EXPERIMENTAL ANALYSIS ON HYBRID COMPOSITES

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Introduction:

A composite material can be defined as a combination of two or more constituent materials with different physical or chemical properties. And which remain separate and distinct on microscopic or macroscopic level within the finished structure. In other words, the constituents do not dissolve or merge into each other, although they act together to form a single material.

The engineering importance of a composite material is that to or more distinctly different materials combine together to form a composite that is either superior or important in some other manner to the properties of the individual components. Most composites have been created to improve combinations of mechanical characteristics such as stiffness, toughness, ambient and high temperature strengths, wear resistance and also aesthetic properties.

Most composites are made up of just two materials. Representing as matrix and reinforcement. The matrix surrounds and binds together a cluster of fibers, particles, or fragments of a much stronger material called the reinforcement. The following examples illustrate the matrix and the reinforcement phase, and how their combination results in better properties.

Objectives:

- To fabricate the hybrid composite materials using hand layup method
- To determine the flexural strength of the hybrid composite materials
- To study the failure patterns
- To determine the strength of the hybrid by conducting flexural tests

Methodology:

- Fabrication of composite materials by using hand layup method.
- Fabricate the composite materials with the help of Epoxy resin [LY556], mould releasing spray, cotton cloth, hardener [HY951].
- Measure the flexural strength on ASTM machine.

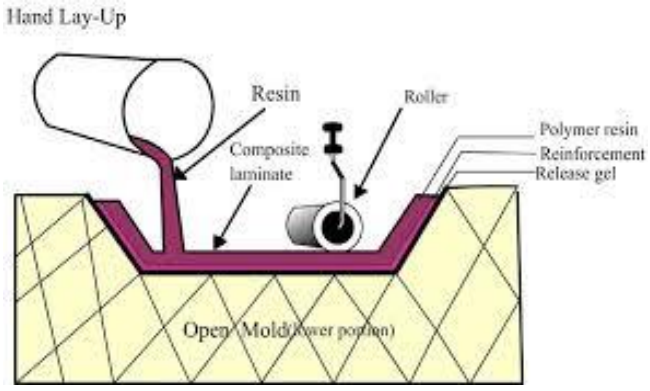
Fabrication Technique:

There are numerous methods for fabricating composite components. Some methods have been borrowed, but many were developed to meet specific design or manufacturing challenges.Selection of a method for a particular part. Therefore, will depend on the materials, the part design and end- use or application. Composite fabrication processes involve some form of molding, to shape the resin and reinforcement. A mould tool is required to give the unformed resin /fibre combination its shape prior to, and during cure. The most basic fabrication method for thermoset composites is hand lay- up, which typically consists of laying dry fabric layers, or “plies,” or prepare plies, by hand onto a tool to form a laminate stack. Resin is applied to the dry plies after layup is complete

Hand lay-up method: The composites are fabricated by adopting hand layup technique which are processed at room temperature and cured for a day before proceeding to testing. The E glass and Jute fiber which were placed along 0 0 − 90 0 orientation embedded in Epoxy resin with & without Shear Thickening Fluid as shown in Fig. Hand Layup Process The composites were prepared for four different compositions for constant matrix weight ratio 60% and for varying Jute weight fraction from 5 to 20 % weight fraction

Composite Preparation: Composites are prepared with only glass as fibre, only jute as fibre, both glass and jute as fibre with a total fibre content of 60%. Volume fraction is used for composite and hybrid composite fabrication is 60% fiber and 40% resin. Hand layup technique is employed.

Epoxy is mixed with hardener as per the standard mixing ratio, and the entire solution is brushed on fibre material. Prepared composite along with mould and spacer plates is kept in the room temperature. Then mould base is removed and is kept at room temperature for 24hrs



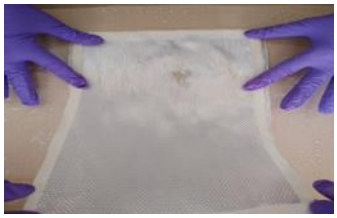
Hand layup method

Procedure followed in Hand layup method:

Step 1: Mixing of epoxy and hardener by the ratio of 100:10 grams as shown in fig

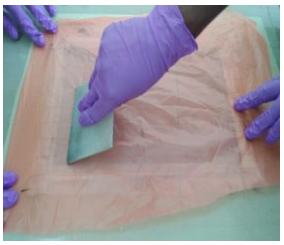
Step 2: A split mould (ModteK sheet) of 250X200 mm is used for compressing the specimen. And cleaning the surface of the mould by waste cotton wool as shown in fig

Step 3: Marking the glass fiber as per the standard dimension and cutting the Glass fiber according to the marking as shown in fig



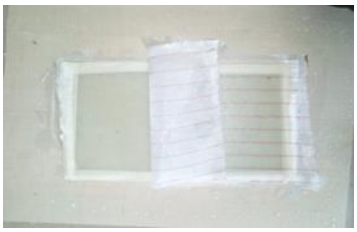
Step 4: Uniform distribution of Resin on the mould applying the first Glass fiber layer on the mould surface as shown in fig

Step 5: Poring and uniform distribution of resin on the layer of glass fiber and applying another layer of glass fiber on the primary layer



Step 6: After the successive lamination of 8 layers of glass fiber, applying the peel ply. This peel ply fabric absorbs some of the matrix resin and becomes an integral part of the laminate. After peel ply layer, applying the releasing film layer to reduce the chance of the product sticking and ease ejection.

Step 7: Applying the load on the laminate and kept it for 24 hours for curing.
Step 8: After 12 hrs, removing the weight from the fabricated mould
Step 9: After the removal of breather material, the releasing film is also removed



Step 10: Removing the peel ply from the composite

Step 11: Finally, fabricated glass composite is obtained

Conclusion:

Natural composites, synthetic composites, and hybrid composites were fabricated using hand lay-up method as per ASTM D-3039 standard. The test is on going