Tensile Strength of Teak Wood Saw Dust – Cashew nut shell liquid resin composites

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***Abstract*—over the last few decades there has been a considerable development in the field of composites and has been extensively used in various applications. Because of the fact that composite materials possess high stiffness, high strength and less weight. In the past few years natural fibers are being used in the field of composites. The reason is that natural fibers are environment ecofriendly, low cost of raw materials. In this present experiment, composite materials prepared using Cashew nut shell liquid (CNSL) resin as matrix and Teak Wood Saw Dust as reinforcing agents were tested for their tensile strength.**

Keywords: Natural fiber, Composite, Cashew nut shell liquid, Teak Wood Sawdust

Nomenclature used:

1. SD – Saw Dust

2. CNSL – Cashew Nut Shell Liquid

I. INTRODUCTION

Engineers and scientists now focus on the use of natural materials for the development of composite materials. The attention is due to their renewable characteristics. If renewable resources can be used for the preparation of composites then it has many advantages ranging from cost effectiveness to proper management and reduction in industrial wastes and byproducts. Composites are materials with superior properties for example glass fiber composites, which made possible the construction of structures, which are lightweight yet very strong [1]. Kevlar, Glass and Carbon fiber reinforced composites are widely used for high-tech applications and are very expensive and unsuitable for low-tech applications. The increase in cost and effect on environment due to composite fibers have forced the scientist and engineers to synthesize new materials and composites which besides having their needed specific physical properties are cost effective as well as environmentally friendly [2].

The natural fiber can replace the synthetic fibers in the areas where high strength and stiffness are not the primary requirement. The use of Natural fibers over synthetic fibers as reinforcements in resin matrix has gained momentum in last decade [3].

Plastics such as polyester, phenolic and epoxy have been successfully reinforced with some plant fibers to produce composites that are suitable for general structural applications, housing and panels for the construction industry. Plant fibers are renewable and biodegradable natural cellulosic materials. They are also light compared to other synthetic fibers and have desirable mechanical properties. In addition, they are cost-effective, environmentally ecofriendly, bio degradable and are abundantly available [4]. Saw dusts are lignocellulose fibers. Significant advances have been made by number of researchers in this field.

Sawdust is abundantly available at a very low cost as they are waste product of saw mill industry. Saw dust is chosen as reinforcement because it will be in fine powder form so it's easier to introduce into the matrices [5].

The other economical route is to use alternative cheap polymeric material without compromising the properties of composites. Plant based natural fibers exist which are suitable for the manufacture of composites matrices and most extensively studied of these natural substances is Cashew nut shell liquid (CNSL) resin. CNSL is a byproduct of Cashew nut processing industry [6]. CNSL is essentially a mixture of phenolic extracted from the shells of the cashew nut and is a good natural alternative to chemically derived phenol. It is also know that CNSL has a very good insecticidal property. Raw CNSL has been used for many years for protecting furniture against certain species of ants and other insects.

The above literature survey encouraged us to use sawdust as reinforcing agents in manufacture of composites. Cashew nut shell liquid (CNSL) resin was taken as matrix. Both the reinforcing agents and the resin used are abundantly available and are economically very cheap.

II. EXPERIMENTAL DETAILS

A. Materials used

Teak Wood Saw Dust (SD), Cashew nut shell liquid (CNSL) resin is purchased from kumaraswamy chemicals, Panruti. The chemical constituents are Methyl Ethyl Ketone Peroxide (MEKP), Cobalt Naphtha Nate, Poly Vinyl Acetate (PVA) and Wax.

B. Method of fabrication

The composite materials are prepared using Hand Layup technique. This type of composite manufacture is widely used in small and medium scale industries. Since it is simple, economical and cheaper.

C. Preparation of samples

The composite material was prepared by using a hand layup technique. There are 3 samples was prepared by varying the quantity of Cashew nut shell liquid (CNSL) resin composites and saw dust quantity was remain constant for the 3 samples. For each sample there are 3 specimens were tested for their Tensile Strength according to the American Standard for Testing Materials (ASTM).

D. Tensile Test

The Tensile Strength of the composites was measured using a Universal Testing Machine (UTM) according to the ASTM D638. For each sample the tensile test of the 3 specimens was carried out. The tensile properties of the specimen were tested and the average values were reported.

