Characterization of Glass and Pineapple Fiber Composite Material Using SEM

[1]M Mohammad yousuf,[2]B Mohamed yahiya

[1]Assistant Professor,[2]Assistant Professor,
[1]Department of Mechanical Engineering,
[1]Aalim Muhammed Salegh College of Engineering, Avadi,India

Abstract : The principle goal of this examination work is to build up another composite material utilizing GLASSFIBER and PINEAPPLE LEAF FIBER (PALF) and to ponder its mechanical properties. Glass fiber fortified epoxy composites are most generally utilized as composite materials. Presently multi day a significant number of the specialists have concentrated on regular fiber composite materials so as to supplant the manufactured filaments because of its eco neighborly nature. Increasingly over regular filaments are most inexhaustibly accessible and efficient. Pine apple leaf fiber is a characteristic fiber having great mechanical properties and it is squander material and not yet investigated much. It is uncovered from the writing review that the malleable and flexural quality of the glassfiber composites is less looked at to PALF composites. In perspective on this, with a plan to build up a better composite contrasted with both, the present examination has done a trial examination on composite material by adding glassfiber and PALF to it. In the present work tests were set up by utilizing PALF what's more, glassfiber by changing there weight rate and by holding the absolute amount of fiber as steady, by utilizing hand lay-up strategy according to ASTM norms (American culture for testing and materials). The created composite material was exposed to various types of tests. The tensile,Impact flexural test were completed by UTM (Universal Testing Machine) and minuscule structure was done by Determined Electron Microscope. It is discovered that, the flexural, sway elastic qualities of the composite with both the filaments is observed to be higher than single fiber composites.

IndexTerms - Pineapple leaf fiber (PALF), Glassfiber, composites.

I. INTRODUCTION

Throughout the most recent thirty years composite materials, plastics and earthenware production have been the predominant rising materials. The volume and number of uses of composite materials have developed consistently, infiltrating and vanquishing new markets constantly. Present day composite materials comprise a critical extent of the designed materials market going from ordinary items to complex specialty applications. While composites have effectively demonstrated their value as weight-sparing materials, the present test is to make them savvy. The endeavors to deliver monetarily alluring composite segments have brought about a few imaginative assembling systems right now being utilized in the composites business. It is self-evident, particularly for composites, that the improvement in assembling innovation alone isn't sufficient to conquer the expense obstacle. It is fundamental that there be a coordinated exertion in structure, material, process, tooling, quality affirmation, producing, and even program the board for composites to wind up aggressive with metals. The composites business has started to perceive that the business utilizations of composites guarantee to offer a lot bigger business openings than the aviation part because of the sheer size of transportation industry. In this manner the move of composite applications from air ship to other business uses has turned out to be unmistakable lately. Progressively empowered by the presentation of more up to date polymer pitch network materials and elite fortification filaments of glass, carbon and aramid, the infiltration of these propelled materials has seen a relentless extension in utilizations and volume. The expanded volume has come about in an anticipated decrease in expenses. Elite FRP can presently be found in such different applications as composite shielding intended to oppose touchy effects, fuel chambers for petroleum gas vehicles, windmill cutting edges, modern drive shafts, bolster light emissions spans also, even paper making rollers. For specific applications, the utilization of composites instead of metals has in actuality come about in reserve funds of both expense and weight. A few models are falls for motors, bended fairing and filets, trades for welded metallic parts, chambers, tubes, conduits, edge control groups and so on. Further, the need of composite for lighter development materials and then some seismic safe structures has put high accentuation on the utilization of new and propelled materials that not just reductions dead weight yet in addition retains the stun and vibration through custom fitted microstructures. Composites are presently broadly being utilized for recovery/fortifying of prior structures that must be retrofitted to make them seismic safe, or to fix harm brought about by seismic movement. In contrast to customary materials (e.g., steel), the properties of the composite material can be structured considering the auxiliary angles.

S.Mishra et al examined the tractable, sway quality and flexural quality of bio-fiber (pineapple fiber/sisal fiber) strengthened polymer lattice composite with distinctive adjusted surface. The surface alteration of sisal fiber, for example, soluble base treatment created ideal ductile and sway quality, while cyaneoethylation brought about greatest increment in flexural quality of cross breed composite

