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Evaluation of Variable combination of Epoxy resin and bamboo composite of different fiber size

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Abstract- Development of the composites with natural fibers and fillers as a sustainable alternative material for some engineering applications, This paper discusses with different length fiber of bamboo (5,10,15mm) with epoxy resin. The combination of 15%,30% and 45% with weight ration of epoxy resin and bamboo taken into mould which is created by combination of wood and metal for fix size . Properties of Composite made of different composition tetes flexural testing , Impact testing and hardness-testing machine.it is observed that some properties increase and for some fiber length and weight ration effect of length show the maximum variation for the performance of weight. This composite has vast application in boat, cycle and aero industry. The results were studied and compared with the conventional materials and it process. It was observed that the material developed can be used in structural applications with strong dependence on its mechanical properties.

Keywords:- Epoxy resin, hardener, flexural test, Impact test, Hardness test

I Introduction:-

Composite materials are materials made from two or more constituent materials with significantly different physical or chemical properties, that when combined, produce a material with characteristics different from the individual components. Due to continues development of world we need composite material is combination of two or more material with different chemical and physical properties with different densities when the combines the new material show some good properties material the good examples of reinforced concreate and masonry. Classification of composite of different two level the first classification based on binder(matrix) combination .the main composite organic matrix composite, metal matrix composite and ceramic matrix composite. Increasing concern about global warming and depleting petroleum reserves have made scientists to focus more on the use of natural fibers such as bagasse, coir, sisal, jute etc. This has resulted in creation of more awareness about the use of natural fibers based materials mainly composites [1]. In past decade there has been many efforts to develop composites to replace the petroleum and other non-decaying materials based products. The abundant availability of natural fiber in India gives attention on the development of natural fiber composites primarily to explore value-added application avenues [2]Composite material are generally used for buildings, bridges and racing car. First composite best rust obtain during concreate mixture the reinforcement receives support from the matrix as the matrix surround the reinforcement and amanitas relative position. In India various natural material available such as bamboo, jute, banana etc. this natural fiber useful to create high strength material by making composite. The steps to economic development composted very helpful for development of world for proper investigation to get good strength material the main combination should be obtain by proper combination of wood and epoxy resin.

II Methodology:-

First step is extraction of bamboo straps from source the cutting of bamboo should be 5mm,10mm and 15mm this size should be maintain for taking the ring of bamboo of 5mm,10mm and 15mm then drying under sun light such way that the water percentage should minimum so that maximum combination obtain then add the epoxy resin with proper percentage of harder this helpful for proper combination of mixture of hardener then this mixture add on mould this mould size should be fix then curing it in 24hr then take universal testing and compression test the result should be plot on graph paper then we calculate the value of the result then we decide the best result.

2.1 Bamboo rings

III Materials

1) Epoxy resin
2) Hardener
3) Bamboo fiber

3.1 **Epoxy resin:** - Araldite AW106 IN this epoxy resin is use for this process. Epoxy resin also known as polyepoxides are class of reactive prepolymers and polymers, which contain epoxide groups. Epoxy resins may be reacted either with themselves through cataltstic homopolymerization.

3.2 **Hardener** :- Hardener HV 953 IN is use for the test the hardener is component of certain type of mixture is used simply to increase the resilience of the mixture once it sets. A hardener may be also be known as accelerant.

3.3 **Material Composition**

Composite	**Composition**
A-1	Epoxy(85wt%)+Short bamboo fiber of length 5mm (15wt%)
A-2	Epoxy(70wt%)+Short bamboo fiber of length 5mm (30wt%)
A-3	Epoxy(55wt%)+Short bamboo fiber of length 5mm (45wt%)
A-4	Epoxy(85wt%)+Short bamboo fiber of length 10mm (15wt%)
A-5	Epoxy(70wt%)+Short bamboo fiber of length 10mm (30wt%)
A-6	Epoxy(55wt%)+Short bamboo fiber of length 10mm (45wt%)
A-7	Epoxy(85wt%)+Short bamboo fiber of length 15mm (15wt%)
A-8	Epoxy(70wt%)+Short bamboo fiber of length 15mm (30wt%)
A-9	Epoxy(55wt%)+Short bamboo fiber of length 15mm (45wt%)

