



MECHANICAL CHARACTERIZATION OF LINEN FIBER BIODEGRADABLE COMPOSITES

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Abstract: The use of composite material had become very important and very useful nowadays. Due to the environmental aspects and new technologies, composite materials are taking a very important role in the industry. The composite materials have different physical and chemical properties compared to that of the plastic materials. Proper care should be taken in preparing the composite material the elements used to be taken in proper ratio and the process for manufacturing the material should be appropriate. Linen Fiber is the major component used and it is the major factor in the obtaining the strength of the product. Composites shows the properties like distinctive qualities in various ways, rust proof, and high quality to weight proportion, yet they dirty nature. Presently the regular fiber composites are generally utilized as a part of car industry and one of the important matters should be friendly with the nature and the environment. Tensile test and SEM analysis were performed on laminates to reveal the strength and crystalline structure.

Keywords: natural fibers, natural composites, automobile parts, biodegradable, bio-composite, soy resin, soy-based resin, sucrose soy-ate, green composite

INTRODUCTION

One of the major natural issues opposing today is the plastic waste issue. The term huge creation and of plastic in each portion of our life has expanded the plastic waste in enormous scales [1]. The waste transfer issues, and solid controls and criteria for cleaner and safe condition, have coordinated extraordinary piece of the logical research to composite materials that can be effectively corrupted or bio adopted as a term composite is typically used to depict composite material with condition and environmental focal points over traditional composites by definition and composite may contain normal fiber and common cements besides composites could be a mix of characteristic fiber and bio degradable cements grid[8]. Utilizing the last wording biodegradable glues.[4] The quantity of glues network's that could be utilized as a part of eco-based composite definitions is fundamentally expanded the examination field of biodegraded capable glues is still in its beginning periods, yet it is developing in prevalence consistently. As of now, a ton of polymer biodegradable materials have showed up as business result of fered by different makers. The high cost of these materials is the primary confinement in their utilization regardless of their one of a kind physical and substance properties the point of these articles is to display a concise audit of the most usually utilized biodegradable glues and normal filaments in composite materials.

1. PROCESS DESCRIPTION

a. 100% soy protein isolates process

At first the fiber is soaked in the water for 24 hours and then the fiber is washed to remove the residues. The fiber is cut to the desired size and weighed. Accordingly the resin and hardeners are also weighed. 100% soy bean isolate powder is taken in bowl and mixed with water. Then the solution is

heated to the desired temperature. Then let the resin be cooled to room temperature. Stick a PVC sheet to the table. Apply the resin on the PVC sheet by using a brush. Then put the Linen fiber layer by layer up to desired thickness. Then dry it until it gets hardened. Finally the composite material is prepared. Repeat this process for different compositions mixing and different Linen fiber cloths. These all laminates are prepared layer by layer by hand. All the layers of linen fiber are finely pasted both sides with soy adhesive [5].

Fig-I



b. 90% soy protein isolates process

At first the fiber is soaked in the water for 24 hours and then the fiber is washed to remove the residues. The fiber is cut to the desired size and weighed. Accordingly the resin and hardeners are also weighed. 90% soy bean isolate powder is taken in bowl and mixed with water. Then the solution is heated to the desired temperature. Then let the resin be cooled to room temperature. Stick a PVC sheet to the table. Apply the resin on the PVC sheet by using a brush. Then put the Linen fiber layer by layer up to desired thickness. Then dry it until it gets hardened. Finally the composite material is prepared. Repeat this process for different compositions mixing and different Linen fiber cloths. These all laminates are prepared layer by layer by hand. All the layers of linen fiber are finely pasted both sides with soy adhesive.

