Experimental and Numerical Simulation Investigation on Composite Material

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Abstract - Fiber are synthetic and they are non- biodegradable. Natural fiber another hand also posses high strength to low weight ratio in regard of certain mechanical characteristics such as flexibility, tensile it also possesses good behavior natural fibers are obtained from agricultural waste, plants etc. In composite material strength, life time, may be decreased due to major fact of water absorption. In order to improve for a better option for both these composites we are going to make a hybrid composite with help of glass fiber, coir or coconut fiber is a natural fiber extracted from the husk of coconut. these composite glass fiber is used as an outer laminate and on the inner natural fibers to reduce moisture absorption. The behavior is studied with help of testing methods such as hardness, density, moisture absorption, impact.

Keywords : E-Glass, Coir, PVA, NaOH.

1. INTRODUCTION:

In recent trends Fiber Reinforced Polymer Composites[FRPC] possess greater advantages than other materials because of both mechanical and physical characteristics and also in regards of manufacturing cost of the composite, the availability in the nature, the processing method employed FRPC are far better than materials. In these FRP fibers are the force withstanding elements they provide strength where areas the resin are responsible for keeping the element aligned on that particular position. The rust occurrence never happens in the FRP so need of special care for that as such in iron materials, they are non-conductive so they don't get magnetized as materials and they have good optical and thermal properties too. So they are preferred in various in aerospace, automotive, space research and also for the production of several other industry and also consumer related equipment. In order to overcome this mixture of both natural and synthetic composites are manufactured in which the outer layer of composites is covered with the synthetic such as glass fibers and on the inside chemically treated natural fibers such as bagasse, sisal is used. In this treatment process mercerization technique is used where the fibers are dipped in 5% aqueous NAOH solution for 8 hours then they are washed and dried in broad sunlight. These fibers are cut in to small pieces. These natural fibers composite volume ratio are varied and the best ratio at which the hybrid composites possess higher ratio are determined by mechanical testing methods such as **bending test and tensile test.**

2. OVERVIEW OF COMPOSITE:

Composites, plastics and ceramics are the main material that is being used by the present world. Composites have a more significant advantage because these are made by engineering processes and mainly helpful to reduce the weight and hence to increase the efficiency. Composite material consists of two or more materials in a different phase. In traditional engineering impurities in metal can be represented in different phase and by definition considered as a composite, but are not considered as a composite due to modulus of strength is nearly same as that of pure metal. Oldest known composites were natural composites, wood consist of cellulose fiber in

2.1 DEFINITION OF COMPOSITE:

Composites are materials consisting of two or more chemically distinct constituents, on a macro-scale, having a distinct interface separating them. One or more discontinuous phases are embedded in a continuous phase to form a composite. Composite mainly formed from two distinguished materials one of which is in the particle or fiber or in sheet form are combined with other material known as a matrix. Fiber in the composites acts as a principle load carrying member due to its high strength modules while matrix in the composites acts as a load transfer medium between the fibers. Due to more ductility of the composite it gives matrix high toughness.

2.2 LITERATURE REVIEW:

[1] preparedcastable particulate filled epoxy resins exhibiting excellent thermal conductivity using hexagonal boron nitride as filler. He observed that the thermal conductivity of boron nitride filled epoxies is influenced by the sample preparation procedures due to the agglomeration effects of the particles in the matrix. He measured the temperature dependence of thermal conductivity of resins as a function of volume content of filler. He also found that the thermal conductivity in percolative systems depends in a complex way on the filler concentration and temperature. In that paper he discussed the mechanism leading to the observed behaviour. Hill and Supanic [2] used platelet-shaped particles of similar size and shape and investigated them as fillers for improving the thermal conductivity of polymer–ceramic composite materials. They found that the conductivities of composites

