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Manufacturing of fluid container using bio-composite material

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ABSTRACT

The need for renewable fibre reinforced composites has never been as prevalent as it currently is. Natural fibres that are available in abundance in nature and can easily be produced offer properties such as strength as much as plastic, bio degradability, and cost reduction. The aim of manufacturing the container is to find an alternative to materials that are not bio degradable. Fibres that have been used in the following research are of agave leaf. The results have been obtained to see whether container manufactured is safe to store fluid such as water.

Keywords: *Agave leaf, Bio-Composite Material, Fluid Container*

1. INTRODUCTION

There is growing demand for materials that are environmentally friendly and sustainable. One of the areas of focus right now is the transportation/automotive field. To reduce the negative impacts on global air quality, human health and global climate. Several researchers are focusing on bio-based composites. With natural fibers being the prime choice for fiber reinforced composites. Plastics have become the choice for many applications due to their long life and attractive properties. Due to its tremendous growth in applications, plastics are one of the fastest growing segments of the waste stream. Majority of plastic products are made from petroleum-based synthetic polymers that do not degrade in land fill site or in a composite like environment. Ecological concerns have resulted in a renewed interest in natural and compostable materials, and therefore issues such as biodegradability and environmental safety are becoming important. Tailoring new products within a perspective of sustainable development or eco-design is a philosophy that is applied to more and more materials. It is the reason why material components such as natural fibers, biodegradable polymers can be considered as interesting 'environmentally safe' alternatives for the development of new biodegradable composites. Nowadays production of natural biodegradable polymer composites is an important research topic on the stage of renewable sources implementation instead of petrochemical sources. Large variety of natural fibres and their developed surface which increases adhesion to matrix makes them an attractive filler material. In fibre-reinforced composites, the fibres serve as reinforcement by giving strength and stiffness to the structure while the polymer matrix holds the fibres in place so that suitable structural composites can be made.

1.1 Problem statement

In this paper, we will focus on material which is related to the safety of the environment and human beings. The plastic is the biggest threat to the environment and its tremendous use. So to eliminate it and stop the harm to the environment we have designed bio composite material fluid container. Replace plastic which causes health defects to the environment as well as human beings. And the development of good alternative with better properties and environment-friendly.

1.2 Objectives

1 To make the energy-intensive environment-friendly material.
2 If the bio-composite material could be the plastic and/or steel in future since it is renewable.
3 To determine if whether fluid container manufactured is safe to store water.

1.3 Composites

1. Fibers of Agave leaf: Fibres used in the manufacturing are obtained from agave leaves. In previous researches, we've found that it has a flexural strength of 81.95 N/mm^2.
2. Epoxy resin: It has the following outstanding properties : Excellent adhesion to many different materials Great strength, toughness and resilience Excellent resistance to chemical attack and to moisture Outstanding electrical insulating properties Absence of volatiles on curing Negligible shrinkage Other epoxy resins for bonding, casting, tooling, pattern making, surface coating, lamination and concrete repairs are available.

1.4 Methodology

The methodology used to manufacture the container includes following processes.

1. Collecting raw Agave plant leaves.
2. Cleaning and soaking of leaves.
3. Extraction of fibres from leaves.
4. The casting of Container using epoxy resin.
5. Determining the results by storing water in the container.

Below is the product obtained after manufacturing:

Figure 1: Fluid Container

1.5 Results

To determine whether the fluid i.e. water stored in the container is safe to drink, water has been stored in the container for 30 days. Later water was tested at Sharayu Enviro Care Consultant & Product Distributor, Pune.

Following are the test results obtained after testing the water.

Table 1: Test report of Water Sample

Sr. No.	Name of the test	Test Results for Sample 1	Test Results for Sample 2
1	pH Value	7.1	7.1
2	Acidity	58 mm/l	32mm/l
3	Alkalinity as $CaCO_3$	90 mg/l	95 mg/l
4	Hardness as $CaCO_3$	70 mg/l	75 mg/l
5	Chlorides	95.71 mg/l	95.71 mg/l
6	Sulphate	82.30 mg/l	86 mg/l
7	Total Solids	100 mg/l	200 mg/l
8	Organic Solids	00 mg/l	0 mg/l
9	Inorganic Solids	00 mg/l	100 mg/l
10	Suspended Solids	100 mg/l	100 mg/l
11	Dissolved Solids	00 mg/l	100 mg/l
12	MPN Index	Less than 2 /100ml	Less than 2 /100ml

Note: Sample 1 is water taken from tap and Sample 2 is water after storing 30 days in a container

1.6 Remarks

Water sample received is Suitable for drinking purpose as per I.S. 10500-2000. However, it is recommended to disinfect the water before using it for drinking purpose.

2. CONCLUSION

It can be seen that bio-composite material has potential to replace plastic. Thus water stored in the container made of the bio-composite material is safe for storing water and can be used for drinking as it does not react with water. However, new process development for bio-composite fabrications for commercial applications is the real challenge of research at the current level of technology so far developed for bio-composites.

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