Review on Design and Development of Jute Epoxy Composite Laminate and Investigate Tensile Strength Validate by FEA software

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Abstract

The objective of present study is to utilize the advantages of naturally available fiber material like jute. On unique combination the jute composite material shows improvement in mechanical properties of material. The present review indicate the progress and advantages of jute in combination with resins The Epoxy resins used in industry due to its mechanical properties. It also having lowest cost, easy to process but it possesses some disadvantages like brittleness & hence it is limitedly used.
Keywords: Natural fiber, Jute fiber, Epoxy, Tensile Strength

I. INTRODUCTION

Natural fibers already have been used 3000 years ago in composite system in Egypt where straw and clay are mixed to build the walls. Over last decades polymer composite reinforced with natural fiber increases demand in both academic as well as in industrial field The widely availability of natural fiber used as reinforcement or as a filler materials. The most important type of natural fibers available are Jute, sisal, banana, skin fiber animal fiber, leaf fiber. The natural fibers can be used in natural fiber to reinforce both thermosetting & thermoplastic matrices

The thermosetting resins such as epoxy, polyester are used in natural fiber composite.

The jute is majorly found in Bangladesh & also some regions of India and widely used with composite materials due to moderate mechanical properties. Jute is natural fiber, available at lowest cost and eco-friendly in nature. During last few years the fiber reinforced polymer increasers its demands.

The jute is an important natural fiber used in composite materials due to its following advantages

1) It has high low density.
2) It has low abrasion behavior to processing equipments.
3) It has good dimensional stability
4) The use of jute is harmlessness.
5) It is eco-friendly.
6) Easily available at lowest cost.

It has following applications

1) Automobile industry.
2) Construction industry.
3) Aerospace industry
4) Marine industry.

II. LITERATURE REVIEW

A. *M. R. Hossain, M.A.Islam, A. V. Vuurea, I. Verpoest.[1]*

The purpose of this study is to investigate tensile strength of jute composite for that purpose jute composite are made with vacuum assisted resins infiltration. In this jute fibers are arranged in sequence of 0/0/0/0, 0/+45/-45/0 & 0/90/90/0 for all cases 25 % jute fiber was considered. The tensile test of devolved composite was compared with experimental test results. In case of0/0/0/0/0 & 0/+45/-45/0 lamina composite higher longitudinal tensile strength is obtained than that of transverse direction.

B. *U.S. Bongarde, V.D.Shinde [2]*

This study is carried out for review on natural reinforced polymer composite. The natural reinforced polymer composite was having high demand in fundamental research & industrial application. The fiber reinforced composite are renewable, cheap & recycling. They are found there application in automobiles, aerospace, railway coaches, military equipments, building construction materials etc. The natural fiber are consistently used in industry due to low density and cheap as compared to other composite materials the

fiber reinforced polymer having capacity to replace the use of glass fiber composite in application of low load bearing capacity the variety natural fiber available are Animal fiber, Leaf fiber, Mineral Fiber, plant fiber, seed fiber, fruit fiber etc. The natural fiber along with their advantages having disadvantages therefore they are limitedly used. The natural fibers are having high moisture absorption capacity to overcome these problems some chemical treatments are done to modify surface properties.

C. *N Saria Sahreen, Dr. E.V. Subba Reddy, H. Raghvendra Rao [3]*

The composite is structural material that consists of two or more items that are combined at microscopic level & in combined conditions they are insoluble with each other. In this research is made to prepare two different phase 1St is to reinforcement & 2nd is to prepare matrix. The matrix material provides support and surrounded by reinforced material. The reinforced material like fiber, partials, flakes. By using matrix material it provides relative position and transfer load between reinforced components.

The fibers are divided in to two group 1st is natural fiber & 2nd is synthetic fiber. The natural fiber includes Bamboo, Sisal, Jute, etc & synthetic fiber includes polyester, polypropen, etc.

The selected fiber must consist of following properties,

1) It should not be toxic.
2) It should have high flash point.
3) It should have exposure to chemical properties.