M. R. Ishak et al has considered and analyzed the mechanical properties of short kenaf bast and main element strengthened unsaturated polyester composites with differing fiber weight portion for example 0%, 5%, 10%, 20%, 30% and 40%. The pressure forming strategy was utilized to set up the

composite examples for malleable, flexural and effect tests in agreement to the ASTM D5083, ASTM D790 and ASTM D256 individually. The general outcomes demonstrated that the composites fortified with kenaf bast fiber had higher mechanical properties than kenaf central element composites. The outcomes likewise demonstrated that the ideal fiber content for accomplishing most elevated rigidity for both bast and center fiber composites was 20%wt. this investigation additionally seen that the lengthening at break for the two composites diminished as the fiber substance expanded. F.Z. Arrakhiz et al., have researched Mechanical properties of Alfa, coir and bagasse filaments fortified

polypropylene (PP) composites. This examination watched expansion of different measure of fortification filaments yielded detectable increments in both tractable and flexural modulus as well as the torsion parameter. It is likewise seen that 56– 75% increments in tractable modulus by the utilization of Alfa, coir furthermore, bagasse while the flexural modulus expanded by 30–47% when contrasted with perfect PP. Maneesh Tewari et al., this work demonstrates a bagasse-glass fiber fortified composite material is created with 15 wt%, 20 wt%, 25 wt% and 30 wt% of bagasse fiber with 5 wt% glass fiber blended in tar. This examination likewise appears Expansion of bagasse filaments diminishes a definitive pliable quality, yet expansion of glass fiber further builds the extreme rigidity in contrast with industrially accessible bagasse based composite. This investigation demonstrates that sway quality increments with Bagasse-glass strengthened strands because of fiber greater flexibility. This examination additionally appeared Expansion of bagasse fiber diminishes bowing quality, however expansion of glass fiber further expands the bowing quality in contrast with economically accessible bagasse based composite.

II. METHODOLOGY

PREPARATION OF MOULDS:
For making the composites a glass trim box was set up with 200X200X3 mm form cavity. The
shape pit is covered with a flimsy layer of watery arrangement of polyvinyl liquor which goes about as a decent discharging operator. Further a meager covering of wax laid over it lastly flimsy layer of polyvinyl liquor was connected. Each coat was permitted to dry for 20 minutes at room temperature. The fiber content in every one of the examples is held as 20grams which is 10% of the absolute load of the example. Another glass embellishment box was set up with 150X150X10 mm shape depression. This is additionally covered with watery arrangement of polyvinyl liquor.
A 3mm thick plate was produced using the epoxy and the hardener in the proportion of 100 and 10 sections by weight separately. At that point the form box was stacked with shape blend and 20 grams of glass fiber and 0 grams of pineapple leaf fiber (PALF) and was set in a vacuum broiler kept up at 1000c for 3 hours to finish relieving. Subsequent to relieving the plate was expelled from embellishment box with straightforward decreasing and it was cut into examples for testing. Similarly other specimens are prepared by varying the weight proportions as shown in above table.

Glass mould to prepare composite material

Extraction of pineapple leaf fibre

GLASS FIBRE

SPECIMEN PREPARATION:

S.NO	GLASS FIBER	PINE APPLE LEAF FIBER
1.	0 grams (0%)	20grams (10%)
2.	5 grams (2.5%)	15 grams (7.5%)
3.	10 grams (5%)	10 grams (5%)
4.	15 grams (7.5%)	05 grams (2.5%)
5.	20 grams (10%)	0 grams (0%)

IV. EXPERIMENTS CONDUCTED:

- Tensile test
- Flexural test
- Impact test
- SEM analysis

TEST	SIZE	STANDARDS
Tensile test	150x15x3mm	ASTMD-3039-76
Flexural test	150x15x3mm	ASTMD-5943-96
Impact test	120x13x3mm	ASTMD-256-88

- Tensile and flexural strength are done with Universal Testing Machine.
- Impact test are done with charpy impact machine.
- SEM analysis are done with specified electron microscope


Universal testing machine

Impact Test Equipment

III. RESULTS AND DISCUSSIONS:

TENSILE:

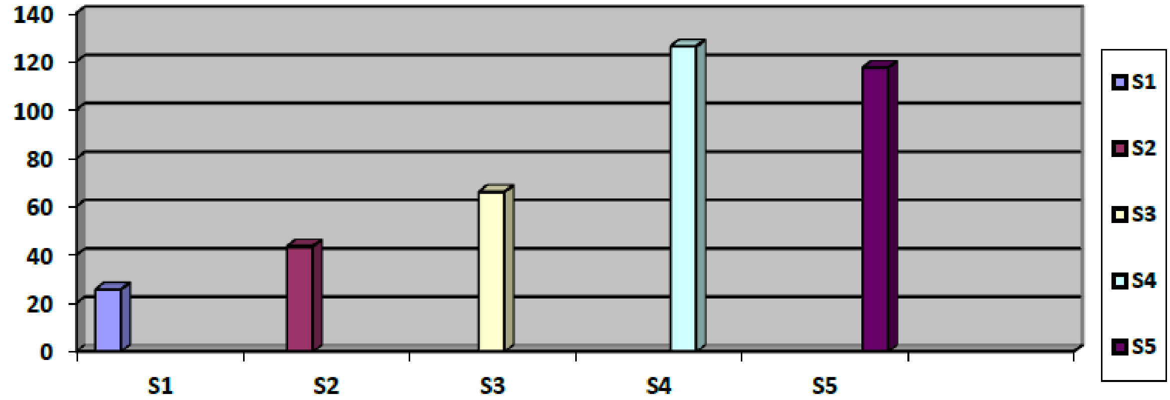


Figure-1 UNITS:Mpa

Figure-1 shows the tensile strength properties of different specimens. The X-axis includes the specimens and the Y-axis includes the tensile strength. The specimen-4 with 15grams of glassfiber and 5grams of PALF gives the better tensile strength when compared to the other specimens and the glassfiber.

FLEXURAL:

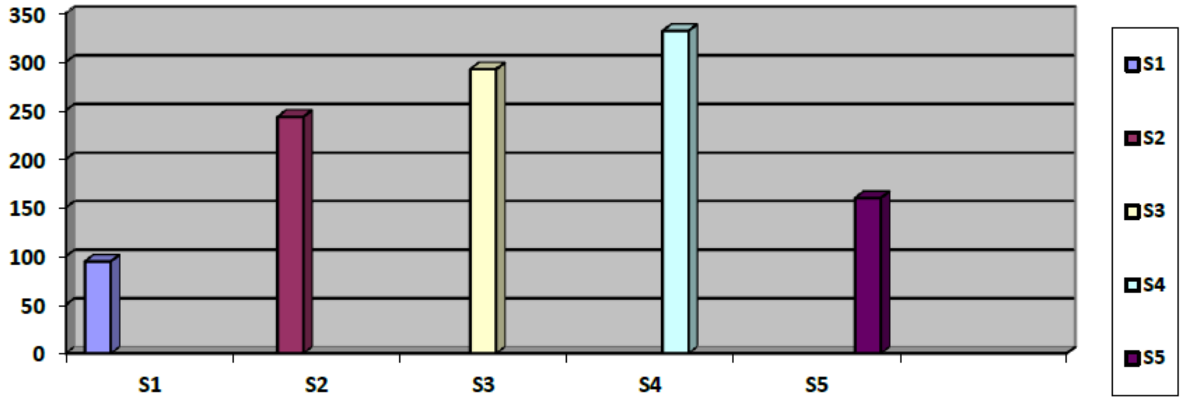


Figure2 UNITS:Mpa

Figure-2 shows the flexural strength properties of different specimens. The X-axis includes the specimens and the Y-axis includes the flexural strength. The specimen-4 with 15grams of glassfiber and 5grams of PALF gives the better tensile strength when compared to the other specimens and the glassfiber.

IMPACT:

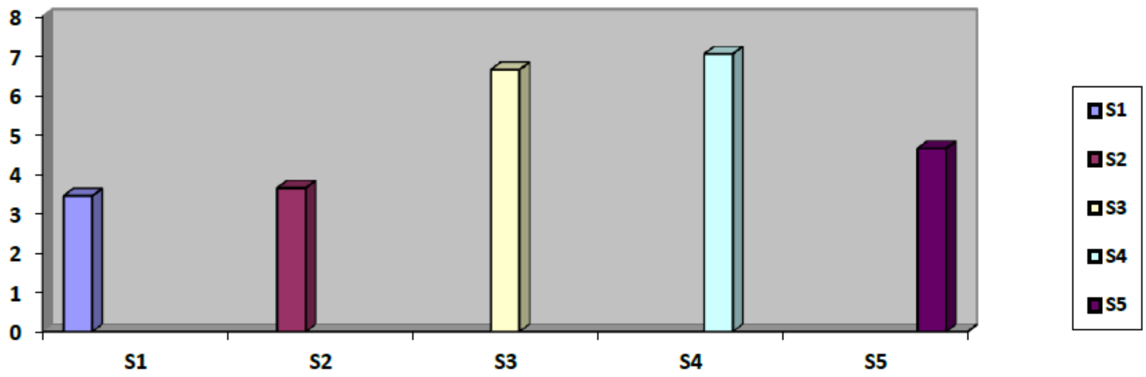


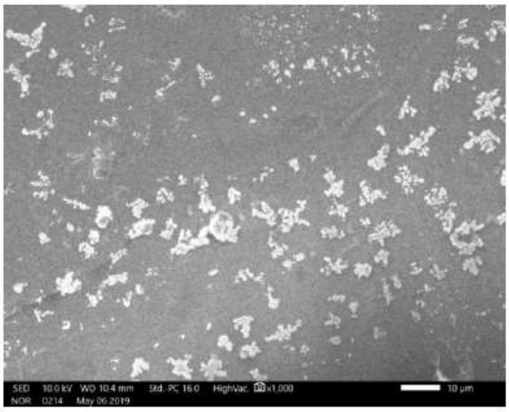
Figure3 UNITS:J

Figure-3 shows impact strength properties of different specimens. The X-axis includes the specimens and the Y-axis includes the impact strength. The specimen-4 with 15grams of glassfiber and 5grams of PALF gives the better tensile strength when compared to the other specimens and the glassfiber.

