Analysis of Mechanical Properties of Abaca & Ramie Composite Material

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Abstract— This present experimental study evaluated the on mechanical properties of Abaca, Ramie & Epoxy composites. Samples of different volume fractions of natural fiber reinforced composites were fabricated by Compression moulding technique and investigated their mechanical properties like tensile strength, Impact Strength and Water absorption test. Specimens were cut from the fabricated laminate according to the ASTM standards for different experiments. The work of this experimental study has been carried out to determine the mechanical properties due to the effect of Abaca and Ramie fibers orientations whose volume fraction are 17.5%, 35%, 65% .The results of this study indicate the orientation (0% , 35%,65%) volume fraction shows the better mechanical properties compare than(35%,0%,65%) & (17.5%,17.5%,65%) fiber.

Keywords: Mechanical Properties, Abaca Fiber/Ramie, Epoxy

I. INTRODUCTION

The composites industry has begun to recognize that the commercial applications of composites promise to offer much larger business opportunities than the aerospace sector due to the sheer size of transportation industry. Thus they shift of composite applications from aircraft to other commercial uses has become prominent in recent years. A composite material consists of two or more physically and/or chemically distinct, suitably arranged or distributed phases, with an interface separating them. It has characteristics that are not depicted by any of the components in isolation. The most commonly, composite materials have a bulk phase, which is continuous, called the matrix, and one dispersed, non-continuous, phase called the reinforcement, which is usually harder and stronger. In this we using the natural fibers like Abaca and Ramie. Abaca is a natural fiber (Scientific name is Musa Textiles) of family name is (Musaceae) yields a banana native to the Philippines. Ramie (bohemia novae), commonly known as China grass, white ramie or rhea, is one of the group referred to as the baste fiber crops. By using those fibers we modify soy protein resin, and composites were characterized for their mechanical and thermal properties.

II. COMPOSITES PREPARATION

Initially the pattern placed on the ground or table, paraffin (or) wax applied on the surface of the mould after finishing OHP sheet used as that surface. Apply a coating of general epoxy resin on the surface and allow adequate time. Abaca fiber placed properly after it as the first layer. Then after adequate time the mixture of general EPOXY resin. Place the glass fiber over the resin mixture surface. Again pour same mixture. Place the RAMIE is mixed with epoxy resin at a proper ratio and then it is poured as the next layer over it. Again pours same mixture as required quantity. Place the glass fiber over the resin mixture surface. Again pour same mixture as required quantity. Abaca fiber placed after it as the last layer. Again pour same mixture as required quantity. Place the glass fiber over the resin mixture surface. Pour the same mixture again in the same ratio. Above all place the glass fiber as the last layer. Apply force to this arrangement using hydraulic press

III. EXPERIMENTAL RESULT

Testing result of composite material the various test performed in mechanical testing are

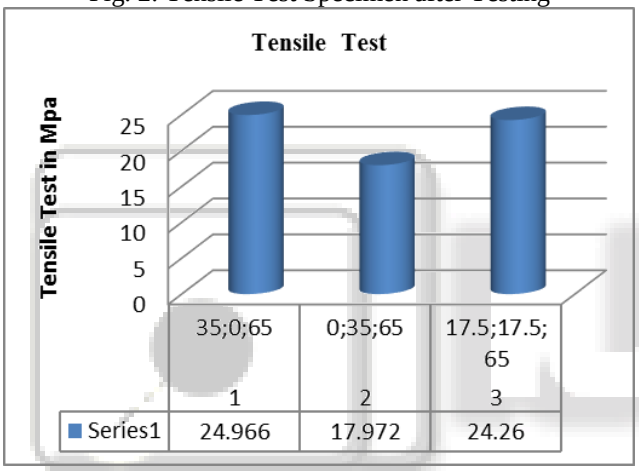
- Tensile test
- Water test
- Impact test

A. Tensile Test Result

Mechanical properties such as Ultimate tensile strength (UTS), % of elongation are computed from the test conducted using universal testing machine (UTM) in accordance to ASTM D-3039 standards. The tensile modulus and elongation at the break of the composites calculated from the stress strain curve. Three specimens tested for each set of samples and the mean values are reported. The first samples gave good results when compared with the other samples.

Fig. 1: Tensile Test Specimen before Testing

Fig. 2: Tensile Test Specimen after Testing



B. Water Absorption Test Result

In water absorption test, the specimens are dried for a specified time and temperature and then placed to cool. Immediately upon cooling the specimens are weighed. The material is then emerged in water at agreed upon conditions, often 23°C for 24 hours or until equilibrium. The specimen size is 0.125" or 0.250" thick. Specimens are removed, patted dry with a dust free cloth, and weighed.

