A Review Paper on Mechanical Characteristic Granual and Evolution of Glass/Palmyra Scrabble Reinforced Hybrid Finder Amalgamation

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Abstract—In this paper is eco friendly the utilization of Palmyra fiber in automotive and aerospace applications has increased drastically due to its high strength and low weight. This research focuses on the development of composite materials using Palmyra waste and glass fiber with Epoxy as a matrix. The mechanical properties such as tensile strength, tensile modulus, compression strength, compression modulus, flexural strength, flexural modulus and impact strength of composites were investigated. Palmyra fiber/glass fiber with relative varying weight percentage in the ratio of 25:75, 50:50, 75:25 and 100:00 had been considered for the study. The composites were prepared by the hand lay molding method. In addition, the prepared composites were subjected to NaOH treated/untreated. The results showed an increase in all the mechanical properties from the addition of Palmyra fiber

Index Terms—Palmyra, glass fiber, Epoxy, flexural, NaOH.

1.0 Introduction:

Composite plates with the fibrous waste material content varying from 30 to 70% by weights were studied. It was observed that the incorporation of pfw in the matrix imparted poor reinforcement effect in tensile, but there was an improvement in other mechanical properties such as shear, bending and impact. Increasing the glass fiber content in the Palmyra fiber waste/glass hybrid composites in polyester matrix resulted in composites with improved mechanical properties. Moisture absorption studies on pfw/glass fiber polyester composites were carried out separately and observed that the composite absorbed 9.23% of moisture in 166 h, 5.57% of moisture in 154 h and 3.5% of moisture in 175 h for the composites with 50% pfw/10% glass fiber, 40% pfw/20% glass fiber and 30% pfw/30% glass fiber respectively. These Palmyra fiber waste and glass fiber hybrid composites could be molded into standard size and used as partition boards, panel for windows, and cupboards etc, which need further attention on effect of moisture absorption on properties. Mixture of NaOH and Na2SO3 was used in modification of banana stem fibers (BSF). Unidirectional BSF reinforced natural rubber (NR) lamina composites were made using compression molding method. The results of the tensile loading in 0˚, 45˚ and 90˚ to the fiber directions of the composite with fiber mass fraction of 30% were studied. Surface modification of the BSF with a mixture of 4% NaOH and 2% Na2SO3 increased the tensile strength and elastic modulus of the composite to 4.03 MPa and 147.34 MPa respectively from 3.12 MPa and 84.30 MPa of the untreated. Variation in properties due to fiber orientations was observed indicating a higher value of properties in the 0o fiber orientation than in 45˚ and 90˚ directions. The result of scanning electron microscope (SEM) micrographs of the surfaces of the fibers indicted an improvement in bonding of the fiber bundles prior to lamination with natural rubber as a result of surface treatment which resulted in its higher tensile strength.

2.0 MATERIALS AND EQUIPMENT:

Epoxy resin (LY-557) thermo setting polymer is used as a matrix, epoxy is the most common thermosetting polymer used as matrix in the polymer composites. Palmyra Fiber is very strong and hardwearing is degrades completely naturally, with no harm to the environment, and is harvested from a renewable source, making it one of the "greenest" fibers available. It has good resistance to friction and heat, and will withstand many chemicals and solvents. Density of different individual fibers of 200 mm length having mean diameter of 0.20 to 0.21 mm, and weight varying from 0.018 gm to 0.022 gm is obtained varies from 606.7 kg/m3 to 789.3 kg/m3 (i.e. 0.606 gm/cm3 to 0.789 gm/cm3).

2.1 Steps in extraction of filler from Palmyra palm trees:

3.0EXPERIMENTAL SETUP:

3.1 Glass Moulds: In the present research work glass moulds are used to prepare epoxy/Glass fiber Nano composites. Glass moulds are made by different dimensions of ASTM standard like tensile test, flexural tests, impact test and compression test. Waxes are a class of chemical compounds that are plastic (malleable) near ambient temperatures. They are also a type of lipid. Characteristically, they melt above 45 °C (113 °F) to give a low viscosity liquid. Waxes are insoluble in water but soluble in organic, no polar solvents. All waxes are organic compounds, both synthetic and naturally occurring.

3.2 Tensile and flexural moulds (ASTM D 638 & D 618): preparation composite for testing the tensile strength and flexural strength the glass moulds prepare as per the ASTM standards (ASTM D 638 & D 618). The glass moulds having the dimensions of (130x130x3) mm.