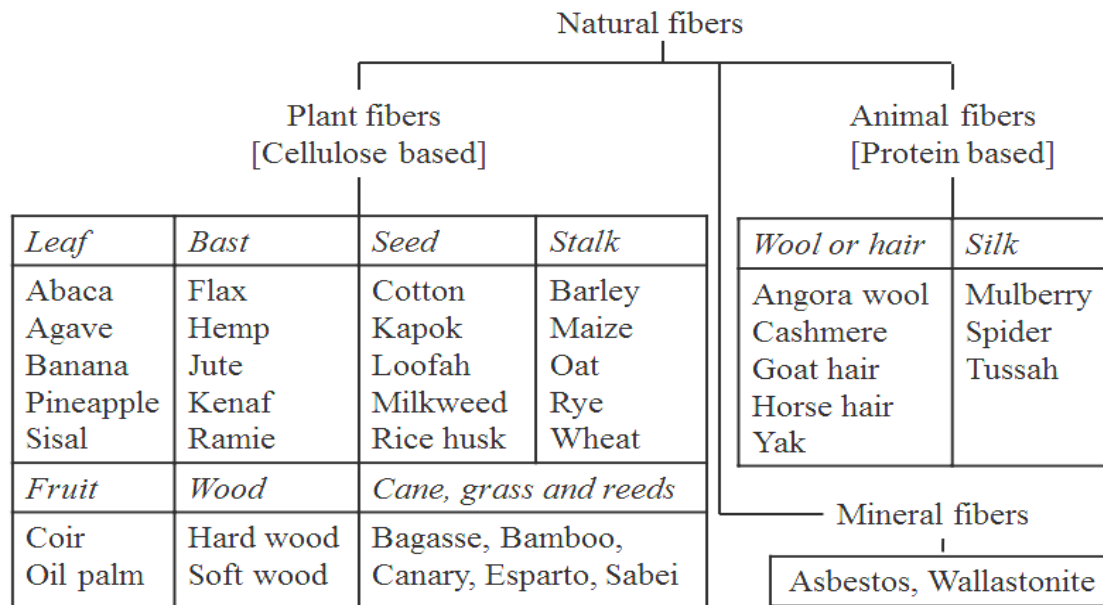


Fig-II

C. MATERIALS REQUIRED

Fibers are thin hair like materials which are in discrete lengthened pieces like a string. Fibers are delegated Natural filaments and synthetic strands. The benefit of normal fiber is

its minimal effort, low thickness, decreased device wear, high durability, high particular quality and biodegradability [2]. Another significant preferred standpoint of characteristic fiber is it goes about as a warm separator and show diminished mass thickness in view of its empty and cell nature. The wellsprings of normal filaments are plants, creatures, and minerals [7]. The pioneer Fibers utilized are cotton, fleece, silk, flax, hemp and sisal. The main artificial fiber is nylon. Both characteristic and engineered Fibers are currently accessible and are being utilized as fillers in accomplishing great properties in composites. Materials Used in Making of Bio Composite Laminate are Linen Fibre, soy protein 100% isolated, soy protein 90% isolated, Glycerin, Vinegar.



d. BIO COMPOSITE LAMINATE

Fiber reinforced polymers – offer numerous advantages to construction, including light weight, high

strength, good thermal insulating properties, great durability, and long service life. Sustainability, however, has been a sore spot.

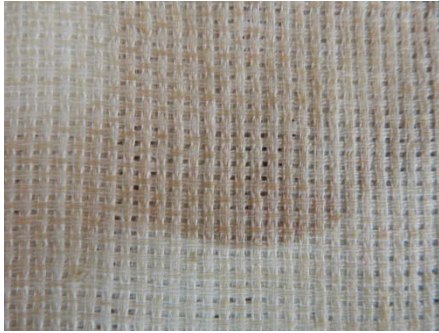
Table-I Different samples and their individual weights of all the four samples

S. No	Sample No	Total Weight (g) after curing
1	Sample-I	91
2	Sample-II	79
3	Sample-III	102
4	Sample-IV	77

Table-II Calculation for weight of resin used in different samples

Sample No	Total weight of sample (g)	Weight of Linen used (g)	Weight of Resin (g)
Sample-I	91	$15.5*5=77.5$	13.5
Sample-II	79	$12.8*5=64$	15
Sample-III	102	$16*5=80$	22
Sample-IV	77	$12.6*5=63$	14