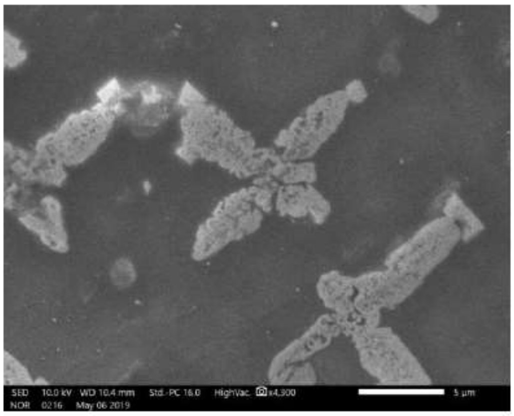
SEM ANALYSIS

A Scanning electron magnifying instrument is a kind of electron magnifying instrument that produces pictures of an example by checking the surface with an engaged light emission. The electrons communicate with iotas in the example delivering different sign that contain data about the surface geography and sythesis of the example. To test the holding between the fortification and framework. The Scanning electron micrograms of broke surfaces of glassfiber fortified epoxy composites were recorded. The micrograms were recorded at various amplifications and areas. Examination of the micrograms of the composites arranged under various conditions is exhibited in the accompanying passages with 20X to 30000x and spatual goals 10,5,2 separately.

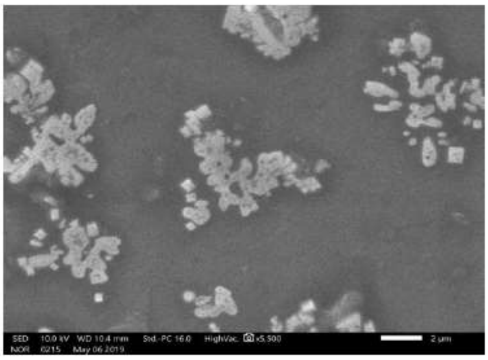
SPECIMEN-1



a



b

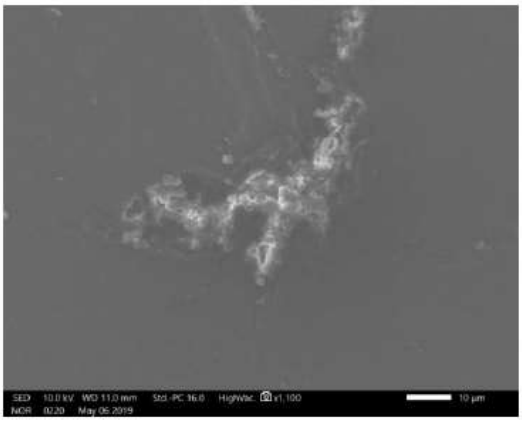


c

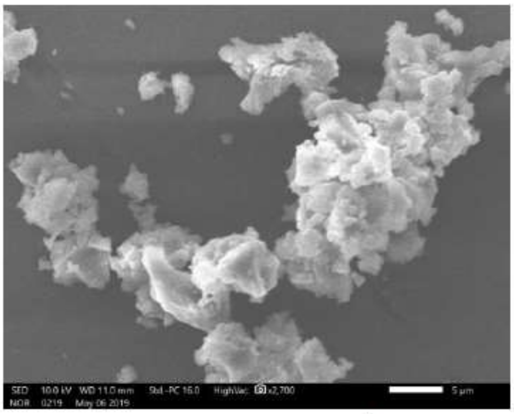
GLASS FIBER	PINE APPLE LEAF FIBER
0 grams (0%)	20grams (10%)

The above figures shows the SEM(Scanning Electron Microscope)Analysis of specimen-1 which shows the micro structure of specimen-1.With three different proportions (10nm,5nm,2nm) with magnification 20X to 30,000X and special resolutions 50nm to100nm and find their microstructure.