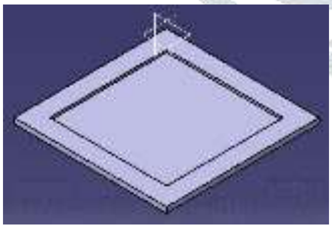

Figure 3.2 Tensile & flexural mould

3.3 Impact mould (ASTM D 256): Making the composite for testing the impact strength of fibrous composite dimensions of (100x100x13) mm.

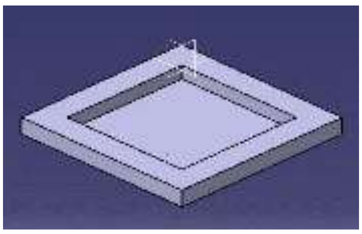

Figure 3.3 Impact mould

3.4 Compression mould (ASTM D 695): For testing the compression strength of composite Glass moulds have dimensions of (10x10x10) mm.

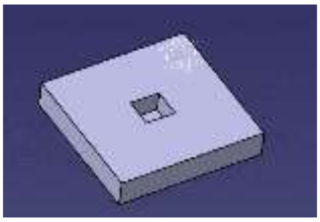

Figure 3.4 Compression mould

4.0 Preparation of Composites:

The composite was prepared by hand layup technique by rule of hybrid mixtures. Firstly, glass moulds were prepared based on ASTM standards with (13 x 12 x 0.3) cm. Then filler was kept in the oven for half an hour to remove moisture. Then mould surfaces were sprayed with polyvinyl alcohol in order to retain the shape of the casting after it is being cured while it is being taken out from the oven. A layer of modified epoxy was poured into the mould upon which CF was stacked randomly by parts. Then the hardener was mixed well with epoxy using mechanical stirrer until it mixture for no air bubbles. Care was taken to keep the mould flat using spirit level while mixture is being poured. Once the mixture poured completely in to the mould then thin OHP sheet was rolled over gently to keep the mould under subjected compression. Then the mould kept aside for 24hours curing, then it is taken into the oven to make sure to melt the mould releasing agent ought to be melt properly. Then the casting should be taken out from the mould using spatulas and knifes. Then the composites were cut in to ASTM sizes for testing. Tensile strength, flexural (bending), compression tests were carried out on par with ASTM D 53455. Tensile and flexural tests were performed on Ignitron universal testing machine (3369). The cross head speed was maintained 50 mm/min. All the tests were accomplished at a room temperature of 23 °C. At least, 5 samples were tested for each composition and results were averaged.

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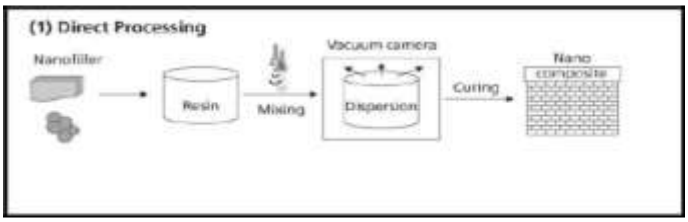
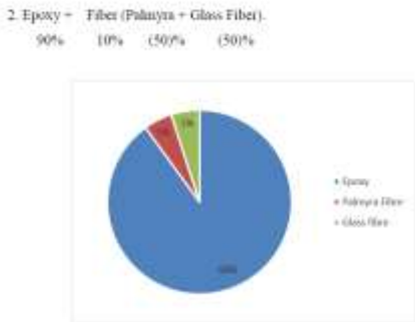


4.1. Combinations:



S.No	Material -1	Percentage	Fibers(Palmyra + Glass Fiber)	Percentage		
1	Epoxy	90%	Fibers(Palmyra + Glass Fiber)	10%	(25)%	(75)%
2	Epoxy	90%	Fibers(Palmyra + Glass Fiber)	10%	(50)%	(50)%
3	Epoxy	90%	Fibers(Palmyra + Glass Fiber)	10%	(75)%	(25)%
4	Epoxy	90%	Fibers(Palmyra + Glass Fiber)	10%	(100)%	(0)%