Fig-III Sample-I



LINEN FIBER texture utilized for fortification

Fig-IV Sample-II



LINEN FIBER texture utilized for fortification

Fig-V Sample-III

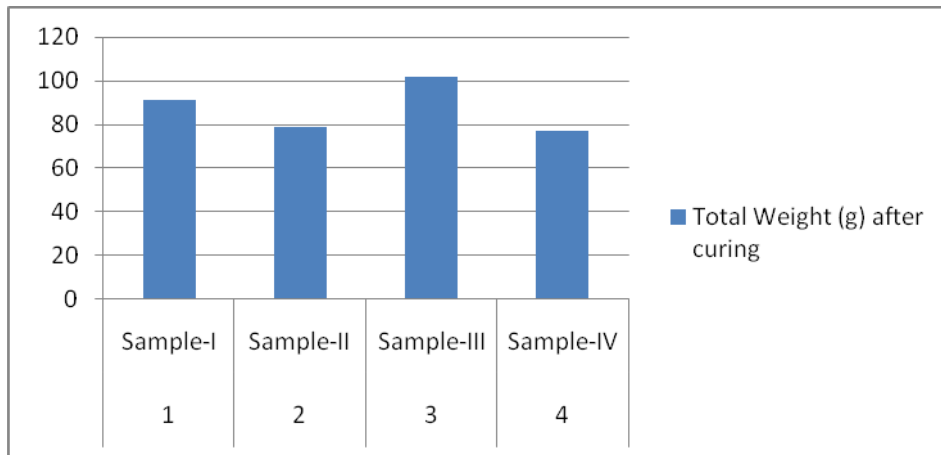


LINEN FIBER texture utilized for fortification

Fig-VI Sample-IV



LINEN FIBER texture utilized for fortification



Graph-I

TENSILE TEST

Fig-VII

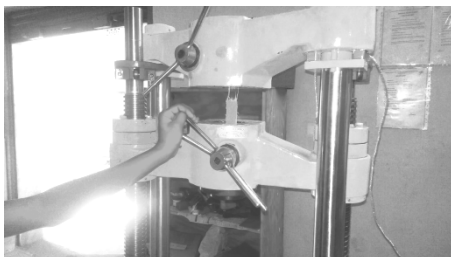


Fig-VIII



Scanning electron MICROSCOPE (SEM) images of fiber laminates

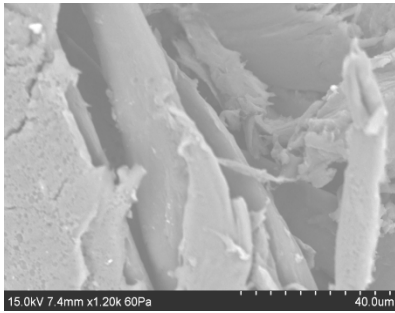


Fig- IX Sample-I

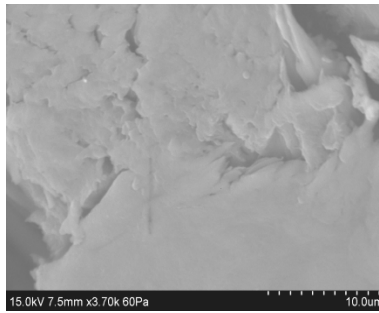


Fig-X Sample-II

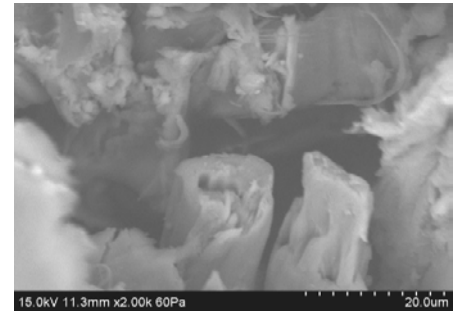


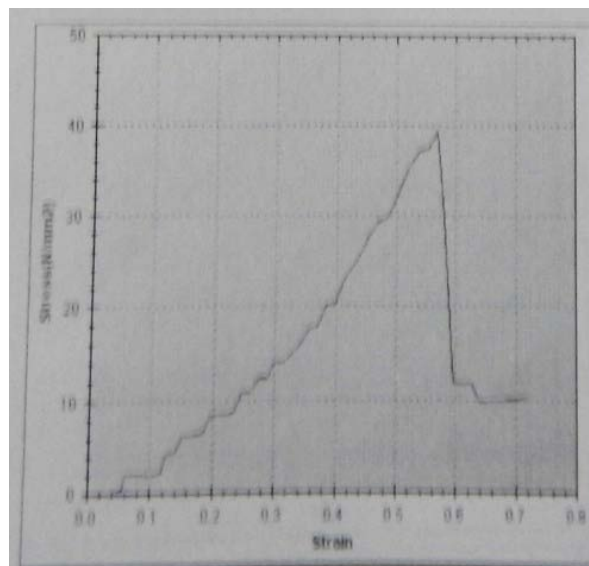
Fig-XI Sample-III

2. RESULTS AND DISCUSSIONS

Sample-I

Table-III : Results of the tensile test conducted on sample containing 5 layers

Input	Output
Specimen shape = Flat	Load at peak = 2.690 KN
material type = composite material	Tensile strength = 39.308 KN/mm ²
Specimen width = 26.22 mm	Tensile Strength(Lateral)= 39MPa
Specimen thickness = 2.61mm	Tensile Strength(linear)=38.5Mpa
Gauge length = 25 mm	Lateral strain= 0.71
Pre load value = 0 KN	Linear strain= 0.91
Max.load = 200 KN	Poisson ratio =0.78
Max.Elongation = 200 mm	
Cross section area = 68.43 mm ²	

