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Fabrication And Testing of Various Mechanical Property of Fiber Reinforced Polymer Composite

Uvesh Ahmad, Mohammad Seraj, Mohd Faizan Hasan

Department of Mechanical Engineering, Integral University, Lucknow

Abstract – Fiber reinforced polymer (FRP) composites have gained significant attention in various industries due to their superior mechanical properties, lightweight nature, and corrosion resistance. This study focuses on the fabrication and testing of FRP composites to evaluate their mechanical properties. The fabrication process involves the selection of suitable fiber materials, such as jute fiber ,Wood Fiber and the matrix material, commonly epoxy resin, to form the composite. Different fabrication techniques, including hand lay-up, vacuum infusion, and filament winding, are employed to achieve desired fiber orientations and volume fractions. To assess the mechanical properties of the fabricated FRP composites, various testing methods are conducted. Tensile tests are performed to determine the composite's tensile strength, modulus of elasticity, and ultimate elongation. Flexural tests measure the bending strength, stiffness, and deflection behavior of the composites under different loading conditions. Impact tests evaluate the material's resistance to sudden loading and its ability to absorb energy. Furthermore, compression tests analyze the composite's behavior under compressive forces. The results of the mechanical tests provide insights into the performance of FRP composites, enabling engineers and researchers to optimize material selection, fabrication techniques, and design considerations. The effects of fiber type, orientation, volume fraction, and matrix properties on the mechanical behavior of FRP composites are thoroughly investigated. The findings of this study contribute to the development of lightweight and high-strength materials for various applications, including aerospace, automotive, construction, and sporting goods industries. The knowledge gained from the fabrication and testing of FRP composites helps in designing structures that are efficient, durable, and resistant to environmental condiotion.

Key Words**:** Fiber Reinforced Polymer Composite Materials, Jute and Wood Fibers, Testing of Materialss

1. Body of Paper

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Introduction 1.1

The composites business today utilizes various state of the art creation procedures because of endeavors to foster monetarily engaging composite parts. Obviously the expense hindrance can't be cleared just by enhancements in assembling innovation, particularly for composites. . For composites to be merciless with metals, there ought to be an organized effort in plan, material, process, tooling, quality certification, collecting, and even program the board. The composites business has started to see that the business uses of composites vow to offer fundamentally more prominent business open doorways than the flying district by virtue of the sheer size of transportation industry.

Definition of composite 1.2

The most all around utilized importance is the going with one, which has been conveyed by: Jartiz "Composites are multifunctional material designs that give attributes unreasonable from any discrete material. They are strong plans made by truly joining something like two doable materials, different in sythesis and qualities and a piece of the time in structure". The lack of this definition remained in the way that it licenses one to pack among the composites any blend of materials without showing either its expressness or the rules which should given it which recollects that it from other extremely run of the mill, bum blends.

Overview of composite Materials 1.3

Composite materials, polymers, and pottery have ruled as arising materials throughout recent years. Composite materials have steadily expanded in volume and number of purposes, persistently entering and overwhelming new regions. Present day composite materials make up an enormous part of the designed materials market, being utilized in everything from straightforward ordinary things to complex expert applications. As necessary the shift of composite applications from plane to other business utilizes has become unmistakable recently. Consistently connected by the presentation of really state of the art polymer gum network materials and predominant execution support strands of glass, carbon and aramid, the section of these overall materials has seen an anticipated development in utilizations and volume.

Objective of the study 1.4

- The targets and their task are illustrated beneath.
- Manufacture of normal fiber (jute and wood) built up epoxy based composite.
- Assessment of mechanical properties (elasticity, hardness, influence strength and so forth.).
- Other than the over all the objective is to cultivate new class of composites by combining ordinary fiber (jute and wood) building up stages into a polypropylene tar. Likewise this work is supposed to present another class of polymer composite that could track down many designing applications.
- Disintegration investigation of the relative multitude of composites are concentrated by utilizing Taguchi exploratory plan.

Materials and Methods 2.1

In This research we use natural fibers that is jute fiber, wood fiber and Polypropylene (PP) as a matrix. in this research we also used Injection Moulding Machine in order to Fabricate our Product.

Jute Fiber 2.1.1

Jute fiber, derived from the plant species Corchorus, is a natural fiber known for its versatility, eco-friendliness, and unique properties. It is one of the most affordable and abundantly available natural fibers, making it highly accessible for various applications. Jute fiber exhibits exceptional strength, good breathability, and thermal insulation properties, making it suitable for diverse uses such as textile fabrics, rope and twine production, packaging materials, geotextiles, and decorative items. Jute's biodegradability and renewable nature contribute to its appeal as a sustainable material option, as it reduces environmental impact and supports the concept of a circular economy. Furthermore, jute fiber cultivation provides livelihood opportunities for rural communities, contributing to socio-economic development

Wood Fiber 2.1.2

Wood fiber refers to the elongated cells that form the structural framework of wood, consisting of cellulose, hemicellulose, and lignin. These fibers are extracted from wood and have diverse applications in industries such as paper manufacturing, construction, textiles, and composites. They are used as a raw material for paper production, combined with resins to create composite materials like fiberboard and particleboard, processed into insulation for buildings, transformed into textile fibers for fabrics, and even utilized as a renewable source of biofuel. Wood fiber is valued for its strength, versatility, and sustainable nature, making it an important resource in various sectors.

