

Preparation & Testing of Duck Egg Shell Powder Reinforced Polymer Composite Material for Automobile and Sports Accessories

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College : *Maharaja Institute of Technology Thandavapura, Mysur*

Branch : *Department of Mechanical Engineering*

Guide(s) : *Dr. T Venkate Gowda*

Student(S) : *Mr. Manikanta R*

Mr. Nakka Shanmukha Sai Teja Reddy

Mr. Prasad Muralan

Mr. Rahul Kumar

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Introduction:

Now-a-days, a larger area of material science research and development is focusing on advances in composite materials primarily because of their desirable properties like high specific strength, adaptability and design flexibility. The matrix in most composite materials of use for automotive applications is usually made of polymers. The earlier studies proven that the egg shells are biodegradable and one of the world's worse environmental problems, especially in the countries where the egg product industry is well developed. The production of eggs on a global industrial level has led to be the increasing of a large amount of egg shells. These egg shells are considered to be toxic materials. In recent years, there has been a focus to reuse these waste resources in the production of new thermoplastic and thermoset polymer materials. On the other hand, food waste become the most environmental problem in the in the current days, even though all the innovative solutions that have been applied. The problem comes from the food waste that cannot be recycled like paper, glass, and even plastic waste. Moreover, food waste may be a high toxic and causes serious health problems. The most solutions for this problem represented by using food waste as a planting fertilizer and biogas producer. In the current study, we would like to introduce another solution for one of the most produced food wastes, which is the egg-shells. The need for low-cost and environment-friendly materials has been continuously increasing, so our aim of this project is examining the capacity of duck eggshell powder as a bio-waste filler in polymer composites and some experiments were carried out to the specimen's such as tensile strength, elongation flexural strength, Impact strength and water absorption to find its mechanical properties for its suitable applications

Objectives:

- To prepare the fine powder from hatched duck eggshells.
- To fabricate duck eggshell powder reinforced polymer composite plate.
- To find the mechanical properties by conducting the following tests:
 - Impact Test
 - Flextural Test
 - Tensile Test
 - Hardness Test
 - Water Absorption Test
 - Thickness Swelling Test

Methodology:

- Preparation of powder of duck eggshells with help of grinding stone.
- Extraction of fine powder using Sewing machine with different size of sews.
- Fabrication of moulds as per dimensions
- Applying the wax over the mould surface
- Weighing the Eggshells powder & polymer as per calculations.
- Gently Mixing the Eggshells powder with polymer & hardener.
- Pouring the composite in to the cavity of the mould.
- Drying the composite materials about 24 hours at room temperature.
- Extraction of sample from the mould.
- Again, drying the composite plates for another 24 hours.
- Cutting the composite plate as per the ASTM.
- Conduction of mechanical testing as per ASTM standards
- Finding suitable application based on the obtained mechanical properties

Results and Conclusion:

In this project we are going to analyze duck eggshell powder reinforced polymer composites behaviors by conducting the mechanical tests. Based on the different results of specimens under the following testing as shown.

- Impact test
- Flextural test
- Tensile test
- Hardness test
- Water absorption test
- Thickness swelling test

By varying the percentage of duck eggshell powdered for the specimens, we are going to use it for different applications.

Scope for future work:

This project will help in using these waste duck eggshells for useful application which will be helpful in our daily life. This composite material can be used to make sport gears along with accessories in automobiles. Further the following tests may be conducted:

- Dynamic mechanical analysis
- Scanning electron microscope
- Energy dispersive X-Ray analysis
- X-Ray diffraction
- Abrasion resistance test
- Adhesive Wear test
- Hardness test