ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. II, Issue VII, July 2015

Review: Mechanical Behavior of Natural Fiber Polymer Matrix Composites

K.Rajendra Prasad [1*]
kraja1454@gmail.com
[1*]Asso.Professor, Mechanical Engineering Department, CMR Engineering College, Hyderabad, India.
N.Jeevan Kumar [2]
[2] Professor, Mechanical Engineering Department, CMR Engineering College, Hyderabad, India

V.Mastan [3]
[3]Asst Professor, Mechanical Engineering Department, CMR Engineering College, Hyderabad, India
Y.Srinivasa Reddy[4]
[2]Asst Professor, Mechanical Engineering Department, CMR Engineering College, Hyderabad, India
V.Mukesh Reddy [4]
[2]Asst Professor, Mechanical Engineering Department, CMR Engineering College, Hyderabad, India

Abstract--*Ecological mindfulness today propels the analysts, worldwide on the investigations of regular fiber fortified polymer composite and savvy alternative to manufactured fiber strengthened composites. In the present work distinctive normal fiber based polymer network composites are set up by utilizing characteristic strands Coir, Saw Dust, Rice husk and their malleable properties are considered. Regular hand-lay-up procedure has been received for assembling the composite. To have a decent similarity between the fiber and network, synthetic adjustment of strands has been completed. The examination affirms that the elasticity of the composites is changes with the volume division of the filaments.*

Key words: *Composites; Polymers;*

I. Introduction

The upside of composite materials over regular materials stem to a great extent from their higher particular quality, firmness and exhaustion attributes, which empowers basic outline to be more flexible. By definition, composite materials comprise of at least two constituents with physically distinct stages.

Be that as it may, just when the composite stage materials have outstandingly extraordinary physical properties it is perceived similar to a composite material.[2] As of late, there has been an expanding ecological cognizance and consciousness of the requirement for economical advancement, which has brought enthusiasm up in utilizing common filaments as fortifications in polymer composites to supplant manufactured strands, for example, glass. [2] Natural filaments, as support, have as of late pulled in the consideration of specialists as a result of their favorable

All Rights Reserved © 2015 IJARTET

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. II, Issue VII, July 2015

circumstances over other built up materials. They are earth well disposed, completely biodegradable, richly accessible, sustainable, modest and have low thickness. Plant filaments are light contrasted with glass, carbon and aramid strands. The biodegradability of plant filaments can add to a solid biological system while their minimal effort and superior satisfies the monetary enthusiasm of industry. At the point when normal fiber-fortified plastics are subjected, toward the finish of their life cycle, to burning procedure or landfill, the discharged measure of CO2 of the filaments is unbiased regarding the acclimatized sum amid their development. [1]

Polymeric materials fortified with manufactured filaments, for example, glass, carbon and aramid give focal points of high firmness and quality to weight proportion when contrasted with traditional development materials, i.e. wood, cement and steel. Regardless of these favorable circumstances, the far reaching utilization of engineered fiber-strengthened polymer composite tends to decrease in light of their high-introductory expenses and furthermore creation of manufactured composites requires a huge quantum of vitality and nature of condition endured due to the contamination created amid the generation and reusing of these engineered materials.

In late time plant filaments have been getting significant consideration as substitutes for manufactured fiber fortifications. Not at all like the customary manufactured filaments like glass and carbon these lignocellulosic strands can grant certain advantages to the composites, for example, low thickness, high firmness, minimal effort, inexhaustibility, biodegradability and high level of adaptability amid preparing. Cellulosic strands like sisal, coconut (coir) and bamboo in their characteristic shape and additionally a few waste cellulosic items, for example, shell flour, wood flour and mash have been utilized as fortifying specialists of various thermosetting and thermoplastic composites. [1]

II. Literature Review

Paul Wambua et.al [3] In this work the specialist clarified about how the normal filaments (sisal, kenaf, hemp, jute and coir) fortified polypropylene composites were handled by pressure shaping utilizing a film stacking technique. The mechanical properties of the distinctive normal fiber composites were tried and analyzed. Hoi-yan Cheung et.al [4] In this paper, the creator clarified far reaching survey on various types of characteristic fiber composites and their potential in future advancement of various types of designing and local items. [5] discussed about E-plane and H-plane patterns which forms the basis of Microwave Engineering principles.