Polypropylene (PP) 2.1.3

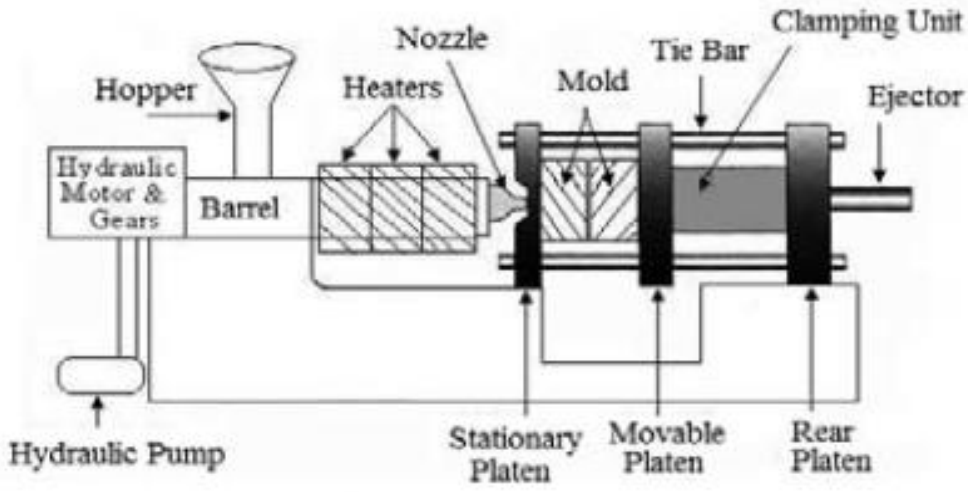
Polypropylene (PP) is a versatile thermoplastic polymer known for its wide range of applications. It is a lightweight, durable, and chemically resistant material that is commonly used in packaging, automotive components, textiles, and medical devices. PP is manufactured through the polymerization of propylene monomers, resulting in a high-strength material with excellent mechanical properties. Its low density makes it ideal for applications where weight reduction is crucial. PP's resistance to moisture, chemicals, and impact allows it to be used in packaging materials, such as bottles, containers, and film. In the automotive industry, PP is utilized for interior and exterior parts due to its impact resistance, thermal stability, and ability to be easily molded. Additionally, PP fibers are used in textiles and non-woven fabrics, while its biocompatibility makes it suitable for medical applications like surgical instruments and implants. Overall, PP's versatility, durability, and cost-effectiveness make it a widely used polymer in various industries.

Injection Moulding Process 2.2

Injection molding is a popular and versatile manufacturing process used to produce a wide range of plastic parts and products. The process involves injecting molten plastic material into a mold cavity under high pressure. First, the mold is prepared by designing and fabricating it to the desired specifications. Then, plastic pellets or granules are melted in a heated barrel and injected into the mold cavity through a nozzle using a screw mechanism. The high pressure ensures that the mold is completely filled. Once the molten plastic is injected, it cools and solidifies within the mold, taking on the shape of the cavity. Cooling can be facilitated by channels or circulating cooling agents. After solidification, the mold is opened, and the part is ejected using ejector pins or plates. The ejected part may require additional post-processing steps such as trimming, surface finishing, or assembly. Injection molding offers advantages such as high production efficiency, the ability to create complex geometries, and the use of a wide range of plastic materials. It finds applications in various industries, including automotive, electronics, medical, consumer goods, and packaging.

Processing of The composites 2.2.1

Fibre Reinforced Polypropylene Composites (FRPCs) are mainly fabricated by Injection Molding
Injection molding methods. Figure shows the type of equipment.



. Figure:4.1 Injection molding machine

Injection molding is a manufacturing process used to produce parts and products by injecting molten material into a mold cavity. It is widely used in various industries to manufacture a wide range of items, from small components to complex parts. Here's a general overview of the injection molding process: Mold Design: A mold is designed based on the specifications of the desired product. The mold consists of two halves, the cavity (which forms the shape of the final product) and the core (which helps create internal features of the product). The mold is typically made of steel or aluminum. Material Preparation: Thermoplastic or thermosetting plastic pellets are melted and mixed to form a molten material. This material is often referred to as the "shot" or "resin." Injection: The molten material is injected into the mold cavity under high pressure. The injection is performed using an injection molding machine, which consists of a hopper, an injection unit, and a clamping unit. Cooling and Solidification: After the molten material fills the mold cavity, it is allowed to cool and solidify. Cooling can be accelerated by circulating coolant or water through channels within the mold. Mold Opening: Once the material has solidified, the mold is opened, and the part is ejected using ejection pins or robotic arms. The cycle time varies depending on the complexity of the part and the material being used. Post-Processing: The ejected parts may undergo additional processes such as trimming, machining, or surface finishing to achieve the desired final product. Key advantages of injection molding include: High production efficiency: Injection molding allows for the mass production of parts with consistent quality. Complex geometries: The process can produce parts with intricate designs, including thin walls, fine details, and complex shapes. Material versatility: A wide range of thermoplastics and thermosetting plastics can be used in injection molding. Cost-effective: Once the initial mold is created, the cost per part can be relatively low, especially for large production runs. Injection molding has revolutionized the manufacturing industry by enabling the efficient and cost-effective production of a wide variety of products. Its versatility, speed, and ability to produce complex parts make it a popular choice for many industries, including automotive, consumer goods, medical devices, and electronics

