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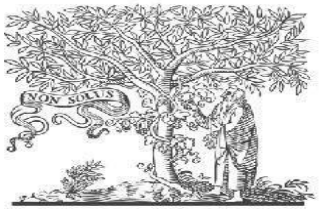

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# Development and Analysis of Rice Husk Composite Material

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**Abstract**

Natural fibers found in agricultural waste are increasingly being used in the polymer industry because of their numerous advantages, including their light weight, low cost, and favorable impact on the environment. During the growth of rice grains, a natural sheath known as rice husk forms around them. Rice husk is a kind of natural fiber that comes from waste from agriculture. It can be used as filler in composite materials in a variety of polymer matrices. The purpose of this experiment is to determine a number of properties of rice husk that has been dried at various temperatures and to suggest the best method.

**Keywords:** Agriculture Waste, Resins, Polymers,, Rice Husk, Composite materials.

## 1. Introduction

Applications for high performance materials have grown steadily in recent years. The ability of a material to perform better is constrained if it has a single composition. Hence, mixing two or more traditional materials can result in new high-tech products. materials that perform. Two or more chemically different materials that, when combined, exhibit better qualities than the component materials are said to be composites. Due to its important characteristics including high strength, modulus, stiffness, and resistance to chemicals, composite materials are flexible materials for multifunctional applications.

Humans used very few materials at the beginning of the industrial revolution, but as science and technology advanced, our need for newer, better materials skyrocketed. We are still looking for these materials now. Composites are artificial materials that were created by science. The scientific community began looking for materials formerly regarded as garbage in order to make them more affordable. Since rice husk, a plentiful agricultural waste, meets all the aforementioned

requirements, it has been extensively employed to develop biofuels.

India's major crop, rice, is produced in large quantities, and the husk is primarily burned, adding to the already dire situation of environmental pollution. It generates rice husk ash, which is more concerning because disposal is challenging. The production of rice husk is thought to be over 759.6 million tonnes worldwide, of which 22% is husk (167.10 million tonnes), which provides a significant amount of practically free raw material provided it can be put to excellent scientific use. Usually, rice husk is employed either as the husk itself or the silica that is extracted from it, which has various sets of physical and mechanical qualities. To create rice husk ash, several researchers have suggested numerous ways, each of which would result in ash of varying quality and qualities.

These items are categorised into the two different levels as follows:

The matrix constituent is normally taken into consideration when the initial level of grouping is established. The principal composite types are:

- Organic Matrix Composites (OMCs).
- Composites using Metal Matrix (MMCs).
- ceramics Matrix Composites (CMCs).

**Applications of composite materials**

The applications are numerous and extensive, panning all industrial sectors and including everything from bathtubs to commercial aircraft.

**Application includes:**

- Boat decking, including hulls, pressure hulls for submersibles, propeller shafts, masts, bulkheads, and rudders.
- Cars and Locomotive body parts, shapes, radiator grills, instrument panels, engine components, fuel lines.
- Materials such as bridges and their columns and repair of concrete
- pipe systems,power and drive shafts, pressure vessels,air ducts.
- Aerospace- general and military aviation, bulkhead, cargo liner, wings, landing gear, doorshubs, satellite structure.
- Sportbike frames, fishing rods, skis, surfboards.

The main aim of research of this article is

- Preparing a specimen
- Testing of its mechanical properties

**Advantages of rice husk:**

- Environmental Friendly.
- Reusable source.
- Excellent specific strength, high modulus.
- Reduced density of product.
- Acoustical insulation.
- Low cost.
- Safe manufacturing process.

The materials used are:

- The rice husk (grain size)
- Polyester resin
- Cobalt accelerator

⌟ Mitel ethyl Ketone peroxide catalyst

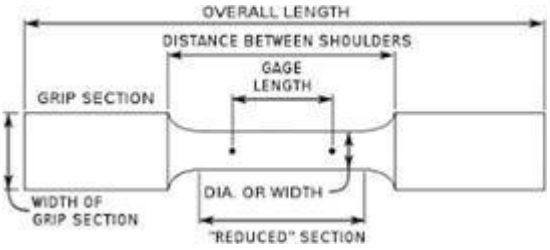
**METHODOLOGY**

The Aim of this research is to make a Particle board by using Polyester resin and mixing of cobalt accelerator and MEKP (Mitel ethyl Ketone Peroxide) catalyst. The mixture of resin and rice husk is poured in to the mould of dimension 240mm*150mm*20mm. The particle board was compacted by hand ramming process the particle board was kept under different conditions. The average composition from other researches is about 70:30 where in this research the composition is Taken as 60:40.

**Testing the mechanical properties :**

**Tensile test:**

The prepared material is taken out from the mould and was machined as per tensile test standard for testing. The main intention of this test is to determine the how the material can withstand the tensile forces.




- Take specimen put it on grips and tighten that with the help of key
- After fixing specimens switch on the machine it is act like a one end is fixed and another end acting load on specimen at end
- We can see load variation and elongation in screen at certain time specimen will break then stop the machine.


**Impact test:**

Generally the ability to resist impact or sudden loads of a material under application of sudden loads is known as impact strength. The impact strength of Composite material depends upon the interfacial bonds between the resin and the fiber.

Testing is carried out in accordance with ASTM D256-56. This test technique decides the Izod influence strength of particulate-reinforced thermo set composites consolidating unidirectional or non-unidirectional fortifications.

Test Type Technique An is the cantilever pillar or Izod type test in which example is held as a cantilever beam(usually vertical) and is broken by a blow conveyed at a proper separation from the edge of the example cinch. In all cases, a specimen with a notch was required for the test.