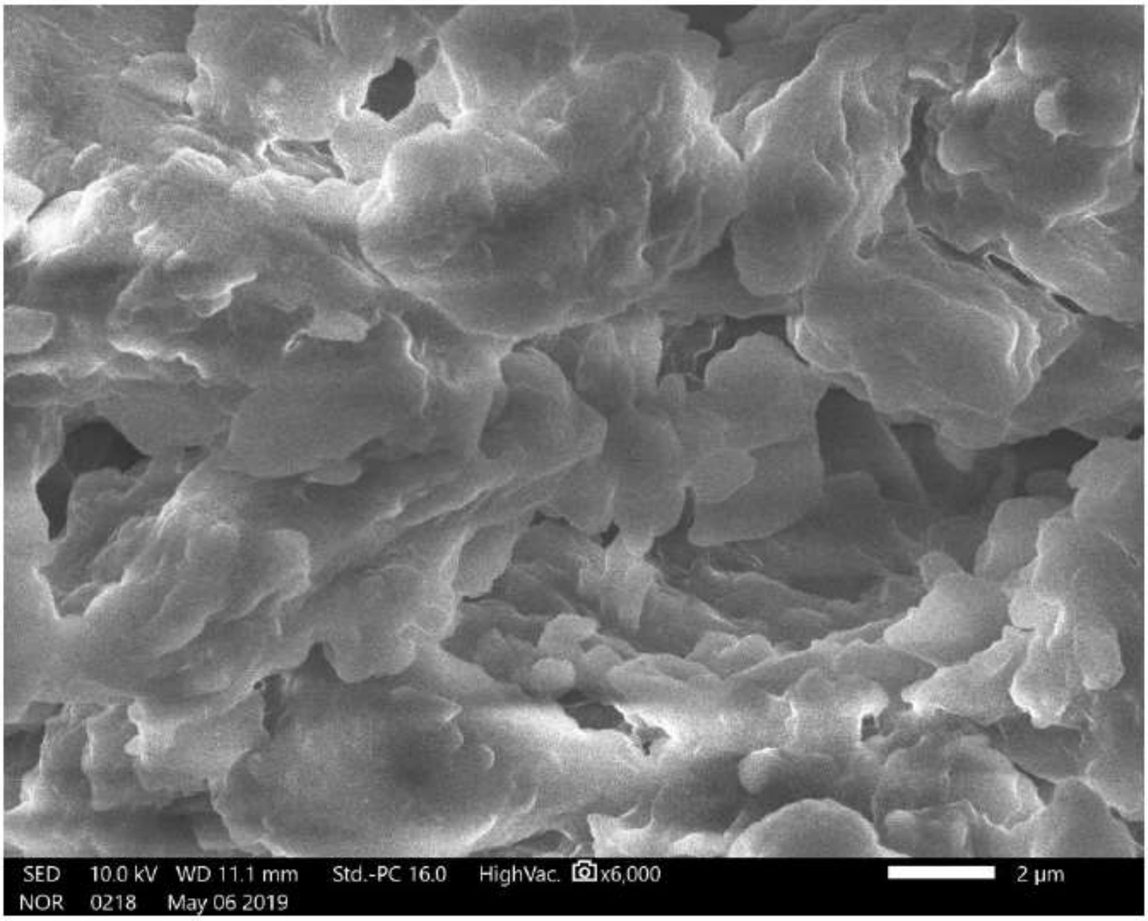
SPECIMEN2



a



b

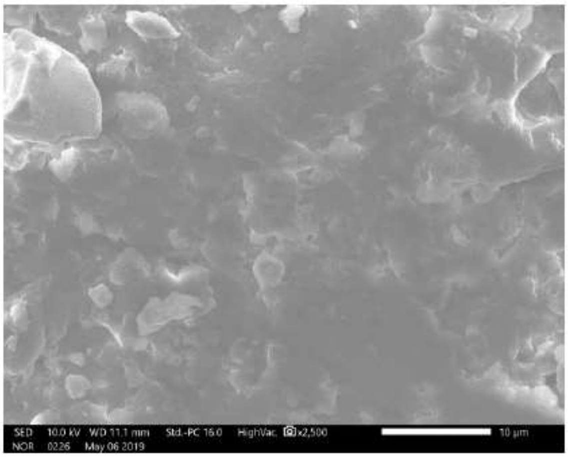


c

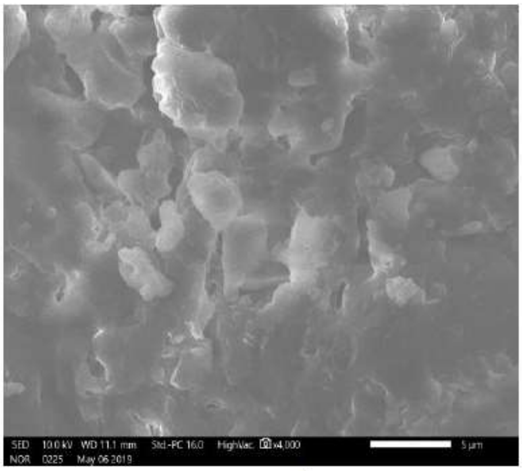
GLASS FIBER	PINE APPLE LEAF FIBER
5 grams (2.5%)	15grams (7.5%)

The above figures shows the SEM(Scanning Electron Microscope)Analysis of specimen-2 which shows the micro structure of specimen-2.With three different proportions (10nm,5nm,2nm) with magnification 20X to 30,000X and special resolutions 50nm to100nm and find their microstructure.