Injection Moulding Parameters 2.2.2

INJECTION MOULDING PARAMTERS	VALUE
Volume	50 cm (flat specimen) 44 cm (tensile specimen) 42 cm (bending specimen)
Injection Pressure	Variable according to fibre content
Switch-Over Point	12 cm
Injection rate	50 cm
Holding Pressure	650 bar
Holding time	20 s
Residual Cooling time	30 s
Screw rotational speed	15 m/min
Back Pressure	32 bar
Decompression Volume	5 cm
Decompression Rate	5 cm
Temperature of the first zone	150°C
Temperature of the second zone	155°C

Temperature of the third zone	160°C
Temperature of the fourth zone	175°C
Temperature of the fifth zone	180°C
Temperature of the Mould	25°C

Mechanical Property Evaluation 3.1

In This research we basically evaluate Three Types of Mechanical Property in order to Test our Fabricated Product that is Tensile Test on Universal Testing Machine, Hardness Test on Brinell Hardness Machine as well as Impact test Charpy Pendulum Impact Testing Machine.

REVIEW OF LITERATURE

Fiber-built up polymer composites (FRPCs) definitely stand out in different businesses because of their remarkable mechanical properties and lightweight nature. This writing audit plans to give an outline of the manufacture strategies and testing procedures utilized to assess the mechanical properties of FRPCs. The audit examines the key variables affecting mechanical execution and features ongoing progressions in testing procedures. Furthermore, it presents the difficulties and open doors for future exploration in this field

Wang and Huang [1] had taken a coir fiber stack, characters of the strands were dissected. Length of the filaments was in the show up at a few spot in the extent of 8 and 337 mm. The filaments complete with the length degree of 15~145 mm was 81.95% of all deliberate strands. Weight of strands with the length degree of 35~225 mm tended to 88.34% of all appraisal. The standard fineness of the coir strands was 27.94 tex. Longer filaments consistently had higher widths. Composite sheets were made by utilizing a power press machine with the coir

Harish et al. [2] made coir composite and mechanical properties were surveyed. Looking at electron micrographs got from break surfaces were used for an emotional evaluation of the interfacial properties of coir/epoxy and differentiated and glass fibers. fiber as the help and the versatile as structure. Versatility of the composites was inspected

Nilza et al. [3] use three Jamaican normal cellulosic fibers for the arrangement and creation of composite material. They took bagasse from sugar stick, coconut coir from the coconut husk and banana trunk from banana plant. Tests were presented to state regulated tests, for instance, garbage and carbon content, water ingestion, clamminess content, versatility, fundamental examination and compound assessment.

Bilba et al. [4] analyzed Two filaments from Jute and wood before their circuit in cementitious cross segments, to configuration defending material for development. Warm debasement of these strands was amassed some spot in the extent of 200 and 700 °C under nitrogen gas stream. Temperature of pyrolysis was as far as possible reviewed. The strong stores got were investigated by dated key evaluation, Fourier Change Infra Red (FTIR) spectroscopy and were seen by Isolating Electron

Microscopy (SEM). This study has shown (1) the relationship between regular, compound relationship with both constraint of fiber in the tree and kind of tree; (2) the expedient and remarkable rot of banana strands with expanding temperature of pyrolysis and (3) the horrible models are made of void fiber

Conrad [5] analyzes the relationship between the transport of lignin and gelatin and

the stacking of Pb and Zn on coir. The coir contained basically of xylem and a fiber sheath. The lignin was similarly scattered in the cell walls of the fiber sheath, but in the xylem, there was no unmistakable substance in the compound community lamella, and a more unassuming substance of lignin in the discretionary walls than in the walls of the fiber sheath. The really perceptible substance of gelatin in the fiber sheath walls was in the middle lamella, cell corners and extracellular network, while in the xylem, the gelatin was evenhandedly dispersed in the wall, with a higher concentration in the middle lamella and cell corners. All cell walls facing the lacuna had a high fulfilled of gelatin. Clear connection between's the stacking of metal particles and the flow of lignin or gelatin, these assessments point at no association with lignin and a positive relationship with gelatin.

