ANALYSIS OF MECHANICAL PROPERTIES ON NATURAL COMPOSITE WITH IRON POWDER

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Abstract - *Wood fibers are the most abundantly used cellulose fibre. They have been extensively used in the modern composite industry due to their specific characteristics. The versatile characteristic of epoxy and its diversity made it suitable for different industrial applications such as surface coatings, potting, fibre reinforcement, and adhesives. However, the pervasive applications in many high-performance field limited the epoxy use because of their delamination, low impact resistance, inherent brittleness, and fracture toughness behavior. The limitations of epoxy can be overcome by incorporation and modification before their industrial applications. Currently, modified epoxy resins are extensively used in fabrication of natural fibre-reinforced composites and in making its different industrial products because of their superior mechanical, thermal, and electrical properties. Present review article designed to be a comprehensive source of recent literature on epoxy structure, synthesis, modified epoxy and its applications. This review article also aims to cover the recent advances in natural fibre-based epoxy composites research study, including manufacturing techniques and their different industrial applications.*

***Key Words*: Wood Waste, Epoxy Resin, Iron Powder.**

1. INTRODUCTION

The availability of the natural fibres of plant origin in abundance has also been a reason for the study in this area. Specific properties of natural fibre composite such as light weight, low cost, renewable in nature, high specific strength and modulus have widened the usage over other materials. A major advantage is that they can be easily disposed of at the end of their lifecycle by compositing or by recovery of their calorific value in a furnace which is not possible in synthetic fibre suchas for glass. Also in automobile industry the use of wood based natural fiber composites enhance the mechanical strength and acoustic performance, reduce material weight and fuel consumption, improve biodegradability and production cost for the auto interior parts. Natural filler based epoxy composite from wood dust is developed and its mechanical behavior under various testing speed and % of filler wt. is investigated and comparative study is done. Also the microstructure of the composite is studied.

1.1 MATERIALS AND METHODSELECTION OF MATERIALS

Wood waste particle
Die
Epoxy resin
Iron powder

1.2 Wood Waste Particle:

Wood waste particles are easily available so we select the wood waste as a composition for their project of performance and analyzing of wood waste composite with iron powder. Wood particles are having eco-friendly features. It does not affect our environment surroundings. And it's also available at very low price and it have high strength for manufacturing industrial application. In this project we select three types of wood waste particles based on easy availability the wood waste particles are listed below

Neem tree wood waste particles
Teak tree wood waste particles
Coconut tree wood waste particles

1.3 Epoxy Resin:

The primary reason for epoxy's popularity is its superb mechanical strength. Welding is often the only alternative. Epoxy is nearly always cheaper and faster than welding. Epoxy also has excellent resistance to chemicals. After setting, there is no worry of a chemical reaction that will weaken the seal. It also resists heat. That resistance makes it ideal for electronics and electrical systems and other industrial applications. Those who use epoxy are aware of the superb mechanical strength and low curing contraction.

TABLE-1: PROPERTIES OF EPOXY RESIN

Properties of epoxy resin	
Property	**Epoxy**
Viscosity at 25°C μ(cP)	12000-13000
Density ρ (g.cm^{-3})	1.16
Heat distortion temperature HDT(^{0}C)	50
Modulus Of Elasticity E(GPa)	5.0
Flexural strength (MPa)	60
Tensile strength (MPa)	73
Maximum elongation (%)	4

TABLE-2: PROPERTIES OF HARDNER

Property	value	Unit
Molecular weight	198.27	
Grade	Purum	
Flash point	230	^0C
Melting point	88-92	^0C
Colour	Brown	

1.4 Iron Powder:

Iron powder has several uses; for example production of magnetic alloys and certain types of steels. Iron powder is formed as a whole from several other iron particles. The particle sizes vary anywhere from 20-200 μm. The iron properties differ depending on the production method and history of a specific iron powder. There are three types of iron powder classifications: reduced iron powder, atomized powder, and electrolyte iron powder. Each type is used in various applications depending on their properties. There is very little difference in the visual appearances of reduced iron powder and atomized iron powder. Most iron powders are used for automobile parts