The respective weights are calculated by using the formula,

Density= mass / volume

Density of epoxy = 1.2 kg/m^3

Density of Palmyra = 0.7 kg/m^3

Density of Glass fiber = 2.2 kg/m^3

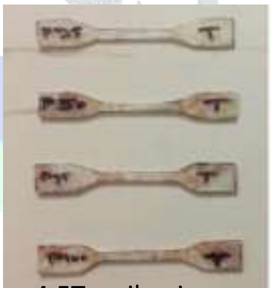
4.2 Prepared Glass Moulds:

4.2. Tensile and flexural moulds 4.2. Compression moulds

4.3 Work pieces:

4.4 Marked work pieces for cutting:

4.5 Work pieces after cutting for testing:



4.5Tensile pieces

4.5Flexural pieces

4.5 Compression pieces

4.5 Impact pieces

5.0 RESULTS & DISCUSSIONS:

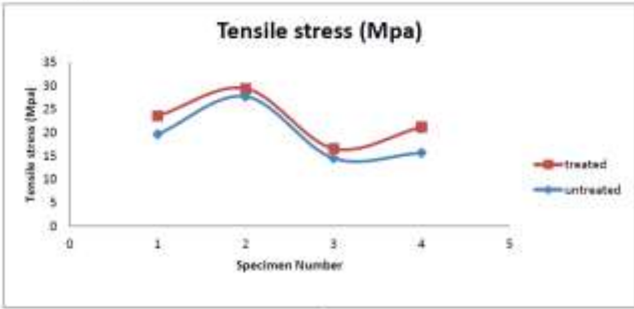
The characterization of the composites reveals that the different ratios of Palmyra palm and glass fiber is having significant effect on the mechanical properties of composites. The properties of the composites with different ratios of Palmyra under this investigation are presented in Table no. 5.1

S.NO	Epoxy (%)	Natural fiber (%)	Artificial fiber (%)	Tensile strength (Mpa)	Tensile modulus (MPA)	Flexural strength (Mpa)	Flexural modulus (Mpa)
Untreated							
1	90	10(25)	10(75)	19.63	1650.21	51.33	4448.31
2	90	10(50)	10(50)	27.68	2333.17	72.58	5509.77
3	90	10(75)	10(25)	14.52	2492.06	61.39	6399.95
4	90	10(100)	10(0)	15.68	3607.18	45.86	3197.85
Treated							
1	90	10(25)	10(75)	23.52	2330.15	71.87	8115.64
2	90	10(50)	10(50)	29.37	2628.83	95.83	7864.64
3	90	10(75)	10(25)	16.59	2876.45	80.61	8969.59
4	90	10(100)	10(0)	21.19	3839.97	72.23	4900.8

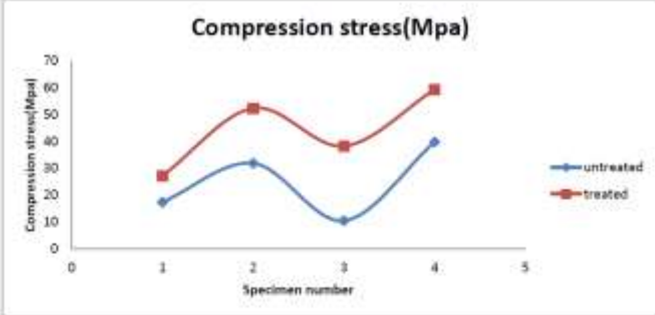
S.NO	Epoxy (%)	Natural fiber (%)	Artificial fiber (%)	Compression strength (Mpa)	Compression modulus (Mpa)	Impact strength (joules)
Untreated						
1	90	10(25)	10(75)	17.36	1428.24	2.45
2	90	10(50)	10(50)	31.85	1920.78	4.2
3	90	10(75)	10(25)	10.43	1285.75	1.8
4	90	10(100)	10(0)	39.80	1346.58	0.4
Treated						
1	90	10(25)	10(75)	27.36	1760.62	4.4
2	90	10(50)	10(50)	52.37	2893.73	5.6
3	90	10(75)	10(25)	38.26	2198.64	2.8
4	90	10(100)	10(0)	59.34	2789.75	1.67

5.1 Test Results Graph Analysis:

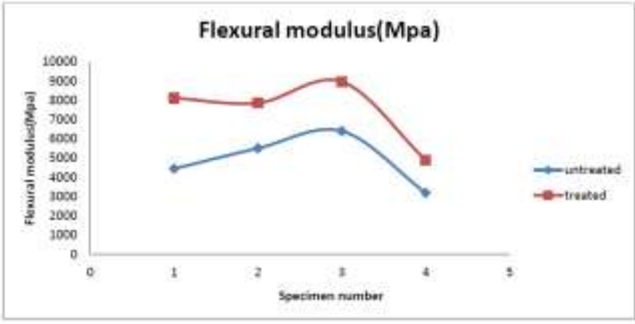
s.no	Tensile strength (Mpa)	
	Untreated	Treated
1	19.63	23.52
2	27.68	29.37
3	14.52	16.59
4	15.68	21.19