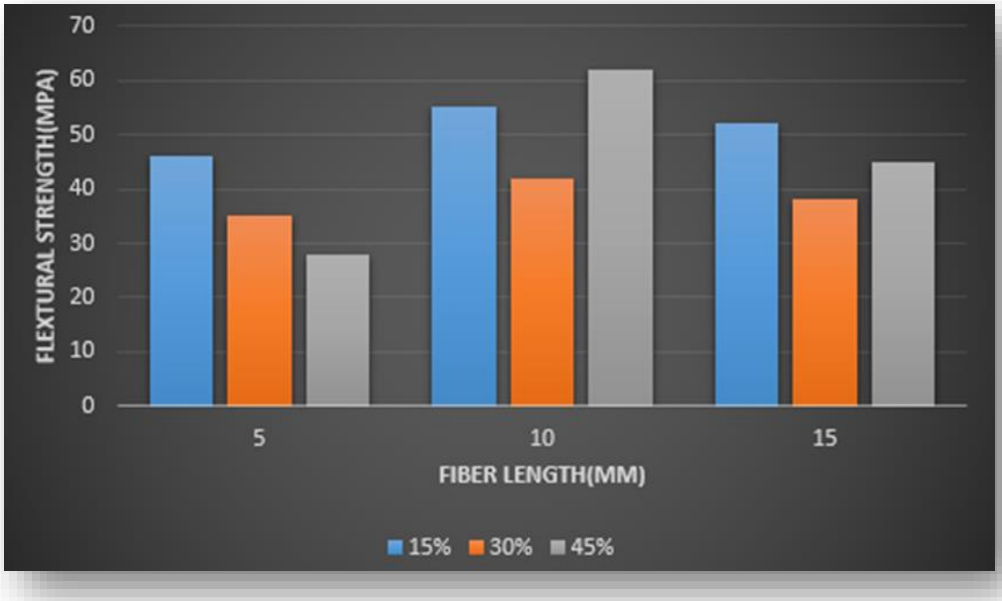
Each test has total 9 sample should be taken so 27 samples are use of different combination .we use sample as different name for identification of result

3.3 Test specimens

IV Testing

4.1 **Flexural test** :-

Flexural strength is defined as the ability of a composite by virtue of which it opposes the deformation likely to be imparted to it under the application of load. The effect of fiber loading and fiber length on flexural strength of composites is shown in Figure 4.1. Flexural test carried out on universal test machine test performed that a material is gripped at both ends by an apparatus which slowly pulls lengthwise the test uses a flat specimen of rectangular cross section where the load is gradually applied with a speed of 1mm per minute until the specimen fails at the given load. The test is accompanied by three point bend test. Flexural strength for bamboo reinforced polymer composite increases with increasing fiber loading and then decreases. The same results comply for fiber length as well. The linearly increasing trend of flexural strength with increasing fiber contents suggests that the bonding between the fibers and the matrix is relatively good.

