a substitute for wood. Be that as it may, reasonable savvy plan and creation methods for production ought to be created. Sisal fiber polymer composites with and without hybridization ought to be created and portrayed in order to show up at a series of composites which might find use in a few regions, for example, marine, primary, buyer articles and industrials applications. Subsequently it very well may be presumed that with precise and tireless research there will be a decent extension and better future for sisal fiber - polymer composites before very long.(Kuruvilla Joseph1 , Romildo Dias Tolêdo Filho2 , Beena James3 , Sabu Thomas4 & Laura Hecker de Carvalho5. Revista Brasileira de Engenharia Agrícola e Ambiental, v.3, n.3, p.367-379, 1999 Campina Grande, PB, DEAg/UFPB).[1]

According to Iniya and Nirmalkar the substantial at the fiber content of more than 2% and a markdown in fiber content is commonly north of 30 to 50mm in fiber length. The fiber proportion is contrasted and the measurement size. Water assimilation is strong in regular filaments since it builds the strength of the physical and mechanical properties of high ductile and compressive strength. The paper is in this manner closed with improvement inside the quantity of strands being estimated by an abatement in mechanical properties of over 1.5%. The strength will be expanded by adding the strands in limited quantities.

- Acquaintance of regular sisal strands with an expansion in the flexural strength and crack strength of the substantial notwithstanding creations without regular filaments.
- The mechanical attributes of the sisal fiber dependent for the most part upon the assembling, condition just as size of the sisal fiber, which will decide the trademark properties, and furthermore on the normal boundaries, for example, the size of the fiber, the length of the measure, the strain rate also the climate of the review.
- On the contrary hand, there was higher pliability inside the cracking of the examples utilizing regular strands, at the end of the day, adding normal filaments to the substantial could all the more likely control the breaking of the substantial.
- After the entire worth of flexural strength had been reached at the tip of the exploration studies for goliath avoidances, the strands actually permitted the 2 areas of the examples to remains together. Under both elastic conditions, various breaking movement was noticed and stacks of

breaking. (Iniya, M.P 1*, Nirmal kumar. K 2. IVC RAISE 2020 IOP Publishing)[2,3]

Mechanical properties of sisal fibers were done in this work. The rigidity of sisal fibers were found to shift contrarily with the gage length. As the gage length builds, the ductile strength diminishes .The youngs modulus is free of the gage length and its worth acquired was around19 GPa. The changeability in strength was viewed as free of the gage length and was evaluated utilizing the Weibull modulus. The Weibull modulus got was comparative for all gage lengths also was around 2.5.(.Md. Masudur R Abir1, a, SM Kashif1, b and Md. Abdur Razzak1, c. Advanced Materials Research Vol 1115 (2015) pp 349-352)[7]

Human Hair Characteristics with Epoxy Resin

This experimental examination on mechanical properties for Human Hair Fiber Reinforced Epoxy Composites prompts the accompanying ends: It has been seen that the mechanical Properties of the composites like rigidity, flexural strength, sway strength are significantly Impacted by the 5% treated fiber. From the tractable test, it is found that the most extreme elasticity was 36.994 N/mm2 for 5% treated fiber and least were 14.392 N/mm2 for 10% treated fiber. The flexural test result shows that5% treated fiber has the most elevated flexural strength (28.048 Mpa) and Non treated fiber has the least flexural strength (11.185 Mpa).It is found from the effect test that, the impact strength of 5% treated fiber is the most elevated (0.7 J) and sway strength of the untreated fiber is the least (0.55 J).(Prof. P. Chokkalingam, M.E., K.J. Vengatesan, T. Prasanth International Conference on Emerging trends in Engineering, Science and Sustainable Technology (ICETSST-2017)[9,10].

In the above sample SEM testing was also been conducted and the results shows that in [Fig 1-3]. (K.J. Vengatesan1, T. Prasanth2, V.K.S. Swagath kumar3, K. Suresh4, Prof. P. Chokkalingam5 International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST) Vol.3, Special Issue.24, March 2017)[8]