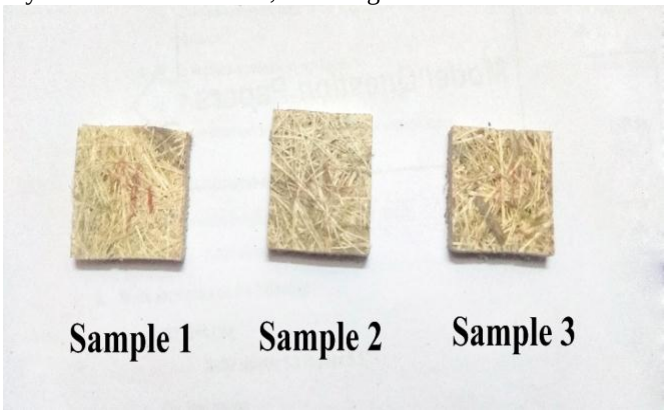
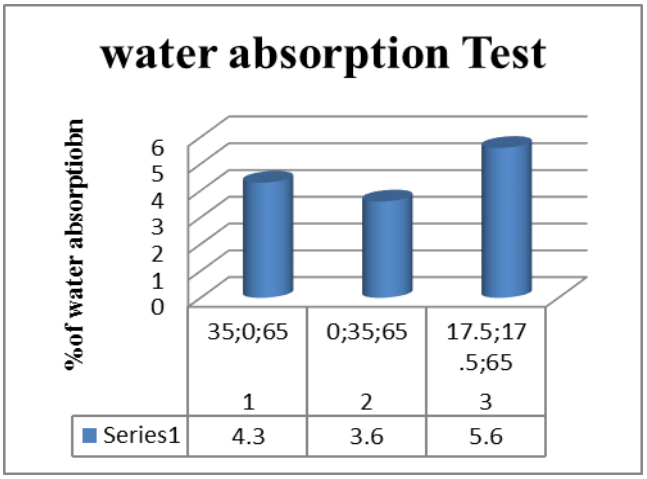


Fig. 3: Water Test Specimen



C. Impact Test Result

ASTMD-6110 (Standard test method for impact properties of polymer matrix composites). The test specimen geometry as specified in the above standard for balance fiber composites are 64 mm long × 12.7 mm wide × 3 mm thick. The Charpy test specimens are clamped in an upright position, so that the end of the specimen faced its striking edge and impact energy absorbed for breaking the specimen is directly obtained. The test result are given below

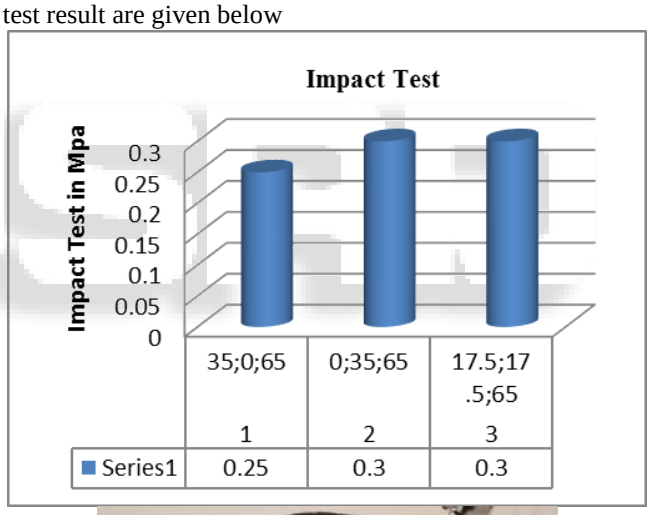


Fig. 5: Impact Test Specimen before Testing

Fig.6: Impact Test Specimen after Testing

IV. CONCLUSION

The Natural Fiber Reinforced Composites tested for its tensile strength, Water strength, impact strength as per ASTM standard (Tensile Test-ASTM D3039, Water Test – ASTM D790, Impact Test-ASTM D256). From the above results it revealed Water and Tensile strength found that highest 35% Abaca fiber 63% Epoxy 2% Ramie Composite. From the result it observed that the Water strength increased with increasing Abaca & Ramie by volume fraction. This is due to complete filling of voids in the matrix by Abaca particles. The Water strength found that highest 17.5% Abaca fiber 17.5 % Ramie 65% Epoxy composite. The impact strength was found that highest 35 % Abaca fiber 0 % Ramie 65% Epoxy composite. The Tensile strength was found that highest 0% Abaca and 35 % Ramie 65% Epoxy composite.

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