Passipoularidis and Philippidis [6] studied the effect of damage gathering metric, predictable life graph definition and cycle counting technique on life assumption plans for composite materials under factor abundancy (VA) stacking. Results show that a net improvement is achieved when direct strength defilement is done as damage metric in life assumption plans, over the top tier PM summation.

Din et al. [7] investigated the liquid stage adsorption of phenol onto coconut shell-based incited carbon for its equilibrium studies and dynamic showing. Coconut shell was changed over into magnificent started carbon through physiochemical incitation at 850 ◦C impacted by CO_2 stream. Quite a bit early, the coconut shell was carbonized at 700 ◦C and the came about burn was impregnated with KOH at 1:1 weight extent. A movement of bunch adsorption tests were driven with early on phenol obsessions going from 100 to 500mgl−1, adsorbent stacking of 0.2 g and the adsorption cycle was stayed aware of at 30±1 ◦C. Manufactured reaction was seen as a rate-controlling limit to this phenol-CS850A cluster adsorption structure due to strong simultaneousness with the pseudo-second-demand engine model. Adsorption limit with respect to CS850A was considered to be 205.8mgg−1.

Rao et al. [8] targets introducing new ordinary strands used as fillers in a polymeric matrix enabling production of judicious and lightweight composites for load conveying structures. An assessment of the extraction frameworks of vakka, date and bamboo fibers has been embraced. The cross-sectional shape, the thickness and manageable properties of these fibers, close by spread out strands like sisal, banana, coconut and palm, are settled probably under similar conditions and contemplated. The fibers introduced in the ongoing survey could be used as a strong help for making composites, which partake in an extra advantage of being lightweight.

Dicket al. [9] direct static and cyclic 4-point curving tests on glass-filled polycarbonate, to accumulate results for appraisal of a speculative model on its ability to predict the shortcoming life and the leftover strength after the cyclic stacking The survey assesses the effects of stacking conditions, for instance the tension extent and the best sensation of uneasiness, on the damage progression. The paper displays the possibility imparting all of the model limits as a component of single variable that is pressure extent, most outrageous nervousness, or a material-subordinate steady.

Ersoy and Kucuk [10] explored the sound ingestion of a cutting edge squander, made during the treatment of tea leaves. Three particular layers of tea-leaf-fiber waste materials with and without help given by a lone layer of woven material texture were pursued for their sound ingestion properties. The preliminary data show that a 1 cm thick tea-leaf-fiber waste material with help providessound ingestion which is for all intents and purposes indistinguishable from that given by six layers of woven material texture. Twenty millimeters thick layers of rigidly maintained tea-leaf-strands and non-woven fiber materials show basically tantamount sound maintenance in the repeat range some place in the scope of 500 and 3200 Hz.

Jacquemin et al [11] proposed a logical micromechanical self-reliable methodology devoted to mechanical states forecast in both the fiber and the lattice of composite designs submitted to a transient hygroscopic burden. The reality subordinate perceptible burdens, at utilize, not entirely set in stone by utilizing continuum mechanics formalism. The unwavering quality of the new methodology is checked, for carbon-epoxy composites, through an examination between the neighborhood stress states determined in both the pitch and fiber as per the new shut structure arrangements and the same mathematical model.

Wang et al. [12] analyzed the strong warm conductivity update of carbon fiber composites using a three-layered numerical system Beginning a more sensible three-layered transport of fibers dissipated in an organization stage is reproduced by a made sporadic age improvement method to kill the distorted between fiber contacts by the two-layered reenactments. The energy transport regulating conditions are then handled through the three-layered structures using a high-efficiency framework Boltzmann plot. The resultant assumptions agree well with the available preliminary data. Differentiated and the ongoing speculative models, the ongoing methodology doesn't depend on exploratory limits which should be settled each case in turn case, with the objective that it is important for plan and upgrade for new materials, past assumption and examination just for existing composites.

Yetgin et al. [13] focused on the tension and manageable tests for five unmistakable adobe mixes. The huge piece of this audit involved uniaxial compressive tests got done with customary fiber mixes. Appropriately, the results got from mechanical tests were presented as tension strain diagrams. Moreover, mechanical properties were associated with the water content for value, unit weight and fiber things and discussions were given. The results show that as fiber content additions, compressive and inflexible characteristics decrease, and shrinkage rates decline.

Rahman et al. [14] focused on a shallow level treatment of the coir fiber and its mechanical properties. Fiber surface change by ethylene dimethylacrylate (EMA) and eased under UV radiation. Pre-treatment with UV radiation and mercerization were done before joining together to chip away at the physico-mechanical execution of coir fibers. The effects of mercerization on shrinkage and fiber weight setbacks were seen at different temperature and solvent base concentration. That is the thing they saw, fiber shrinkage is higher at low temperature and 20% salt treated coir fibers yielded most noteworthy shrinkage and weight mishaps. It was found that higher shrinkage of the polymer joined fiber showed redesigned physico-mechanical properties. The joining of solvent base treated fiber shows an addition of polymer stacking (around 56% higher) and flexibility (around 27%) than half EMA joined fiber. The fiber surface geology and the versatile break surfaces were depicted by separating electron microscopy and were found better interfacial sticking to the modified fiber-system interface.