After fabrication of glass & jute fiber composite test specimens are tested on universal testing machine & it is concluded that the glass & jute fiber composite shows effect of fiber weight on the mechanical properties of materials.

D. *M.K.Gupta,R.K.Srivastava,Himanshu Bisaria[4]*

The natural fibers are may be replacement for synthetic fiber. The advantages of synthetic fiber are low cost, low density, easy availability, & renewable. This paper is rewive on mechanical properties of jute fiber reinforced polymer composite. During this study the mechanical properties such as tensile strength, impact, on jute fiber reinforced polymer are analyzed.

Fiber reinforced polymer composite consist of matrix of thermo set or thermoplastic composite and fiber like natural and synthetic at high strength. The jute is cheapest vegetable fiber found in Bangladesh as well as in India the jute finds its application in cloths bags, floor mats etc. during fabrication of jute fiber reinforced polymer composite different types polymers are used such as Epoxy, polyester, vinyl are used. The jute fiber reinforced composite is better replacement for synthetic fiber due to advantages like easy availability, low cost, eco-friendly. For fabrication of JFRPC different methods are used such as hand layup, filament winding, injection molding. To make specimen of JFRPC different orientation and weight fractions are considered. The JFRPC find its application in cloths, bags, chairs, tables, door panels, roofing, packing materials, kitchen sinks etc.

E. *Temesgen Berhanu, Pradeep Kumar, Indradeep Singh[5]*

Jute fiber is used as reinforcement material in the development of engineering application. The jute fiber matrix has ability to make replacement for synthetic fibers. During this study jute fiber polypropen composite was fabricated by considering weight percentage from 30-50%. The behavior of weight with increase or decrease in % was elaborated with mechanical proprieties. The fabricated specimen was tested on the universal testing machine as per ASTM standard specification. The natural fiber is best option for synthetic fiber in polypro pen composite. However the demand of natural fiber is increase due to its natures like eco-friendly, non-toxic and easy availability. The natural fiber with polymeric composite finds its applications in construction industry, furniture, tables, and automobile components. The efficiency of natural fiber composite is obtained by bonding matrix. The raw material used as polypro pen and jute while polypro pen is used as matrix and jute is used as fabric material. The tensile strength and flexural strength of fabricated specimen was conducted on universal testing machine. At 40% of weight calculation jute fiber reinforced composite shows high tensile strength.

F. *Dr. Ali Hubi Haleem[6]*

The epoxy resins are widely used in industry due to better mechanical & physical properties. However the epoxy resins having certain limitation due to properties like brittleness. In this work polymeric composite was fabricated with unique combination of jute & glass fiber. The arrangement is made in (0-90) orientation. The fabricated specimen was tested for modulus of elasticity, toughness, and fracture. The conducted tests shows that the jute reinforced laminate having better properties than single use of resins. The jute play as important role as filler material in combination with glass material. The use of jute fiber improves toughness of material the reinforced epoxy resins in combination with jute shows increase in modulus of elasticity.

G. *D.Vermal, P.C.Gope, M.K.Maheswari, R.K.Sharma[7]*

A composite material is made up of combination of two or more materials. For that purpose long fiber and matrix are preferred. However India is hub of natural fibers like jute, bamboo, Sisal, Banana they are easily available and cheap and hence they are in combination with composite found application building industry, hospitality, automobile industry, etc. the present study was carried out to give exposure for bagass fiber polymer composite having low strength as compared to hybrid fiber but they have design flexibility, cheap & non toxic. By some chemical treatment the bagass fiber finds its application in furniture's, electronic equipment, packaging industry.

III. CONCLUSION

From literature review it can be seen that the composite materials having high strength to weight ratio, light weight. The availability of natural fiber having potential for replacement of synthetic fiber as well as conventional materials like wood, metal etc. The material scientist focused on the natural reinforced composite with jute, sisal, coir, pineapple, banana etc. The jute is attractive natural fiber used for reinforcement in composite because of its low cost renewable, low energy requirement for processing. Jute as a natural fiber used for making cloths, cords, bags & geo textile materials. Therefore jute composite can ensure very effective and value added application for the natural fiber.

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