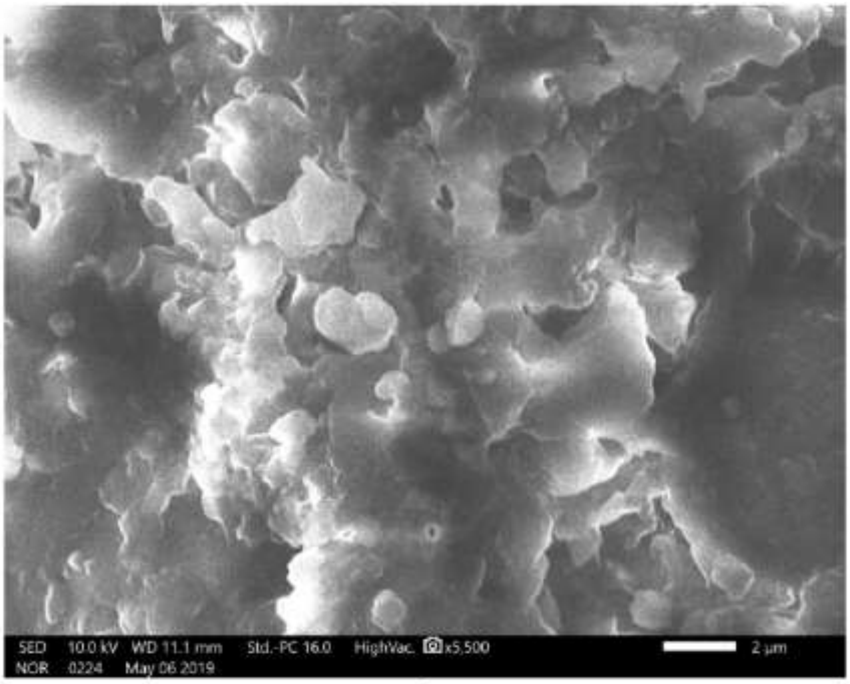
SPECIMEN-3



a



b

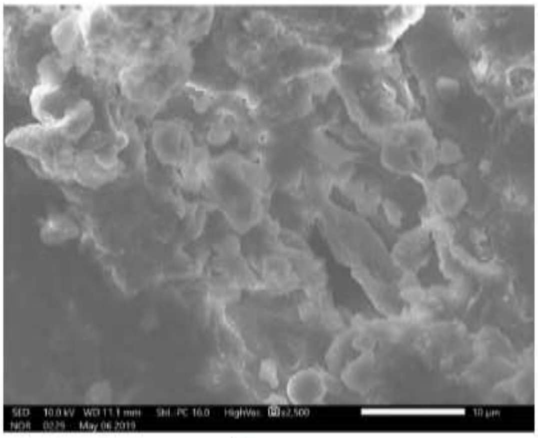


c

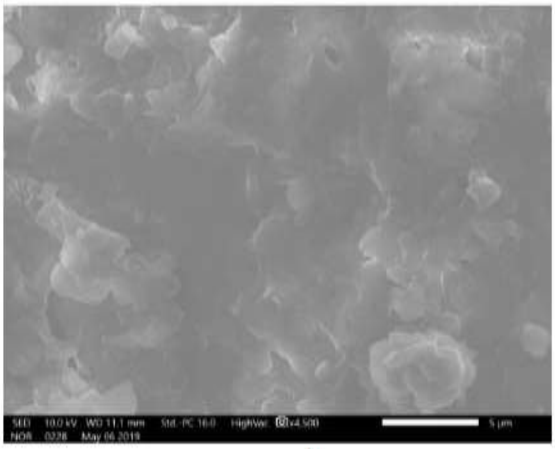
GLASS FIBER	PINE APPLE LEAF FIBER
10 grams (5%)	10grams (5%)

The above figures shows the SEM(Scanning Electron Microscope)Analysis of specimen-3 which shows the micro structure of specimen-3.With three different proportions (10nm,5nm,2nm) with magnification 20X to 30,000X and special resolutions 50nm to100nm and find their microstructure.