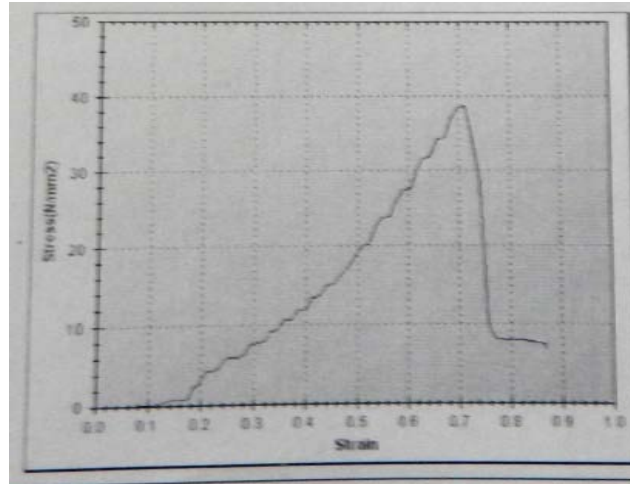


Sample-II

Table-IV : Results of the tensile test conducted on sample containing 5 layers

Input	Output
Specimen shape = Flat	Load at peak = 3.240 KN
material type = composite material	Tensile strength = 38.567 KN/mm ²
Specimen width = 31.23 mm	Tensile Strength(Lateral)=38.5 mpa
Specimen thickness = 2.69mm	Tensile Strength(linear)=39.3 mpa

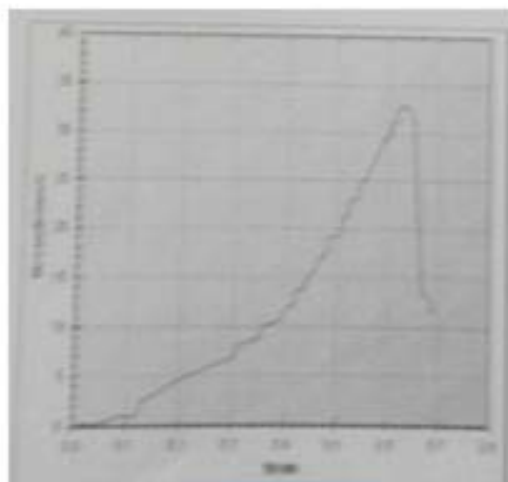
Gauge length = 25 mm	Lateral strain= 0.89
Pre load value = 0 KN	Linear strain= 0.72
Max.load = 200 KN	Poisson ratio = 1.22
Max.Elongation = 200 mm	
Cross section area = 84.01 mm ²	



SAMPLE-III

TABLE-V: results of the tensile test conducted on sample containing 5 layers

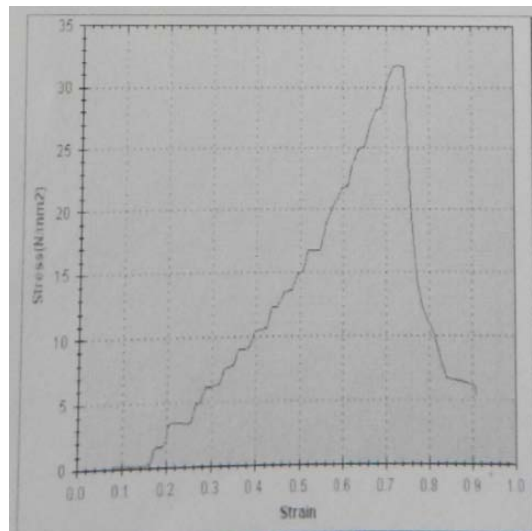
Input	Output
Specimen shape = Flat	Load at peak = 2.690 KN
material type = composite material	Tensile strength = 32.825 KN/mm ²
Specimen width = 32.52 mm	Tensile Strength(Lateral)= 32.8 mpa
Specimen thickness = 2.52mm	Tensile Strength(linear)= 25.5 mpa
Gauge length = 25 mm	Lateral strain=0.7
Pre load value = 0 KN	Linear strain= 0.72
Max.load = 200 KN	Poisson ratio =0.97
Max.Elongation = 200 mm	
Cross section area 81.95 mm ²	