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**Hardness test:**

This material was tested using the Rockwell hardness test because the material's Brinell scale-identified indentation could not be seen on it. The Rockwell hardness test is a generally involved strategy for estimating the hardness of metallic materials. It is based on indenting a test specimen under controlled load with a small spherical or conical indenter. In this test, the test example is put on an iron block, and a minor burden is applied to the indenter to connect with the outer layer of the example. Once contact is made, a major load is applied, and the depth of the resulting indentation is measured. The Rockwell hardness number is then determined from the difference in depth between the initial and final indentation depths.

The Rockwell hardness test has several different scales, depending on the type of Indenter and the load applied. The most common scales are the Rockwell A, B, C, D, E, F, and K scales, each of which is designed for specific types of materials and applications.

WATER ABSORPTIVITY TEST:

The Absorptivity test is done to identify the water absorptivity rate for the material. The specimens are placed inside a vessel which is filled with standard quantity of water. After 24 hours, the water is weighed to check the absorptivity rate of specimen.

Calculation and results:

Area Dimensions of the mould=24*15*2 cm

Volume of mould= 720 cm3

Ratio of composite mixture= 60:40

Which implies 60% of mould is filled with resin a mixture or polymer and other 40% is filled with Rice husk

**Mass of composite(polymer):**

60% of 720 cm3

432 cm3 of mould must be filed with polymer mixture

And this 432 cm3 is further consists of 3 fluids i.e., polyester resin , cobalt accelerator and MEKP catalyst

Catalyst and accelerator must be mixed in 2% of both in the 100% of resin

Polyester = 415% MEKP Catalyst = 7.5%

Cobalt accelerator = 7.5% Mass of Resin

Volume of Resin = 415 cm3

Density of resin (polyster) = 1.265 g/cm3

Mass of polyester= volume x density

=415 x 1.265

=524.975

**Mass of catalyst:**

Volume of catalyst = 7.5 cm3 Density of MEKP= 1.17 g/cm3

Mass of MEKP= 7.5 X 1.17

=8.775 GRMS

**Mass of accelerator:**

Volume of cobalt accelerator= 7.5cm3

Density ofcobalt accelerator= 0.91 g/cm3

Mass of accelerator = 7.5 x 0.91= 6.895 grms

Mass of Rice husk:

Density of rice husk = 0.377 g/cm3

Volume of ricehusk= 40% of 720 cm3

=288 cm3

Mass of rice husk = 0.377 x 288

= 108.57 grams Apparent density

=1.265+1.17+0.91+0.377 =3.722 g/cm3

Total weight of composite = Mass of all materials

=524.975+8.775+ 6.895+108.57

=647.145grams

Tensile test values(Forced condition):

| Load (N) | Elongation (mm) | Stress, (N/mm 2) | Strain |
|---|---|---|---|
| 449 | 0.7 | 8.98 | 0.009 |
| 450 | 0.8 | 9.0 | 0.010 |
| 453 | 1.1 | 9.06 | 0.014 |

**Tensile test values(Natural condition):**

| Load, N | Elongation,mm | Stress, N/mm2 | Strain |
|---|---|---|---|
| 274 | 0.1 | 5.48 | 0.0013 |
| 283 | 1.0 | 5.66 | 0.013 |
| 279 | 0.6 | 5.58 | 0.008 |
| 281 | 0.8 | 5.62 | 0.0106 |

**Imapact Test energy:**

| FORCE DRIED | NATURAL DRIED |
|---|---|
| 0.62 | 0.26 |
| 0.57 | 0.38 |
| 0.73 | 0.26 |

**HARDNESS TEST VALUES:**

**Rockwell Hardness Number**

| FORCE DRIED | NATURAL DRIED |
|---|---|
| 22 | 14 |
| 27 | 16 |
| 26 | 11 |

**ABSORPTION TEST RESULTS:**

**NATURAL DRIED SPECIMEN :**

Weight of empty vessel= 320g Quantity Of water=1L

Weight Of Watered Vessel = 1.320 kg

Weight of the material=40g

After 1 day,

Weight of watered Vessel= 1.130 kg

Absorption= 190g-40g= 150g

**FORCE DRIED SPECIMEN :**

Weight of empty vessel= 180g Quantity Of water=1L

Weight Of Watered Vessel = 1.180 kg

Weight of specimen=40g After 24 hours,

The weight of watered Vessel= 1.130 kg

Absorption= 50g-40g= 10g

From the above results of absorption test, It is clearly Observed that The Absorptivity is more in natural dried specimen Than Sun dried Specimen. This Is Because the Bond Which is formed by fibre and matrix is tightly packed because of high wind speed in the atmosphere and in case of natural Dried Specimen the wind speed is very low which caused weak bonds between matrix and fibre thus resulting more Absorptivity.

**CONCLUSION:**

This project led to the conclusion that the polyester composite material made from rice husks with a composition ratio of 60:40 that is solidified in force dried conditions has better strength parameters and less absorptivity than the composite material that is solidified in natural conditions and has better absorptivity.

**FUTURE SCOPE**

Rice husk composite material has a promising future scope due to its various benefits and potential applications in different industries. This composite material is eco-friendly, low-cost, and abundant, making it an attractive alternative to conventional materials. Rice husk composite material can be used in construction, automotive, and packaging industries, among others. Additionally, it has good mechanical properties, such as high strength and stiffness, which make it suitable for load-bearing applications. With the increasing demand for sustainable materials, rice husk composite material has the potential to become a widely adopted material in the

future. Ongoing research and development in this field can further enhance the properties and applications of this material, making it a more competitive and viable option.

**ADVANTAGES AND DISADVANTAGES:**

**ADVANTAGES -**

•Sustainable and renewable
•light weight
•Cost effective
•Good thermal Insulation
•High Mechanical Properties

**DISADVANTAGES -**

• Limited compatibility
• less moisture absorption
• processing challenges
• limited temperature resistance

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