“MECHANICAL PROPERTIES EVALUATION OF NATURAL FIBERS REINFORCED BIO-COMPOSITES & FABRICATION OF A BIO-COMPOSITE TELEPHONE STAND (ARECA FIBERS, SISAL FIBERS, COCONUT COIR AND JUTE FIBERS AS REINFORCEMENTS)”

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Introduction:

There is a growing interest in the use of natural fibers as reinforcing components for both thermoplastic and thermo set matrices, because of the ideal benefits offered by natural fibers such as convenient renewability, biodegradability, and environmentally friendliness. Bio-composites which have natural fibers as reinforcements have increasingly attracted attention because they may be a promising material not only as a novel material for natural resource, eco-friendliness, sustainability, lightness, carbon dioxide reduction in nature and cost-effectiveness, but also as an alternative to conventional glass fiber polymer composites in many industrial and commodity applications.

Conventional and traditional fiber reinforced composite materials are composed of carbon fibers, glass fibers which are incorporated into Polymers, these composite materials have excellent mechanical properties but these materials cause environmental pollution due to the non-degradability of fibers. The uses of natural fibers as reinforcement has grown substantially in the past decade as they have low density and high specific strength, and are of utmost interest in applications striving for lightweight and high strength.
OBJECTIVES:

- Extraction of Natural fibers such as Areca fibers, sisal fibers, Jute fibers, and coconut coir.
- Pre-treatment of the extracted fibers with NaOH for the improvement of surface morphology.
- Fabrication of bio-composites using Natural Fibres as reinforcements and Epoxy as matrix.
- To evaluate the Mechanical properties of Bio-Composites. [Tensile, bending, strength]
- Fabrications of a simple telephone stand using this Bio-composite.

Methodology:

- Extraction of natural fibers: natural fibers such as Areca fibers, sisal fibers, Jute fibers (Procured) and coconut coir are extracted by retting and mechanical extraction.
- Selection of Matrix material: Epoxy (CY-230): Hardener (HY-951)
- The extracted natural fibers were Surface Treated with NaOH (10%) for improving the surface morphology.
- Preparation of the Composite using Epoxy resin as the matrix and natural fibers as the reinforcement. The weight fraction of fibre and matrix was kept at 40%-60%.
- Testing the composite materials for the evaluation of Mechanical Properties such as Tensile Strength, Bending Strength and Impact Strength.
- Fabrication of a simple telephone stand by using the bio-composite.
Snap shots of the Preparation of natural fibers reinforced Hybrid Composites and the fabrication of a simple Telephone stand.

Figure showing the fabrication of Hybrid Composite with Areca fibers, sisal fibers Jute fibers and coconut coir as reinforcements.
**Results and Conclusion:**

The present experimental study aims at learning the mechanical behaviour of hybrid natural fiber composites. Samples of Areca fibers, sisal fibers, jute mat and coconut coir fibers reinforced Epoxy hybrids were manufactured using hand layup method where the stacking of plies was alternate and the weight fraction of fibre and matrix was kept at 40%-60%. Specimens were cut from the fabricated laminate according to the ASTM standards for different experiments.
The mechanical properties obtained were as follows:

The tensile strength was found to be 150 MPa.

The flexural strength was found to be 120 MPa.

The impact strength (Charpy impact test) was found to be 1.6 Joules.

Once the mechanical properties were evaluated a simple portable telephone stand was fabricated.

The following factors were considered for the fabrication of the telephone stand:

- Stability of the product
- Cost of production
- Ease of manufacture
- Reliability of service
- Ergonomic aspects
- Low setup time
- Ease of transport.

The Areca fibers, sisal fibers, jute mat and coconut coir fibers were used in an effective manner, which otherwise are considered to some extent as a waste product.

The hybrid composites produced with these natural fibers can be used for household furniture applications and may replace the conventional metallic, non-metallic, wood, and plastic materials to some extent.