Philippidis [15] concentrated as a result of damage assortment metric, consistent life graph plan and cycle counting method on life assumption plans for composite materials under factor plentifulness (VA) stacking. Results show that a net improvement is achieved when direct strength debasement is done as mischief metric in life figure plans, over the state of the art PM summation.

Nilza et al. [16] utilize three Jamaican regular cellulosic strands for the plan and assembling of composite material. They took bagasse from sugar stick, banana trunk from banana plant and coconut coir from the coconut husk. Tests were exposed to state administered tests, for example, debris and carbon content, water assimilation, dampness content, elasticity, natural investigation and synthetic examination

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Wang et al. [18] investigated the strong warm conductivity improvement of carbon fiber composites using a three-layered numerical methodology Starting a more reasonable three-layered dissemination of strands dissipated in a network stage is copied by a made sporadic age advancement strategy to clear out the misrepresented between fiber contacts by the two-layered proliferations. The energy transport supervising conditions are then settled through the three-layered structures using a high-capability lattice Boltzmann plot. The resultant assumptions agree well with the available preliminary data. Differentiated and the ongoing speculative models, the ongoing methodology doesn't depend on trial limits which should be settled each case in turn case, so it is useful for plan and improvement for new materials, past assumption and examination just for existing composites.

RESULTS AND DISCUSSIONS

The experimental outcomes are shown and talked about in this segment. Normal upsides of three replications of the Tractable test, Hardness test and the Effect test.

Tensile Strength

The malleable tests were performed utilizing a testing machine model 8889. The width and the thickness of the examples were estimated and recorded (360 mm by 20 mm by 5 mm). The malleable tests were completed by ASTM D 038-01. The elastic qualities were determined from this test.

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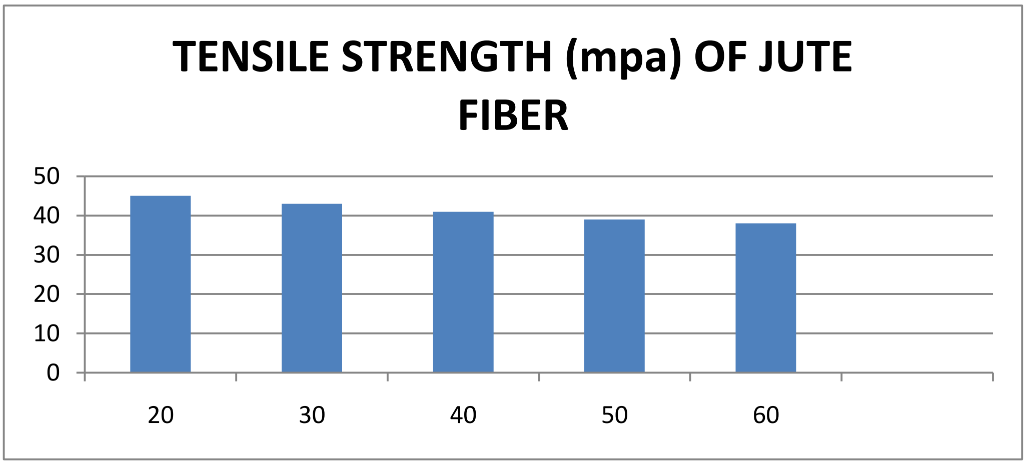
Table 6.1 Tensile Properties of Jute fibre

S NO.	Weight of jute fibre (gm)	Weight of PP (gm)	Maximum Stress (MPa)
1	20	250	49
2	30	250	46
3	40	250	44
4	50	250	42
5	60	250	40

Graph 6.1



On testing on Universal Testing Machine The tensile strength was achieve as per 20 gm of jute fiber and 250gm of Polypropylene (PP) we get Maximum Permissible Stress is 45mpa similarily on 30gm,40gm,50gm,60gm we get Maximum Permissible stress(mpa) is 49,46,44,42 and 40 respectivily

Table 6.2: Tensile properties of wood fiber

S NO.	Weight of wood fibre (gm)	Weight of PP (gm)	Maximum Stress (MPa)
1	20	250	34
2	30	250	35

3	40	250	41
4	50	250	42
5	60	250	44

Graph 6.2

similarly on wood fiber Tensile strength The Maximum Permissible stress (mpa) is 34,35,41,42,44 on Flax fiber weight ratio that is 20,30,40,50,60(gm) Respectively.

6.3 Impact Strength

The impact strength of jute laminate hybrid composites is presented in Below table. It is observed that the laminate composite is exhibiting higher impact strength than the wood reinforced composite. The jute hybrid composite impact strength is higher than wood reinforced composite but lower than glass fiber reinforced composite.