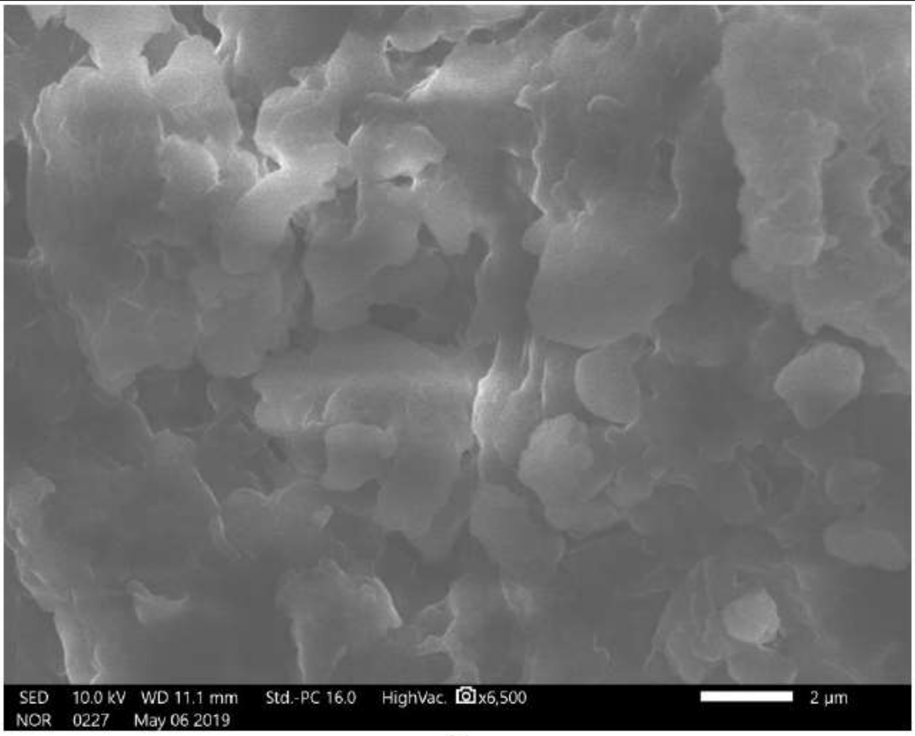
SPECIMEN-4



a



b

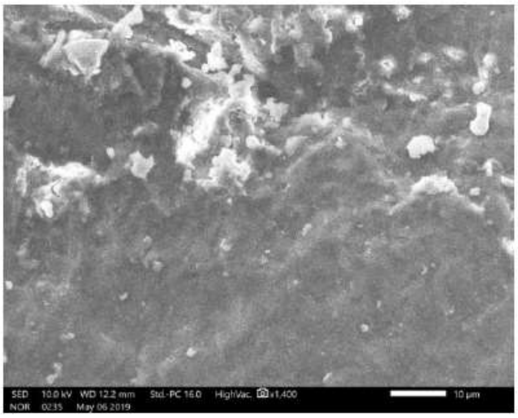


C

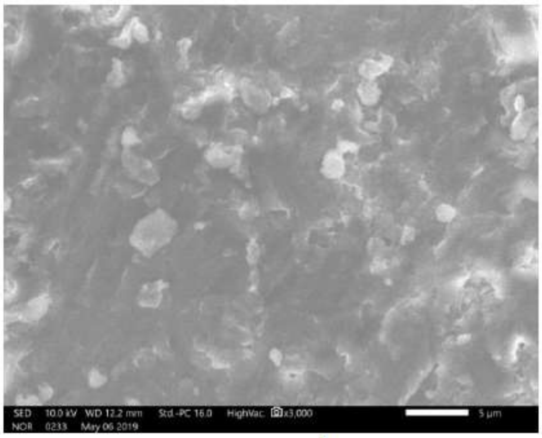
GLASS FIBER	PINE APPLE LEAF FIBER
15 grams (7.5%)	5grams (2.5%)

The above figures shows the SEM(Scanning Electron Microscope)Analysis of specimen-4 which shows the micro structure of specimen-4.With three different proportions (10nm,5nm,2nm) with magnification 20X to 30,000X and special resolutions 50nm to100nm and find their microstructure.