2. Material Composition

TABLE-3: MATERIAL COMPOSITION

MATERIAL	COMPOSITION 1	COMPOSITION 2	COMPOSITION 3
TEAK WOOD	60%	0%	30%
NEEM WOOD			
IRON POWDER	0%	60%	30%
EPOXY RESIN	20%	20%	20%

4. EXPRIMENTAL PROCEDURE

An initial preparation of all the materials and tools that are going to be used is a fundamental standard procedure when working with composites. This is mainly because once the resin and the hardener are mixed, the working time (prior to the resin mix gelling) is limited by the speed of the hardener chemically reacting with the epoxy producing an exothermic reaction.

Each group of student must prepare ALL materials and supplies available and set up before proceeding.

Also, as part of the initial preparation, the woven cloth must be cut according to the shape of the part. In this experiment the student needs to have two pieces of fiberglass material cut into one foot squares.

4.1Mould preparation

Before starting with the layup process an adequate mould preparation must be done. Mainly, this preparation consists of cleaning the mould and applying a release agent in the surface of it to avoid the resin to stick. In this experiment the mould preparation is simply taping the plastic sheeting to the table top. If this was an actual mould the student would do the following:

Clean the mould with a clean cloth

Apply and spread release agent in the surface of the mould

Wait certain to set up the release agent

Buff with clean cloth

Lay-up process

Once all the materials are prepared, the workstation is ready and the mould preparation done; the students can start with the lay-up process. The first step is to mix the resin and the hardener. The proportions are usually given by the supplier and can be found on the containers of the hardener or resin. The portions can be either measured by weight for by volume but it is important to follow these proportions exactly as this is a complete chemical reaction and all components must react completely for maximum strength of the matrix. It is easiest to measure proportions using the volume method and a screw in pump that inserts into the cans of resin and hardener. These pumps can be purchased along with the containers of resin and hardener. Make sure to keep the resin pump and container top separate from the pump and container top of the hardener because any contamination will initiate the chemical reaction and cause the resulting blend to harden.

The mixing is performed in the mixing containers with the mixing stick and should be done slowly so as to not entrain any excess air bubbles in the resin. Be careful to mix completely and deliberately for a full two minutes before applying. It is best to use a “flat” stick- such as tongue depressor; a round stick does not work well as it does not ‘paddle’ the mixture to blend it properly. Note: Plastic mixing containers may melt during the exothermic reaction, so it is best to use containers that are specifically made for the purpose of mixing epoxy resin. These are typically available from the resin vendor.

Next an adequate quantity of mixed resin & hardener is deposited in the mould and a brush or roller is used to spread it around all surface. It is important not to add too much resin, which will cause too thick of a layer, nor to add less than the necessary amount, which will cause holes in the surface of the part when it is cured. An estimate of the amount of resin needed can be based on weight of glass fibre cloth. One can assume 50 volume% resin/50% volume% fibre and then use the density of the reinforcement to arrive at the weight of the resin. It is good to then add a small safety factor so that enough resin is mixed for the layup.

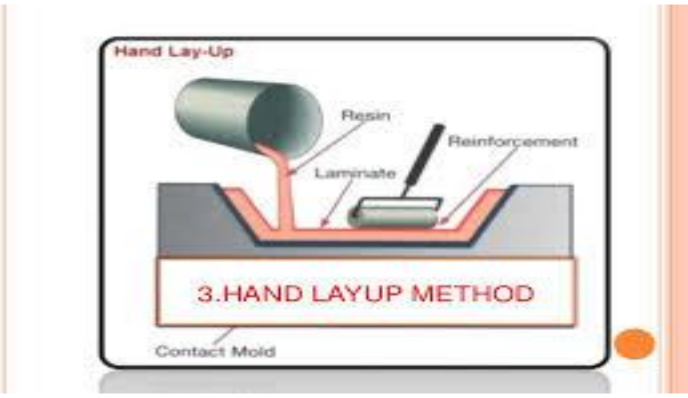


FIG 1 HAND LAYUP METHODE

5 TESTING PROCESS:

- HARDNES TEST
- IMPACT TEST

5.1 HARDNES TEST

Rockwell hardness test for given specimen.