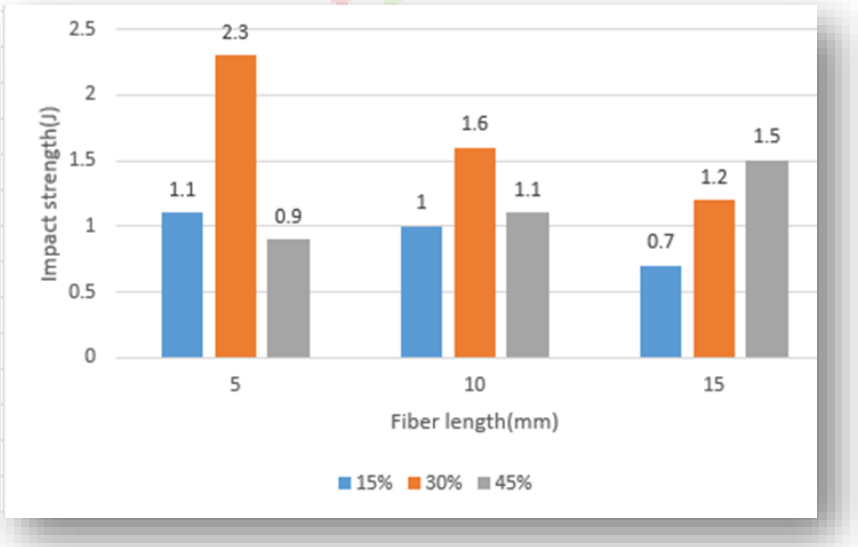


4.1 Flexural Test result

flexural strength in this case varies with varying composition and it is found that the strength goes on increasing with increasing percentage of fiber in the composite for each length of fiber. The flexural properties measured in the present work are well compared with various earlier investigators , though the method of extraction of bamboo fiber is different. The tensile modulus indicates the relative stiffness of a material and can thus be obtained from stress strain diagram . Optimum value of flexural strength for the composite is found to be at 30% fiber loading for each length of fiber. The highest value for flexural strength is for 30% fiber loading for a fiber length of 10 mm.

4.2 **Impact test** :-

Impact tests are conducted by loading the test specimen between two plates and then applying a force to the specimens by moving the crossheads together. During the test the specimen is applied high force on specimens verses the applied load is recorded

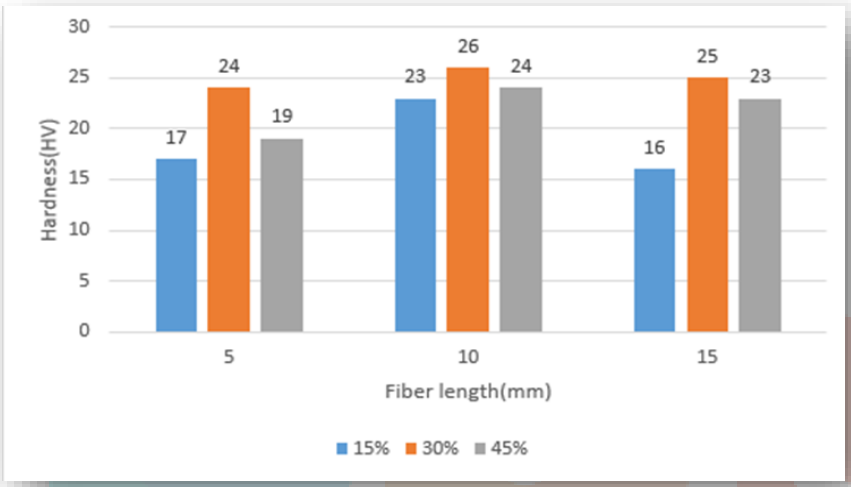


4.2 Impact Test result

The decrease in impact strength or smaller variation in strength may be due to induce micro spaces between the fiber and matrix polymer, and as a result causes numerous microcracks when impact occurs, which induce crack propagation easily and decrease the impact strength of the composites.. The highest value for Impact strength is for 30% fiber loading for a fiber length of 5 mm.

4.3 **Hardness test**:-

Hardness in this case varies with varying composition and it is found that the strength goes on increasing with increasing percentage of fiber in the composite for each length of fiber. The hardness properties measured in the present work are well compared with various earlier investigators , though the method of extraction of bamboo fiber is different. Optimum value of harness for the composite is found to be at 30% fiber loading for each length of fiber. The highest value for hardness for 30% fiber loading for a fiber length of 10 mm.



4.3 Hardness Test result

V Conclusion:

i)Composite of epoxy resin and bamboo can be easily fabricated

ii) Good results obtained for fiber length 10mm and epoxy resin 30% using flexural strength

iii)During Impact strength it is observed that when fiber length is 5mm and epoxy resin is 30% maximum strength observed.

iv) Optimum value of harness for the composite is found to be at 30% fiber loading for each length of fiber.

v)The highest value for hardness for 30% fiber loading for a fiber length of 10 mm.

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