Table 6.3: Impact Properties of jute fibre

S NO.	Weight of jute fibre (gm)	Weight of PP (gm)	Impact Strength (KJ/m2)
1	20	250	12
2	30	250	15
3	40	250	17
4	50	250	20
5	60	250	24

Graph 6.3

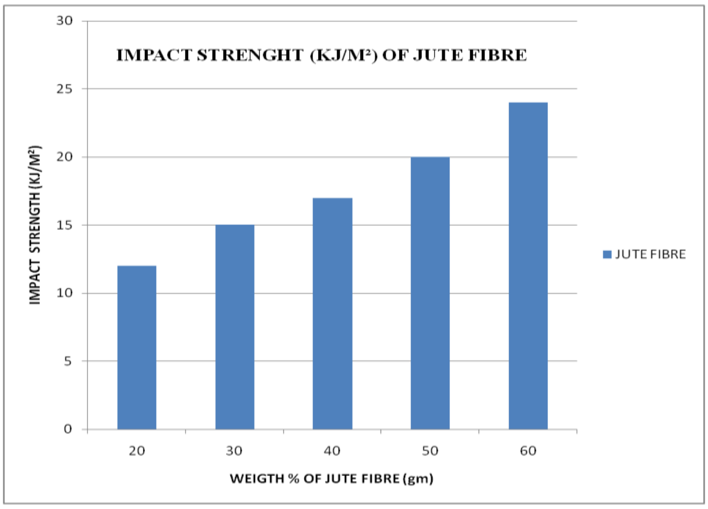


Table 6.4: Impact Properties of wood fibre

S NO.	Weight of wood Fiber (gm)	Weight of PP (gm)	Impact Strength (KJ/m2)
1	20	250	30
2	30	250	27
3	40	250	25
4	50	250	22
5	60	250	20

The Impact Testing test was conducted on Charpy Pendulum Impact Testing Machine the Impact load is applied on the specimen 20,30,40,50,60 Respectively and the impact strength is achieved 30,27,325,22,20 (KJ/M^2).

Hardness Test

The Hardness test of jute and wood fibres composites is presented in Below Table. It is observed that the laminate composite is exhibiting hardness.

Table 6.5: Hardness Properties of Jute fibre

S NO.	Weight of jute fibre (gm)	Weight of PP (gm)	Hardness (HRB)
1	20	250	47
2	30	250	52
3	40	250	56
4	50	250	60
5	60	250	65

Graph 6

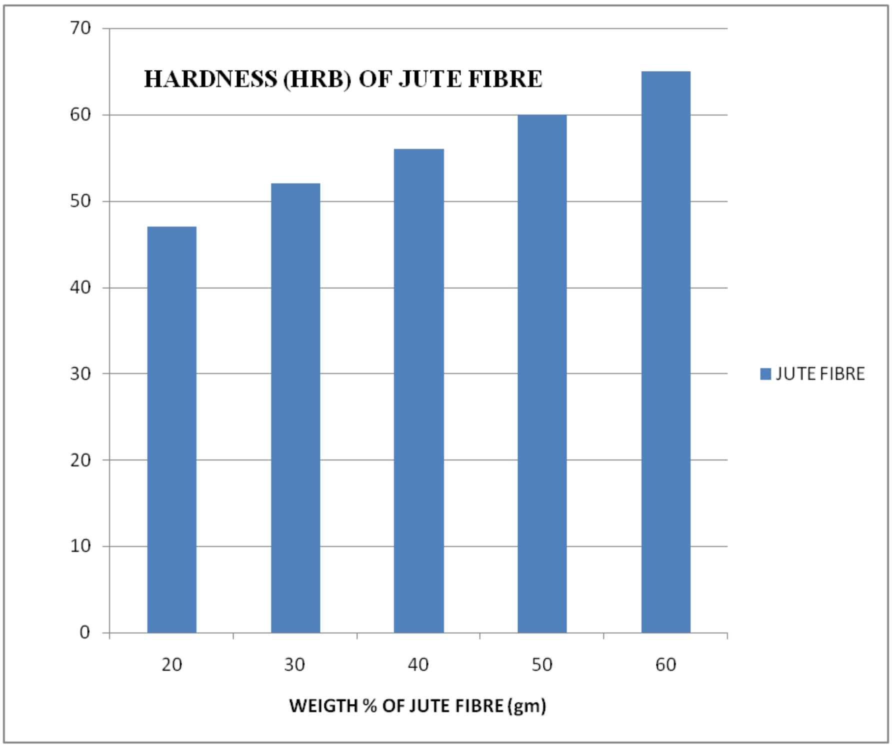


Table 6.6: Hardness Properties of wood fibre

S NO.	Weight of wood fibre (gm)	Weight of PP (gm)	Hardness (HRB)
1	20	250	65
2	30	250	63
3	40	250	59
4	50	250	56
5	60	250	62

