

Experimental of Mechanical Properties in Glass Fiber by using Epoxy and Polyester Resin

D. Kumaravel, E. Gopinath

Abstract: Alkali Resistant Glass Fibers are designed specifically for use in concrete. It is made from a specially developed glass composition of zirconium dioxide which is appropriately used in concrete. It is to evaluate and compare the physical and mechanical properties of laminates prepared of different composition of Glass fiber. In this experiment, two specimens with different composition was taken and prepared by using hand layup method. Tensile test, Impact test and Brinell hardness test were carried out and their performances were evaluated. In this experiment, composite was subjected to water absorption test. From the result, property of two specimen was compared and analyzed.

Keywords : composite, epoxy, glass fiber, , polyester resin

I. INTRODUCTION

Composites have gained such lot recognition attributable to their process benefits and smart technical properties like strength, density, impact, stiffness, modulus, creep rate and damping. Composite is one which is made with more than two materials to obtain the required property. At present, composite play a vital role in industrial application. By selecting the proper material for composite, quality of the product can be improved. Most composite materials have a bulk section which continuously referred to as the matrix and one spread non-continuous section referred to as the reinforcement which is tougher and stronger. Glass fiber is a typical reinforcing material for thermosetting matrices having numerous structural applications.

II. EXPERIMENTATION

Resin is a viscous substance of plant or artificial origin that is usually convertible into polymers. In this project epoxy and polyester resin were used. By the addition of 150 milliliter of hardener to one litre of resin and mix it gently for 2 minutes, the epoxy resin was prepared. In a same way, by the addition of 10 milliliter of peroxide and 15 milliliter of accelerator with one litre of resin, the polyester was prepared. The details of the various composite materials are given in Table-I. The composite specimens as per the above combination were prepared by hand layout method with the dimensions of 250mm x 250mm x 10mm. The setup is kept undisturbed for 24 hours in the room temperature for the matrix to set properly. The prepared composites were cut for testing as per American Society for Testing and Materials.

Table- I: Composite Detail

S.No.	Material Description	Material Details
1	Specimen 1	Fiber+ Epoxy resin
2	Specimen 2	Fiber + polyester



Fig. 1. Composite prepared by Hand layup Process.

III. TESTING AND RESULT

A. Tensile Test

The composite specimen was cut as per American Society for Testing and Materials standard. Specimen prepared by polyester withstand the load up to 55 KN, but epoxy mixed specimen break within 18 KN load. Hence, it was noticed from the testing result that, the fabricated composite specimen polyester has shown the greater improvement when compared to epoxy. The details of the tensile test reading are shown in Table-II.



Before test

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After test

Fig. 2. Tensile test specimen

Table- II: Tensile test result

Specimen	Yield Load (KN)	Ultimate Load (KN)	Breaking Load (KN)
Specimen 1 (Polyester)	65	70	55
Specimen 2 (Epoxy)	21	26	18

B. Charpy Test

Hardness property of fabricated composite specimen was evaluated with the aid of impact testing machine. The composite specimen was prepared as per American Society for Testing and it was noticed that, the hardness property of epoxy specimen had high impact strength of 7.125 J/m². The values of the impact test are shown in Table-III.



Before Test



After test

Fig. 3. Charpy test specimen

Table- III: Charpy test result

Specimen	Impact Energy Observed (J)	Impact Strength (J/m ²)
Specimen 1 (Epoxy)	537	7.125
Specimen 2 (Polyester)	353	6.875

Specimen 1 (Epoxy)	570	7.125
Specimen 2 (Polyester)	550	6.875

C. Brinell Hardness Test

Brinell technique applies a preset check load to an inorganic compound ball of fastened diameter that is command for a preset period of time. The ensuring impression is measured with a specially designed Brinell magnifier. The BHN value of two specimen are shown in Table-IV.

Table- IV: Hardness test result

Specimen	Ball Diameter (mm)	Load Applied (Kg)	Diameter Indentation (mm)	BHN
Specimen 1 (Epoxy)	10	1000	7	22.27
Specimen 2 (Polyester)	10	1000	8	15.91

D. Water absorption test

Water absorption test was conducted on composite material to find the capability of material to withstand water during industrial application. In this experiment, material was made to dry for one hour at 40°C and cool up to room temperature. It is done by immersing the material in water for 24 Hrs and compares the weight of composite before and after immersion. From the result, absorption property can be obtained.



Before test



After test

Fig. 4. Water absorption test

Table- V: Water absorption test result

Specimen description	Weight before test (gm.)	Weight after 24 hours (gm.)
Specimen 1 (Epoxy)	35.3	37
Specimen 2 (polyester)	53.7	53.8



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IV. CONCLUSION

This experiment shows that successful fabrication of glass fiber with Epoxy and Polyester resin composites is possible and very cost effective by simple hand lay-up technique. Testing was done on two specimens with different composition and result was analyzed. It is concluded from the above testing that the Glass fiber with Epoxy resin having good hardness and impact strength as compare with polyester. But the specimen made with polyester having good tensile property.

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