In this paper, a pre-impregnation procedure has been presented for the infusion trim of

All Rights Reserved © 2015 IJARTET

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. II, Issue VII, July 2015

sisal fiber fortified polypropylene (PP/SF) composites. S. Harish et.al [6] researched the utilization of coir, a characteristic fiber inexhaustibly accessible in India. Regular filaments are solid and lightweight as well as moderately extremely shoddy. M. Ashok Kumar et.al [7] examined the tractable, flexural and dielectric properties of composites made by strengthening Sansevieria cylindrica as another normal fiber into an elastic based polyester network. J.L.Thomason [8] in this paper the poor execution of characteristic strands as composite fortifications where the emphasis on substance angles has not yet conveyed the "heavenly vessel" of glass fiber substitution in volume applications is talked about

III. Fabrication of Composites

The normal strands are altogether washed with refined water keeping in mind the end goal to evacuate soil, dregs and different pollutions like light and delicate fiber. At that point the fiber is dried to expel the dampness until the point when it puts on steady weight then Alkali treatment has been done to enhance the scattering of the particles, diminishing agglomeration by lessening the hydrogen holding that holds them together. The UP sap and hardeners are blended in the proportion, (MEKP) catalyst1.5 gm and (1%Cobalt) quickening agent 3.0 gm, as prescribed by the sap producer. The dried and hacked filaments are then included to the UP sap according to the required proportion and very much mixed until the point when the constituent blends consistently. At that point the blend is moved into the form and permitted to stay in the shape for 24hrs under heap of 100kg. The formed composite is expelled from the shape after 24hrs. At that point the composite material is cured in the heater at 1000C for 2hrs. This disposes of dampness from the material. Examples of reasonable measurement according to ASTM-D638 standard are cut utilizing a precious stone cutter for malleable testing.

Fig1: Tensile Test Specimen Before Test

Fig 2: Tensile Test Specimen After Test

All Rights Reserved © 2015 IJARTET

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. II, Issue VII, July 2015

Table 1: Details of Composites Prepared C-Coir, H-Rice Husk, S-S

Sl. No.	Specimen Designation	% of Coir	% of Rice Husk	% of Saw Dust
1	C5	5	-	-
2	C10	10	-	-
3	C15	15	-	-
4	C20	20	-	-
5	H5	-	5	-
6	H10	-	10	-
7	H15	-	15	-
8	H20	-	20	-
9	S5	-	-	5
10	S10	-	-	10
11	S15	-	-	15
12	S20	-	-	20
13	C10H10	10	10	-
14	C10S10	10	-	10
15	C10S10H10	10	10	10

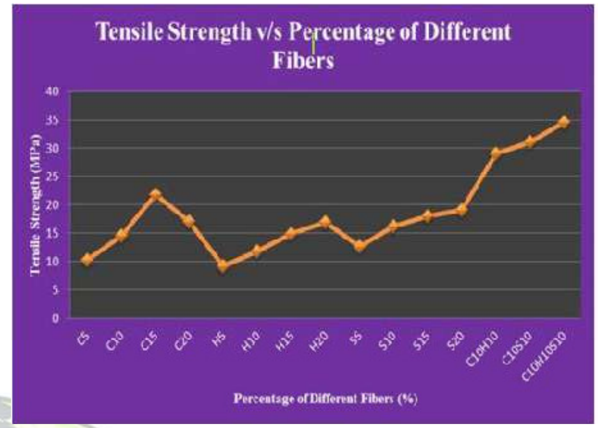

Fig 3: Comparative Line Chart of Tensile Strength of Various Composites

IV. Results and Discussions

The results of characterization test are reported here. The evaluation of tensile strength has been studied and discussed. The interpretation of the results and the comparison among various composite samples are also presented(Fig 3 and Fig 4).