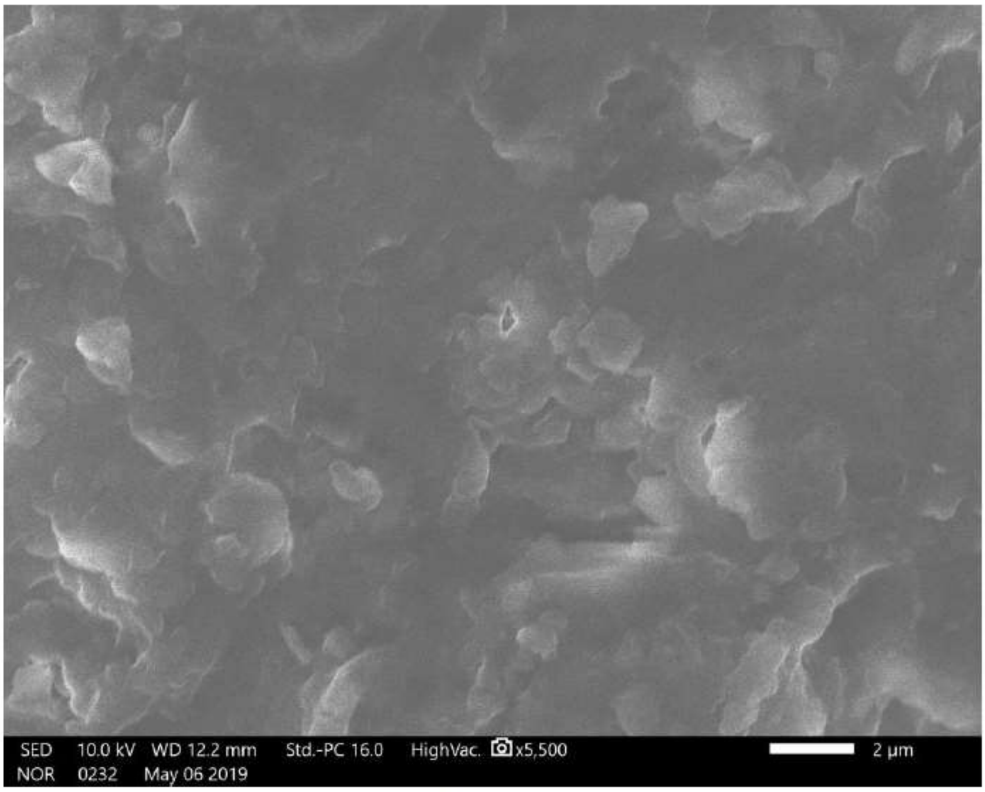
SPECIMEN-5



a



b



c

GLASS FIBER	PINE APPLE LEAF FIBER
20 grams (10%)	0grams (0%)

The above figures shows the SEM(Scanning Electron Microscope)Analysis of specimen-5 which shows the micro structure of specimen-5.With three different proportions (10nm,5nm,2nm) with magnification 20X to 30,000X and special resolutions 50nm to100nm and find their microstructure.

IV. CONCLUSIONS

- The specimen 75% of glass fiber and 25% of PALF in total weight percentage of composite material gives the best tensile strength property compared to the 100% of glass fiber. The tensile strength of glassfiber is 117mpa and the tensile strength of 75% of glass fiber and 25% of PALF is 126.18mpa which is higher than the pure glass fiber, hence the glass fiber can be replaced with PALF for the applications where tensile strength is criteria.

- The specimen 75% of glassfiber and 25% of PALF in total weight percentage of composite material gives the best flexural strength property compared to the 100% of glassfiber. The flexural strength of glassfiber is 159.99mpa and flexural strength of 75% of glassfiber and 25% of PALF is 331.92mpa which is higher than the pure glass fiber, hence the glass fiber can be replaced with PALF for the applications where flexural strength is criteria

- The specimen 75% of glassfiber and 25% of PALF in total weight percentage of composite material gives the best impact strength property compared to the 100% of glassfiber the impact strength of glassfiber is 4.6J and the impact strength of 75% of glassfiber and 25% of PALF is 7.0J which is higher than the pure glass fiber, hence the glass fiber can be replaced with PALF up to certain amount.

- The specimen 75% of glassfiber and 25% of PALF in total weight percentage of composite material gives the best Microscopic structure compared to the 100% of glassfiber because of its closely packed atoms in structure.

REFERENCES:

[1] K.Sabeel Ahmed and S.Vijayarangan, Tensile, flexural and interlaminar shear properties of woven jute and jute-glass fabric reinforced polyester composites, Material Processing Technology;2008;207:330-335.
[2] Maries Idicula, S.K. Malhotra, Kuruvilla Joseph, Sabu Thomas, Dynamic mechanical analysis of randomly oriented intimately mixed short banana/sisal hybrid fiber reinforced polyester composites, Composites Science and Technology;2005;65: 1077-1087.
[3] Yan Li, Yiu-Wing Mai, Lin Ye, Sisal fiber and its composites: A review of recent developments, Composites science and technology; 2000; 60:2037-2055.
[4] M. Jawaid, H.P.S. Abdul Khalil, Azman Hassan, Rudi Dungani, A. Hadiyane, Effect of jute fibre loading on tensile and dynamic mechanical properties of oil palm epoxy composites, Composites:Part B;2012;xx:xxx-xxx. Article in press.
[5] K.Murali Mohan Rao, K. MohanaRao, A.V. Ratna Prasad, Fabrication and testing of natural fiber composites: Vakka, sisal, bamboo and banana, Materials and Design ;2010;31: 508 513.