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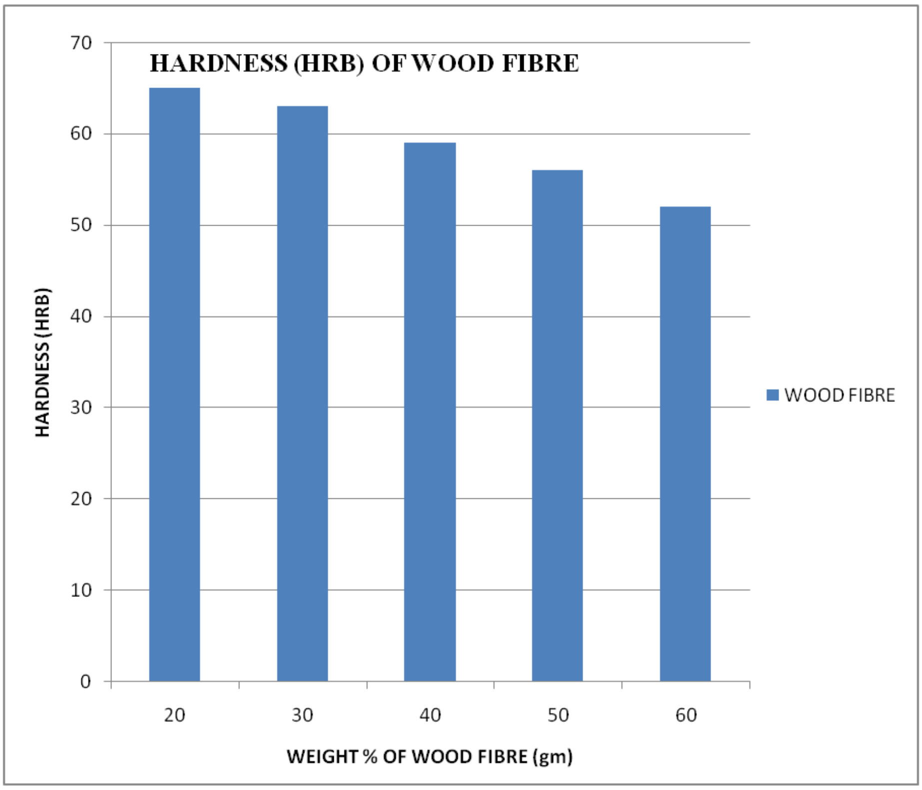
Graph 7



The hardness test was conducted on Brinell Hardness Machine. 20,30,40,50,60 are the weight percentage of the wood fiber. The hardness achieved in the test is 65,63,59,56,62 Respectivily

Author with specimen of jute and wood fiber composites

Final Product

CONCLUSION

NFRPCs certainly stand apart over the span of late numerous years. PP is an insignificant cost thermoplastic polymer, which has a couple of brilliant properties. Various fibers are upheld with PP to prepare composites. Among ordinary strands are by and large used as help with PP. Jute and wood with composites have commonly superb mechanical properties. Among ordinary strands, flax fibers are solid areas for incredibly when upheld with PP produce composites having extraordinary mechanical properties. Fiber adjustment can fabricate the mechanical properties of FRPCs pleasantly. Surface of fibers can be modified by medications like alkalization/mercerization, oxidation, diazotization, and so on to additionally foster fiber-PP connection which will achieve more conspicuous mechanical strength. Solidification of coupling expert like MAPP in appropriate total in the assembling of FRPCs will fabricate the mechanical properties of FRCPs. The possible destiny of FRPCs has every one of the reserves of being stunning, considering the way that PP is a negligible cost lattice. Future investigation should focus in on the improvement of mechanical properties of FRCPs. Future investigation should in like manner focus in on the replacement of made fibers by customary strands contemplating the regular truth. Development in the strength of ordinary fibers developed polypropylene composites through various drugs of typical strands to get best connection between typical fibers and PP will help with superseding customary fiber upheld polypropylene composites.

REFERANCES

1. Rodriguz E, Petrucci R, Puglia D, Jose MK and Vazauez A. Characterization of composites based on natural and glass fibers obtained by vacuum infusion. J Compos Mater 2005; 39(3): 265–282.

2. Han SO, Lee SM, Park WH and Cho D. Mechanical and thermal properties of waste silk fiber reinforced poly(butylenes succinate) bio composites. J Appl Polym Sci 2006; 100(6): 4972–4980.

3. Mohanty S, Sushil VK, Sanjay NK and Sudhansu TS. Influence of fiber treatment on the performance of sisal polypropylene composites. J App Polym Sci 2004; 94(3): 1336–1345.

4. Seung-Hwan L, Siqun W, George MP and Haitao X. Evaluation of interphase properties in a cellulose fiber-reinforced polypropylene composite by nanoindentation and finite element analysis. Compos Part A 2007; 38(6): 1517–1524.

5. Ganster J, Fink HP and Pinnow M. High-tenacity man-made cellulose fibre reinforced thermoplastics—injection moulding compounds with polypropylene and alternative matrices. Compos Part A 2006; 37: 1796–1804.