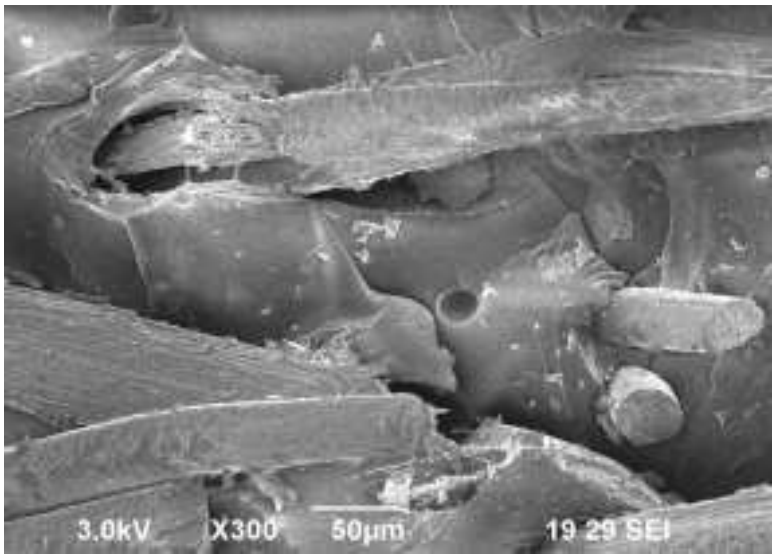

Fig.1:*SEM image for tensile test specimen with 5% treated*

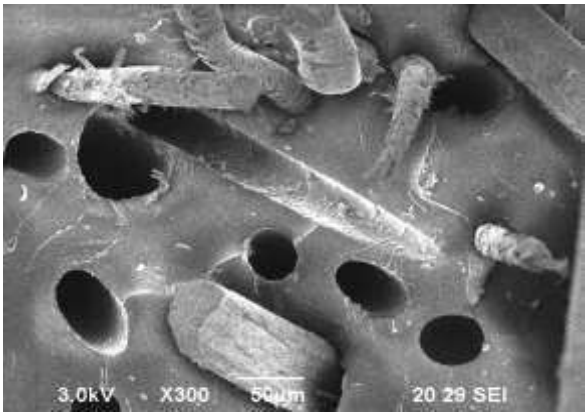

Fig.2: *SEM image for flexural test specimen with 5% treated*

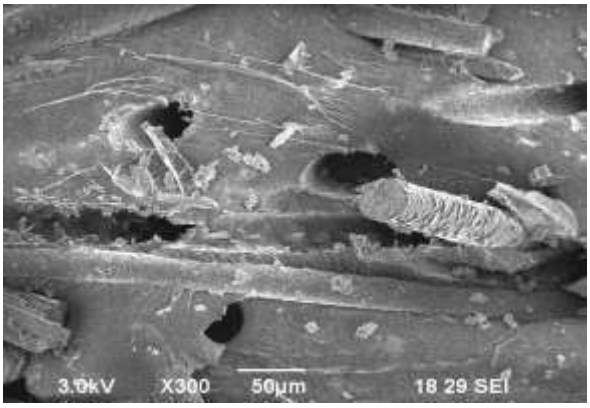

Fig.3: *SEM image for impact test specimen with 5% treated*

According to a review done by Mukhan Vati and Preeti Dhankar human hair is pertinent for different assembling processes and furthermore more exploration in required in the field of climate front projecting of different composites accepting the human hair as their main fiber. Till now none of the studies have investigated the human hair with different size/length in various surrounding conditions to comprehend the essential material science of this god gifted composite fiber. So investigation of this area can be utilized to take advantage of the human hair as a more skilled organic composite fiber in future. Human hair area give incredible examples to exhibiting the capability of mid-IR AIR imaging. Contrasted and unadulterated plastic example. Adding human hair fiber into plastic materials could increment elasticity, Impact strength since strands gives solidarity to built up composite. After a point, strength of composite beginnings diminishing on the grounds that connection point holding between fiber and sap continues diminishing as fiber weight rate expansion in composite.(IJARSE)[4-6]

RESEARCH ON SISAL FIBER AND HUMAN HAIR ON EPOXY BASED COMPOSITES

Mechanical Properties

As wide range of natural fibers are been infused together to find new composites that can reduced the cost of material and machining, on that path a new reinforced composite was also introduced using human hair and sisal fiber and epoxy resin as matrix. Prof. R. K. Bhoyar1, Roshan P. Kothe, Saurabh Gillarkar, Samir Chacherkar, Rishabh Barve, Pranay has discovered a very unique mechanical properties of the particular reinforced composites.

Samples	UTS(N/sq.mm)	Flexural load(kg)
Single layer(un treated)	12.64	31.3
Single layer (Treated)	19.44	48.1
Double layer (Un treated)	15.00	36.97
Single layer (treated)	16.69	52.45

Water Absorption Test

At different interval the absorption of water showed gradual increment. In this experiment it is concluded that the effect of moisture absorption and thickness swelling is higher in single layer (untreated) and double layer (untreated) composites.

Samples	Weight		% of weight gain		Thickness		Thickness Swelling	
	Initial	After-156hrs	Initial	After-156hrs	Initial	After-156hrs	Initial	After-156hrs
Single layer (Untreated)	12.521	18.387	0	5.574	0.490	0.5	0	2.40
Single layer (Treated)	13.027	13.861	0	6.402	0.506	0.515	0	1.77
Double layer (Untreated)	11.257	12.890	0	14.50	0.388	0.406	0	4.639
Double layer(Trearted)	14.493	16.021	0	10.54	0.696	0.715	0	2.72

CONCLUSION

The mechanical and water absorption characteristics of the human hair and sisal fiber based mostly on the manufacture, condition as well as size of the sisal fiber, which will determine the characteristic properties, and also on the natural parameters, such as the size of the fiber, the length of the gauge, the strain rate and the environment of the study.

Human hair and sisal fiber are applicable for various manufacturing processes and also more research in needed in the field of weather fore casting of various composites taking these two as their chief fiber. It is clear from this review that chemically processed or treated substances became future altered sisal fiber reinforced composites as a consequence of its strong mechanical structural materials, economic and ecological characteristics. Due to the relatively lesser costs of sisal fibers, inexpensive methods of processing can be formed for the composites. It is essential to analyze the interaction amongst mechanical properties and methods of manufacturing. So exploration of this area can be used to exploit the human hair and sisal fiber as a more competent composites using other matrix and more and more techniques can be utilized to find the exact composition of the composite that can be utilized for various applications.

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