FIG.1 FIRST SET OF SAMPLE AFTER TESTING

FIG.2 SECOND SET OF SAMPLE AFTER TESTING

FIG.3 THIRD SET OF SAMPLE AFTER TESTING

III. RESULTS AND DISCUSSIONS

The results obtained after testing the composites for their tensile strength are shown below in the table 1, 2, 3 respectively. The composites prepared using Cashew nut shell liquid (CNSL) resin as the matrix and Teak wood saw dust as reinforcing material were tested for their tensile strength. Three samples were prepared by increasing the cashew nut shell liquid resin percentage. For each samples three specimens were tested for their tensile strength. The mean tensile strength of the samples was obtained. On comparing reports of the tensile strength of first, second and third set of samples, the third set of samples showed better result. The first and second sets of samples were lower in the tensile strength when compared to the third set of samples. The reason for the third set of sample shows better tensile strength is that they have more cashew nut shell liquid (CNSL) percentage when compared to the other set of samples. However, as the cashew nut shell liquid resin percentage was increased, the improvement in tensile strength was observed.

Table.1 Experimental values of tensile strength

SAMPLE No.	PERCENTAGE ELONGATION	ULTIMATE LOAD (N)
1	3.750	50
2	4.375	45
3	4.375	55

Table.2 Experimental values of tensile strength

SAMPLE No.	PERCENTAGE ELONGATION	ULTIMATE LOAD (N)
1	4.250	45
2	4.000	60
3	3.875	55

Table.3 Experimental values of tensile strength

SAMPLE No.	PERCENTAGE ELONGATION	ULTIMATE LOAD (N)
1	3.875	55
2	2.750	50
3	3.750	65

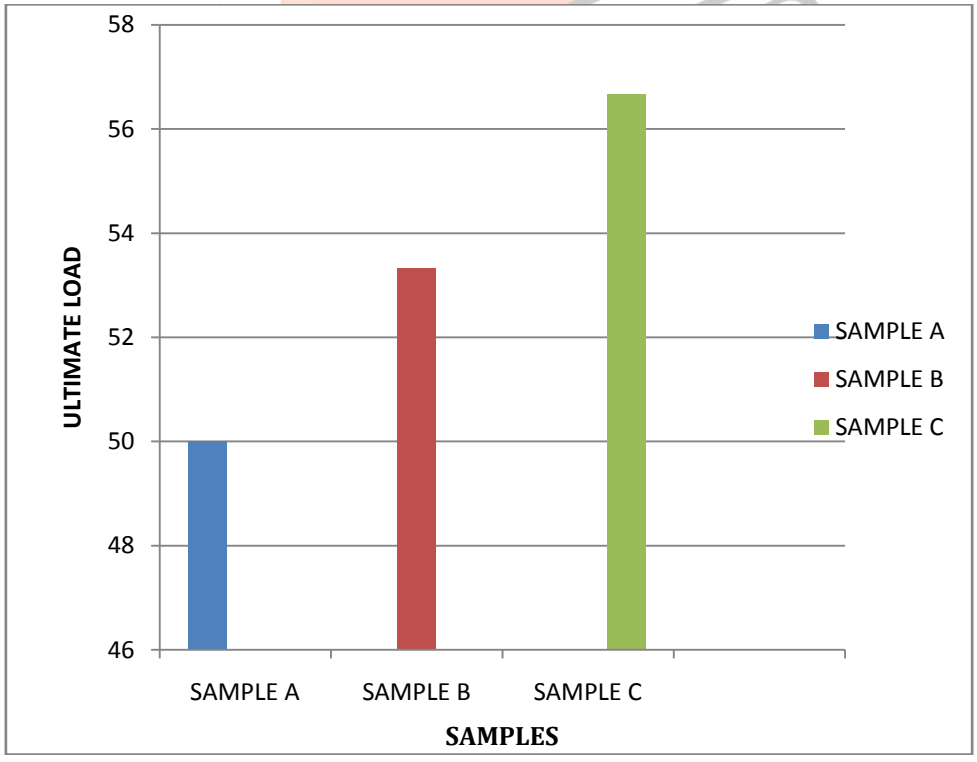

FIG.4 GRAPH SHOWING THE COMPARISON OF TENSILE STRENGTH FOR THE COMPOSITE SAMPLES

IV. CONCLUSION

The tensile properties of the Cashew nut shell liquid (CNSL) resin and Teak wood saw dust has been obtained. The following results can be concluded from the study.

1. The tensile strength of the third set of samples shows better results when compared to the first and second set of samples.
2. This composite can be used effectively in low tech application where high strength and stiffness is not the major concern.
3. In such applications natural fiber can replace the synthetic fiber and thereby making it more economical and environment ecofriendly.

V. REFERENCES

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