6. Ljungberg N, Cavaille JY and Heux L. Nanocomposites of isotactic polypropylene\ reinforcedwith rod-like cellulose whiskers. Polymer 2006; 47(18): 6285–6292.

7. Han-Seung Y, Wolcotta MP, Hee-Soo K, Sumin K and Hyun-Joong K. Properties of lignocellulosic material filled polypropylene biocomposites made with different manufacturing processes. Polym Test 2006; 25: 668–676.

8. Abdelmouleh M, Boufi S, Belgacem MN and Dufresne A. Short natural-fibre reinforced polyethylene and natural rubber composites: Effect of silane coupling agents and fibres loading. Compos Sci Technol 2007; 67(7–8): 1627–1639.

9. Srikanth P, Shaoqin G, Eric O, Liqiang Y and Roger MR. Polylactide-recycled wood fiber composites. J App Polym Sci 2009; 111: 37–47.

10. Tartakowski Z and Pietrzak-Mantiuk A. Resistance of high-content polypropylene/wood composites to low-current arc discharges. Polym Test 2006; 25: 342–346.

11. Geum-Hyun D, Sun-Young L, In-Aeh K and Young-To K. Thermal behavior of liquefied wood polymer composites (LWPC). Compos Struct 2005; 68: 103–108.

12. Borysiak S, Paukszta D and Helwig M. Flammability of wood polypropylene composites. Polym Degrad Stabil 2006; 91: 3339–3343.

13. Van de Velde K and Kiekens P. Effect of material and process parameters on the mechanical properties of unidirectional and multidirectional flax/polypropylene composites. Compos Struct 2003; 62: 443–448.

14. Jonn AF, Wayne YC, Danny EA, Roy BD and Patricia AL. Enzyme-retted flax fiber and recycled polyethylene composites. J Polym Environ 2004; 12(3): 171–165.

15. Keener TJ, Stuart RK and Brown TK. Maleated coupling agents for natural fibre composites. Compos Part A 2004; 35: 357–362.

16. Bos HL, Mu¨ssig J and van den Oever MJA. Mechanical properties of short-flax-fibre

reinforced compounds. Compos Part A 2006; 37: 1591–1604.

17. Angelov I, Wiedmer S, Evstatiev M, Friedrich K and Mennig G. Pultrusion of a flax/polypropylene yarn. Compos Part A 2007; 38(5): 1431–1438.

18. Baley C. Analysis of the flax fibres tensile behaviour and analysis of the tensile stiffness

increase. Compos Part A 2002; 33(7): 939–948.

19. Yuanjian T and Lianghua X. Hemp fiber reinforced unsaturated polyester composites. Adv Mater Res 2006; 11-12: 521–524.

20. Pracella M, Chionna D, Anguillesi I, Kulinski Z and Piorkowska E. Functionalization, compatibilization and properties of polypropylene composites with hemp fibres. Compos Sci Technol 2006; 66: 2218–2230.

21. Pickering KL, Beckermann GW, Alam SN and Foreman NJ. Optimising industrial hemp fibre for composites. Compos Part A 2007; 38: 461–468.

22. Gosline JM, Denny MW and DeMont ME. Spider silk as rubber. Nature 1984; 309: 551.

23. Khan MMR, Masuhiro T, Yasuo G, Hideaki M, Giuliano F and Hideki S. Physical properties and dyeability of silk fibers degummed with citric acid. Biores Technol 2010; 101(21): 8439–8445.

24. Somashekar R and Gopalkrishne Urs R. Crystal size distribution in pure nistari silk fibres. Polymer 1993; 34(13): 2711–2713.

25. Grı´nia MN, Andrea CDR, Carlos APL, Carlos G, Olga ZH, Bronislaw P, et al. Preparation and characterization of ethanol-treated silk fibroin dense membranes for biomaterials application using waste silk fibers as raw material. Biores Technol 2010; 101(21): 8446–8451.

26. Khondker OA, Ishiaku US, Nakai A and Hamada H. A novel processing technique for thermoplastic manufacturing of unidirectional composites reinforced with jute yarns. Compos Part A 2006; 37(12): 2274–2284.

27. Thi-Thu-Loan D, Shang-Lin G and Ma¨der E. Jute/polypropylene composites, I. Effect of matrix modification. Compos Sci Technol 2006; 66: 952–963.

28. Ranaa AK, Mandala A and Bandyopadhyay S. Short jute fiber reinforced polypropylene

composites: Effect of compatibiliser, impact modifier and fiber loading. Compos Sci Technol

2003; 63: 801–806.

29. Fung KL, Xing XS, Li RKY, Tjonga SC and Mai YW. An investigation on the processing of sisal fibre reinforced polypropylene composites. Compos Sci Technol 2003; 63: 1255–1258.

30. Joseph PV, Kuruvilla J and Sabu T. Effect of processing variables on the mechanical properties of sisal fiber-reinforced polypropylene composites. Compos Sci Technol 1999; 59: 1625–1640.