filled with hard, stiff ceramic particles exceeded 3.5 W/(mK), or >20 times the conductivity of the polymer matrix, those showed to be almost independent of the intrinsic filler conductivity range of 33–300 W/(mK). On the contrary, the thermal conductivity of composites filled with soft, platelet-shaped BN fillers reached over 13 W/(mK). Hence they proposed a mechanism whereby conductivity prediction models in the literature. In 2004, Lianhua Fan et.al. [3] highlighted that composites as such have unique characteristics combining the low- temperature processability of organic polymer matrix and the various functionalities endowed by the other component in the composites. Furthermore, electrically conductive adhesives (ECAs) had been explored as an environment friendly interconnection technique. Along with the many potential advantages for surface mount and flip chip applications, typical ECA materials suffered from a few critical issues that limited its use as a drop-in replacement for lead-containing solders. Making an attempt to understand and improve the thermo-mechanical properties of ECA materials, they introduced nano-sized silver particles into the conventional ECA compositions. The nano particles influence on bulk resistivity has been reported in this paper, as maintaining an acceptable conductivity which is imperative for high performance and environmentally benign interconnections. They found that the bulk resistivity of ECA formulations strongly depended on the contents of nano particles and silver flake, as well as the surface properties and particle morphology. Thermal conductivity of alumina based composite samples was also affected upon the inclusion of nano alumina particles. The electrical and thermal conductivities of the polymer composites containing nano particles were determined by the contacts of micro-sized particles and interfaces that involved nano particles along the conduction paths. Wenying et.al.

2.3 PROBLEM IDENTIFICATION

- Natural fiber composites are poor in mechanical properties compared to synthetic fiber composites because the natural fibers have water absorption property and also bio- degradable properties.
- Poor moisture resistance which causes swelling of fibers failure of structural performance in natural fibers.
- Poor thermal resistance, electrical insulation, and sound insulation in natural fibers.

2.4 USE OF COMPOSITE:

Due to weight saving advantage composites are mainly used in applications like automobile and aircraft where even a small amount in reduction of weight also count. Some uses of composites are described below:

- In aircraft it is used in the door skin on the stabilizer box fin, in elevators, rudder, loading gear, tail, spoiler, flap body etc. 20-30% reduction in weight is possible by the use of composites.
- In aerospace it uses to make space shuttle, space station where it comprises the function of weight reduction. It is used because it shows low value of co-efficient of thermal expansion.
- In automobile it uses to make body frame, chassis components, engine components, drive shaft, leaf spring, exterior body part etc. and it performs different functions such as due to its high stiffness it has good damage tolerance, good surface finish and appearance, weight reduction hence higher fuel efficiency.
- In sporting goods, it uses to make tennis and racquetball, racquets, golf

club shaft, head bicycle frame, skis, canoe helmets, fishing poles tent poles etc. It is used because it helps to design weight reduction vibration damping design and has high flexibility.
- In electrical it used to make printed circuit board, computer housing, insulators, randomness battery plates. And it is used because of portable weight saving.

3. METHOD: [Hand lay-up method]

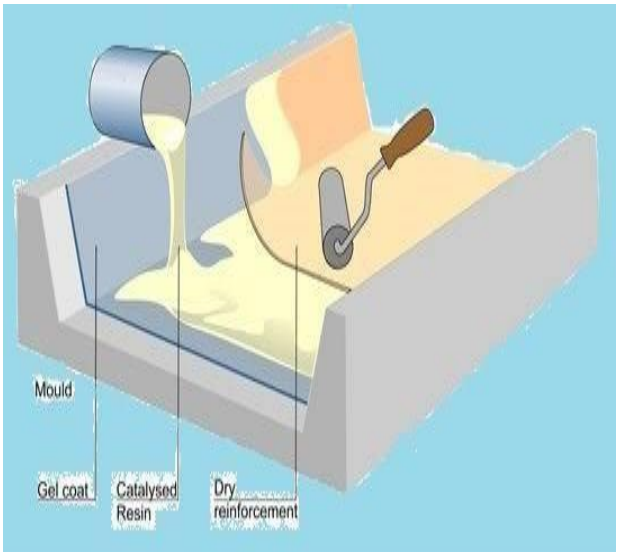

Fig: hand lay-up method

3.1 PREPARATION OF HAND LAY-UP METHOD:

- For hand layup process method first the bottom layer is covered by polythene sheet and the PVA (poly vinyl alcohol) are applied on it to avoid the stickiness of the resin with the bottom sheet and also they are applied on the top and on the sun mica sheet.

- The epoxy resin(ly-556) and hardener(hy-951) are mixed in the ratio 10:1 they are stirred well. First the glass fibers are placed on the bottom then the coir and again the glass fiber and then the glass fiber is placed and at last the top layer is covered by glass fiber the resin are poured at each layer of fiber.

- The volume of glass fiber and coconut fiber are varied based on the weight ratio then a force is applied constantly to avoid void formation and set to cure for 6 days.

➢ By repeating the procedure and changing the volume ratio six more composites are prepared.