Tensile test Results

Table 2: Tensile Strength of Composites

Specimen	Tensile Strength (MPa)
C5	10.3
C10	14.5
C15	21.79
C20	17.02
H5	9.2
H10	11.8
H15	14.96
H20	16.98
S5	12.6
S10	16.16
S15	18.06
S20	19.06
C10H10	29.09
C10S10	31.17
C10H10S10	34.53

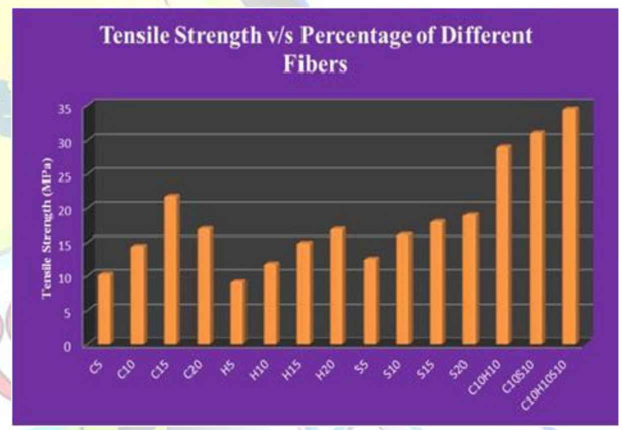

Fig 4: Comparative Bar Chart of Tensile Strength of Various Composites

From the Tensile Test Results it is clear that every one of the examples demonstrate calculable change of mechanical properties. Expansion of strands , up to 20%, in to the composites enhances rigidity, strain rate , level of Elongation, Young's Modulus. In the event of coir composites past 15% of coir malleable properties diminishes because of poor holding of sap over the fortification. Henceforth diminish in properties of the

All Rights Reserved © 2015 IJARTET

example happens. From above chart it can undoubtedly indentify that the half and half composites displays the great rigidity when contrasted with different composites this may as a result of expanded in the fortification.

V. Conclusions

From Result and dialog it is discovered that the Natural Fiber Hybrid Composite, made out of Coir fiber+ Rice Husk + Saw Dust + Unsaturated Polyester tar blend indicated better consequence of elasticity. The quality of the Composite material increments as the Percentage of fortifications increments. This is because of the Strong holding of the Matrix with the Reinforcement (Fiber) and the heap is conveyed by them.

References

[1]. Girisha.C, et,al, Tensile Properties Of Natural Fiber-Reinforced Epoxy-Hybrid Composites, International Journal of Modern Engineering Research (IJMER), Vol.2, Issue.2, Mar-Apr 2012 pp-471-474.

[2]. Tong Yuanjian, et,al, Impact and fatigue behaviour of hemp fibre composites, Composites Science and Technology 67 (2007) 3300–3307.

[3]. Paul Wambua*, et,al Natural fibres: can they replace glass in fibre reinforced plastics, Composites Science and Technology 63 (2003) 1259–1264.

[4]. Hoi-yan Cheung, et,al Natural fibre-reinforced composites for bioengineering and environmental engineering applications, Composites: Part B 40 (2009 Elsevier Lt) 655–663.

[5]. Christo Ananth, S.Esakki Rajavel, S.Allwin Devaraj, M.Suresh Chinnathampy. "RF and Microwave Engineering (Microwave Engineering).", ACES Publishers, Tirunelveli, India, ISBN: 978-81-910-747-5-8, Volume 1,June 2014, pp:1-300.

[6]. A.S. Harish, et,al Mechanical property evaluation of natural fiber coir composite, M A T E R I A L S C H A R A C TE R I Z A T I O N 6 0 (2 0 0 9) 4 4 – 4 9

[7].M.ASHOK KUMAR, et,al Fabrication and performance of natural fibers: Sansevieria cylindrica, waste silk, jute and drumstick vegetable fibres (Moringa Oleifera) reinforced with rubber/polyester composites, International Journal of Fiber and Textile Research 2011; 1(1): 15-21.

[8]. J.L.Thomason, Why Are Natural Fibres Failing To Deliver On Composite Performance, Department of Mechanical Engineering, University of Strathclyde, 75 Montrose Street, Glasgow G1 1XJ.

All Rights Reserved © 2015 IJARTET