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Research Article

FABRICATION AND STUDY THE MECHANICAL PROPERTIES OF ALKALINE UNIDIRECTIONAL LONG KENAF FIBER WITHOUT ANY FILLER REINFORCED POLYMER COMPOSITES

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A B S T R A C T

The Tensile stress, Bending stress and Hardness of Alkaline kenaf fabric reinforced composites were evaluated and compared with those normal polyester resin and observe the improvements in the properties. The test samples were fabricated using the Hand layup process and the specimens were out in accordance with the ASTM standards. The kenaf fiber was added in steps of 10%, 20%, 30%, 40% and 50%. It was found that the mechanical property increased with increasing content. Maximum value was determined. Addition of Alkaline and kenaf fiber shows an improvement in the tensile strength, hardness, Bending strength of fabric-reinforced polyester composites.

INTRODUCTION

Composites are now extensively being used for rehabilitation/ strengthening of pre-existing structures that have to be retrofitted to make them seismic resistant, or to repair damage caused by seismic activity. Unlike conventional materials (e.g., steel), the properties of the composite material can be designed considering the structural aspects. In some instances, best results may be achieved through the use of composites in conjunction with traditional materials.

METHODOLOGY

Materials

Polyester resin is an unsaturated, thermosetting resin produced by a reaction between several organic acids and polyhydric alcohols. It is most commonly used in the construction of molded reinforced fiber and composite products. The polyester resin used in most molding applications is a viscous liquid requiring the addition of catalysts and accelerators to complete the curing process. Polyester resins are contact products which require no pressure to cure and can be cured from a fluid or solid state. Although these products have several distinct disadvantages when compared to other commonly used composite resins, they still offer an attractive balance of ease of use, low cost, and positive physical characteristics. The dried and cleaned fibers (Figure. 4.3) were used for preparation of banana fabric. Plain weave fabric was prepared in a simple handloom machine having fabric count of 22 x 22 (per inches) that is 22 fibers in warp (longitudinal) direction and 22 fibers in weft (crosswise) direction per inch. In the present work plain weave fabric (mat) was used.

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1. Polyester resin
2. Curing system
3. Accelerator or promoter: Cobalt napthenate
4. Catalyst: Methyl Ethyl Ketone Peroxide

Panel Fabrication

Hand lay-up technique is used to prepare specimen. The working surface was cleaned with thinner to remove dirt and a thin coat of wax is applied on the surface to get smooth finish. Then a thin coat of polyvinyl alcohol (PVA) is applied for easy removal of mould. Kenaf fiber are cut to the required dimensions for test specimen pre-impregnated with matrix material and placed one over the other in the mould. Casting was cured under light pressure for 2 hours before removal of mould. All test specimens were molded and prepared according to ASTM-D standard to avoid edge and cutting effect, thereby minimizing stress concentration effect. Specimen length, width, gauge length, depth and configuration for each test and required cross head speed are clearly specified.

Modeling and Analysis

Standards, dimensions and configuration of composite test specimen

Sl. No.	Specimens Tested	ASTM-A370 Standard	Length A (mm)	Width B (mm)	Depth D (mm)	Gauge lengthe (mm)
1	Tensile	638	165	20	3	54
2	Bending	790	80	12.7	3	---

Tensile Test Specimen

Figure 1

Bending Test Specimen

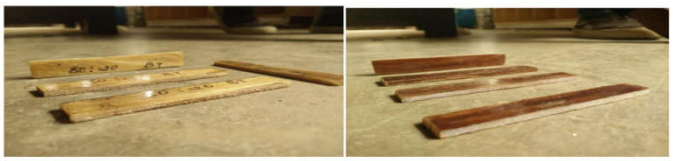

Figure 2

Hardness Test specimen

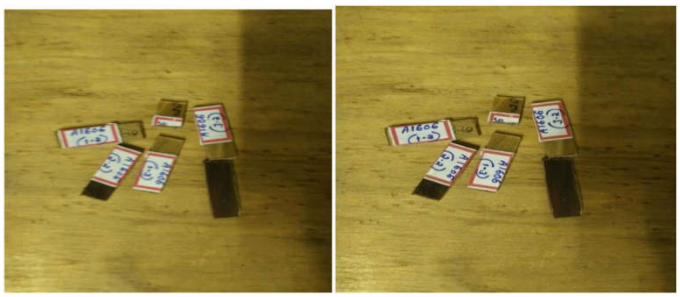

Figure 3

RESULTS AND DISCUSSION

Compostion	Tensile stress
(90-10)%	90.23 MPa
(80-20)%	55.89 MPa
(70-30)%	35.35 MPa
(60-40)%	45.48 MPa
(50-50)%	37.18 MPa

Compostion	Hardness number
(90-10)%	78
(80-20)%	78
(70-30)%	79
(60-40)%	80
(50-50)%	81

Compostion	Bending stress
(90-10)%	27.969 MPa
(80-20)%	22.4389 MPa
(70-30)%	31.623 MPa
(60-40)%	4.898 MPa
(50-50)%	10.58 MPa

CONCLUSION

The following points are the conclusions drawn from the experimentation of Kenaf reinforced Epoxy Matrix Composites.

1. The present investigation revealed that different composition of fibre influences the improved or enhanced properties of composites.
2. The maximum Tensile stress is obtained for composites reinforced with 10 wt. % fibre (NaOH Treated) i.e. 90Mpa
3. The maximum bending stress is obtained for composites reinforced with 30% wt. % fibre (NaOH Treated) i.e. 31.623Mpa.
4. The maximum Shore D hardness number obtained for composites reinforced with 50% wt fibre (NaOH Treated) i.e 81.

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