3.2 COMPOSITE PREPARATION:

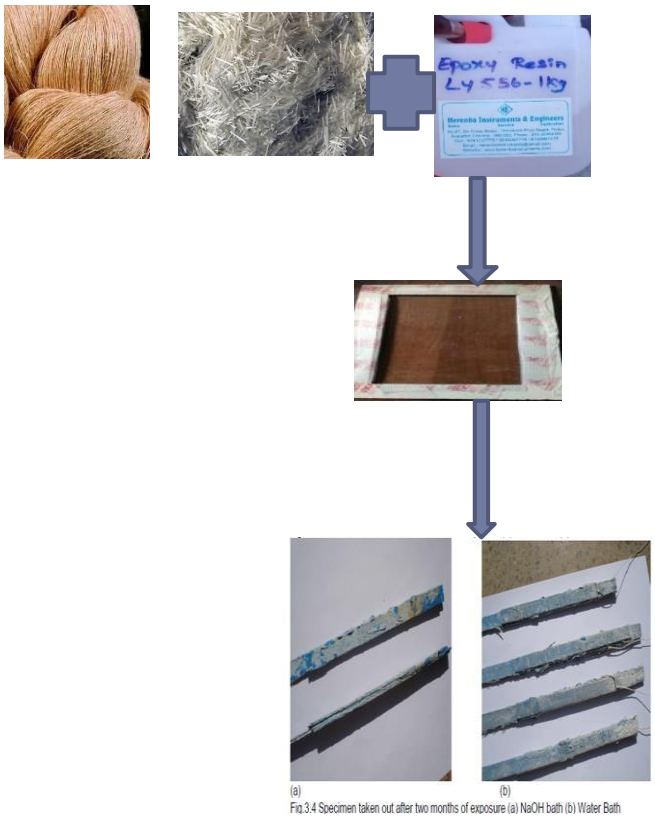

Fig.3.4 Specimen taken out after two months of exposure (a) NaOH bath (b) Water Bath

3.3 Numerical Analysis: Concept of Finite Element Method (FEM) and ANSYS

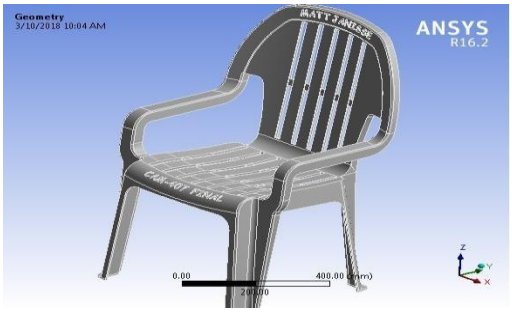

Fig: Geometry importing

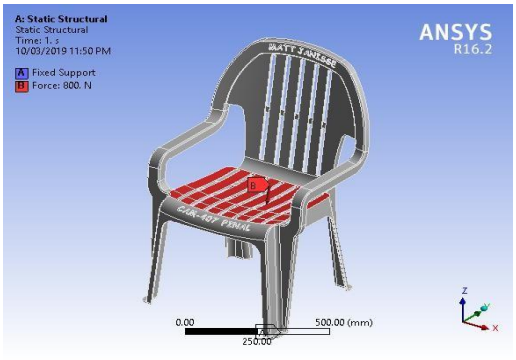

Fig: Load Condition

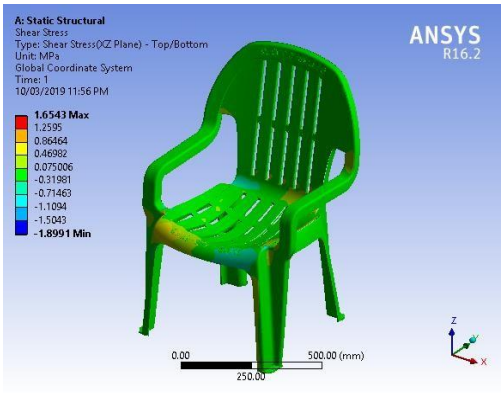

Fig : Static structural

4. CONCLUSION:

Glass fiber has greater mechanical strength. Hence agricultural products such as coir or coconut fiber are introduced in to it. And the variation in the characteristics of the composites are studied and found that. At certain introduction in the volume ratio of the glass fiber and coir the strength of the composites is greater. But at test such as impact were the specimen is subjected to sudden load we determine that increase in glass content store more energy and resist breakage than the specimen that possess increase in coir content. This project conducting FEM result and experimental strength test took .The Fem result shows plastic chair less strength comparing degradable Composite material and also which is easily degradable while immersing in NaoH or water.

5. REFERENCE:

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