TABLE- 4: HARDNESS TEST

S.NO	SPECIMAN	INDENT	LOAD in N	SCALE	RESULT
1	Teak+Iron Powder+Epoxy Resin	Ball	150	B	200HRB
2	Neem+Iron Powder+Epoxy Resin	Ball	150	B	225HRB
3	Teak+Neem+Iron Powder+Epoxy Resin	BALL	150	B	235HRB

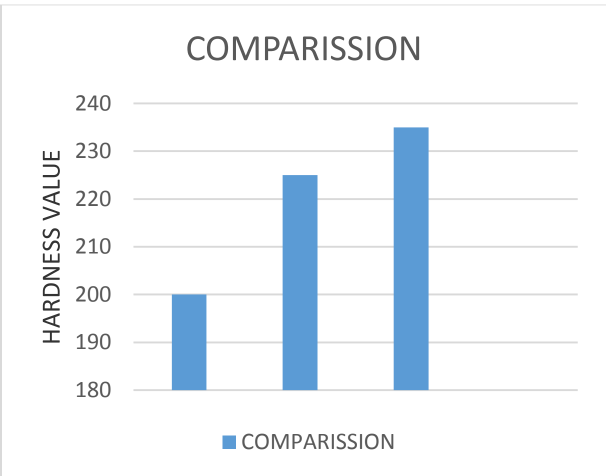
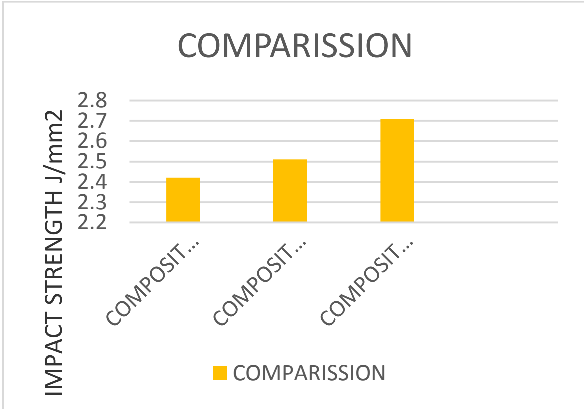


CHART-1: HARDNESS RESULT

5.2 IMPACT TEST

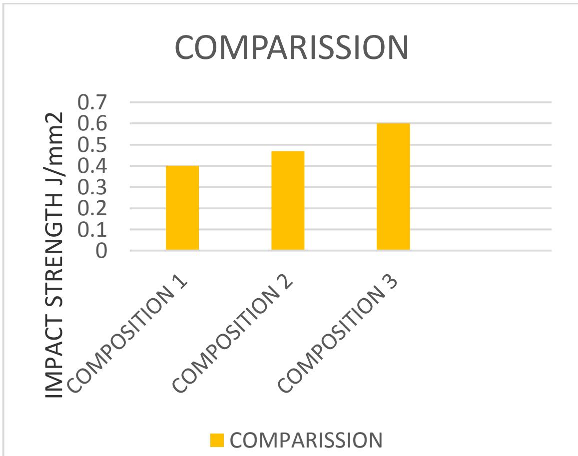
5.2.1 CHARPY TEST

FIG 2 Test specimen



COMPARISSION CHART-2: FOR CHARPY TEST

5.2.2 IZOD TEST



COMPARISSION CHART-3: FOR IZOD TEST

PROJECT PHOTO:

FIG-3 PROJECT PHOTO

6. CONCLUSION

In this work the experiment and analysis on the fabricated composite material has been done successfully. The results of the composite material which is fabricated by using hand layup technique to determine Hardness test and Impact test has been taken in the reinforcement particles of the wood and iron powder with epoxy resin. This will increase the strength of wood composite. Metal Matrix composite of (Teak30%+Neem30%+Iron Powder20%+Epoxy Resin20%) is more strength and hard then the (teak 60%+ iron powder 20%+ epoxy resin20%) and (neem60%+ion powder20%+epoxy resin20%).) .It is observed that the results of testing process

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