Design And Fabrication of Helmet by using Hybrid Composite Material

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Abstract: **Recently, bio composite materials are synthesized using natural cellulose fibers as reinforcements together with matrix, which have attracted the attention of researchers due to their low density with high specific mechanical strengths, availability, renewability, degradable and being environmental-friendly. The present work attempts to make an improvement in the current existing helmet manufacturing methodology and materials used to have better mechanical properties as well as to enhance the compatibility between fibers and the matrix. The bio- composite are prepared with the unsaturated polyester matrix and fibers such as E-glass fiber, sisal fiber using hand lay-up method with appropriate proportions to result in helmet shell structure. The fabricated helmet are planned to evaluate its mechanical properties such as tensile strength, impact strength and compression strength**

INTROUCTION:

The major environmental problem faced today is the non degradable plastic wastes The tremendous production and use of plastics in every segment of our life has increased the plastic waste in huge scales increased the plastics wastes in huge scales. The waste disposal problems, have directed grate part of the scientific research to eco composites materials that can be easily degraded or bio assimilated. Natural fibers have advantages such as low cost and very light weight however they suffers from lower mechanical properties compared to glass fibers .in the present study an attempt has been made to reinforcement epoxy resins matrix with multiple nature fibers and to characterize its mechanical performance to evaluate their suitably for helmet application.

MATERIAL AND METHODS

This chapter describes the details of processing of the composites and the experimental procedures followed for their mechanical characterization. The raw materials used in this work are

MATERIALS USED

- Epoxy resin (LY-556)
- Hardener (HY-951)
- Natural Fibres (Sisal, E-Glass fiber)
- NaoH Solution

METHODOLOGY

Step 1:Selection of matrix material

Epoxy LY-556 resin belonging to the Epoxide family was taken as the matrix. HY 951 was used as the hardener.

Step2: Selection of reinforcement and Natural fibers

Natural fibers such as Sisal, E-Glass fiber were taken to fill as reinforcements in the Polymer composite.

Step 3: Extraction of fibers

Sisal Fiber:

- Sisal is Commercially available.
- Sisal is a natural fiber (Scientific name is Agave sisal of Agava ceae (Agave) family yields a stiff fiber traditionally used in making twine and rope.
- Sisal is fully biodegradable and highly renewable resource.
- Sisal fiber is exceptionally durable and a low maintenance with minimal wear and tear.

E-Glass fiber:

It is also called as electrical glass. It has a specific resistance greater than steel so it is used to make high performance. The fiber glass is not sensitive to variations in temperature and hygrometry. And it has a low co-efficient linear expansion Step 4: Surface treatment of fibers Freshly drawn fibers generally include lots of impurities that can adversely affect the fiber matrix bonding. Consequently the composite material made from such fibers may not possess satisfactory mechanical properties. Therefore it is desirable to eliminate the impurity content of the fibers and perhaps enhance the surface topography of the fibers to obtain a stronger fiber-matrix bonding. The fibers were left to treat with 5% NaOH for 3-4 hrs. Later they were drawn and dried under sunlight for 1-2 hours.

Step 5: Wet Hand lay-up technique

Hand lay-up technique is the simplest method of composite processing. The infrastructural requirement for this method is also minimal. The processing steps are quite simple. First of all, a release gel is sprayed on the mold surface to avoid the sticking of polymer to the surface. Thin plastic sheets are used at the top and bottom of the mold plate to get good surface finish of the product. Reinforcement in the form of woven mats or chopped strand mats are cut as per the mold size and placed at the surface of mold after perspex sheet. Then thermosetting polymer in liquid form is mixed thoroughly in suitable proportion with a prescribed hardner (curing agent) and poured onto the surface of mat already placed in themold.

PHOTOGRAPHY

SAFETY

Max total deformation in natural composite is 0.01mm which is less than total deformation 0.207mm

ADVANTAGE

Comparing to conventional reinforcing fibers like glass, carbon and Kevlar, natural fibers have the following advantages:

•Environmentally friendly
•Fully biodegradable
•Non toxic
•Easy to handle
•Non abrasive during processing and use
•Low density/lightweight
•Source of income for rural/agricultural community
•Renewable, abundant and continuous supply of raw materials
•Low cost

APPLICATION

Hand lay-up method finds application in many areas like aircraft components, automotive parts, boat hulls, diase board, deck etc.

FEATURES OF THIS PROJECT

Presently, the main markets for bio composites are in the construction and automotive sectors. With further developments and improvements in performance, however, new opportunities and applications will likely arise. Significant opportunities are likely to occur in the built environment as this sector responsible for producing huge volumes of waste at a time when the environmental impact of industries is coming under close scrutiny. For example, new, 'environmentally friendly' materials are needed for off- site construction methods, improved quality and ease of installation and build

CONCLUSION

Since both the geometries are same and same load is applied; the equivalent stress distribution is same in both the cases. But the equivalent max strain in natural composite is 0.000056 mm/mm which is less than the max strain 0.00039mm/mm Plastic. Max total deformation in natural composite is 0.01mm which is less than total deformation 0.207mm in Plastic. Hence in the preliminary ANSYS test show that the natural composite with glass reinforcement possess better mechanical strength than the traditional plastic material.

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