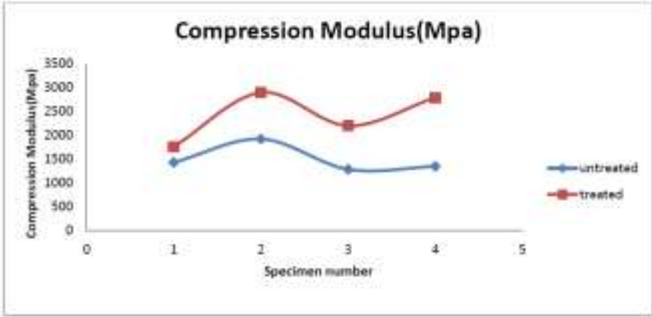
s.no	Compression strength (Mpa)	
	Untreated	Treated
1	17.36	21.15
2	31.85	52.37
3	10.43	38.26
4	39.80	59.34



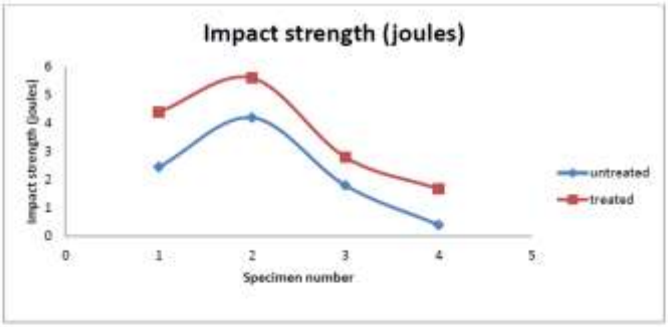
s.no	flexural modulus (Mpa)	
	Untreated	Treated
1	4448.31	8115.64
2	5509.77	7864.64
3	6399.95	8969.59
4	3197.97	4900.8



s.no	Compression modulus (Mpa)	
	Untreated	Treated
1	1428.24	1760.62
2	1920.78	2893.73
3	1285.75	2198.64
4	1346.58	2789.75

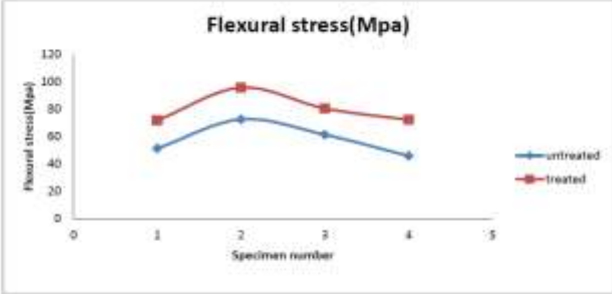


s.no	Energy absorbed (joules)	
	Untreated	Treated
1	2.45	4.4
2	4.2	5.6
3	1.8	2.8
4	0.4	1.67



The above results observed impact strength of treated fiber was high compare to untreated fiber composites because of proper addehesion of fiber and matrix material proper bonding was created between them. The maximum impact strength of an untreated fibered composite is 4.2 joules (for 50% weight of fiber) and for treated fibered composite is 5.6joules (for 50% weight of fiber). The compression strength is increased for treated fiber composite compared to untreated composite by 25%.

s.no	Flexural stress (Mpa)	
	Untreated	Treated
1	51.33	71.87
2	72.58	95.83
3	61.39	80.61
4	45.86	72.23



6.0. CONCLUSION:

This experimental investigation of mechanical behavior of Palmyra fiber reinforced epoxy composites leads, This work shows that successful fabrication of a Palmyra and fiber rein forced epoxy composites with different ratios of Palmyra and glass fiber is possible by simple hand layup technique It has been noticed that the mechanical properties of the composites such as tensile strength, flexural strength, impact strength of the composites are greatly influenced by varying the weight ratios of Palmyra and glass fiber. All these results indicate that the Palmyra and glass fiber, epoxy composites might have promising automotive and aerospace applications.

7.0 REFERENCES:

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