Sample-IV

Table-VI: Results of the tensile test conducted on sample containing 5 layers

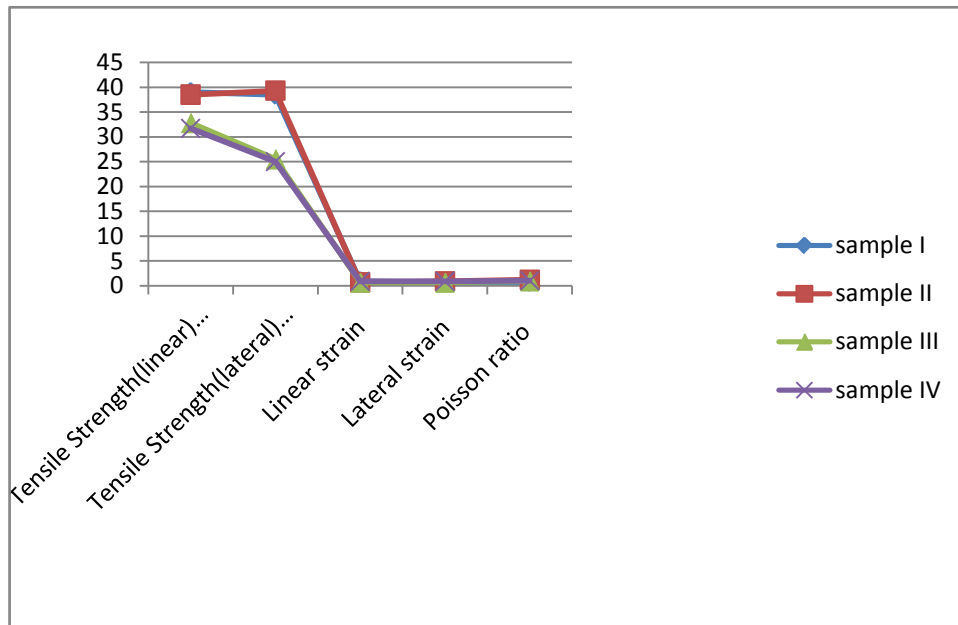
Input	Output
Specimen shape = Flat	Load at peak = 2.930 KN
material type = composite material	Tensile strength = 31.784 KN/mm ²
Specimen width = 28.02 mm	Tensile Strength(Lateral)= 31.7mpa
Specimen thickness = 3.29mm	Tensile Strength(linear)= 25 mpa
Gauge length = 25 mm	Lateral strain= 0.91
Pre load value = 0 KN	Linear strain= 0.90
Max.load = 200 KN	Poisson ratio = 1.0
Max.Elongation = 200 mm	
Cross section area = 92.19 mm ²	



3.CONCLUSIONS

The above discussion is justified that the composite materials in late decades many trails and tests have been coordinated to perceive the composites which exhibited the movements in various organizations financially[6]. In this idea a composite overlays have been manufactured by with combination of soy and vinegar and glycerin, structure of five layered cotton fiber and with 100% soy protein pitch. It is watched that the flexibility (level) is more for treated to all the others which is 39MP when appeared differently in relation to coordinate. The unbending nature (coordinate) is more for five layered cotton fiber which is 38 MPA. The sidelong strain for five layered cotton fiber is test sample 1. The immediate strain for five layered cotton fiber is test sample 2. The Poisson extent is

more for five layered cotton fiber which is 0.78. For this reason, manufacturing a bio-composite. The properties of laminates are changed as the direction of laminates changes i.e the strength will be differ in x-axis and y-axis directions in this samples the large gap linen fiber laminate have less strength when compared to small gap linen fiber samples. Fiber using regular fibers as strand (cotton strands, and soy pitch, glycerin, vinegar) as grid helped in finishing convincing mechanical direct [3]. Research around there and headway of substantially more arrangements of trademark fiber composites will achieve formation of reasonable and eco-pleasing materials. This will moreover help in gathering varied things for better living of humankind. With the help of UGC minor project funding this project is conducted.



Graph-II

4. ACKNOWLEDGEMENTS

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