



## DEVELOPEMENT OF GLASS/ DRUMSTICK/BANANA FIBRE REINFORCED EPOXY HYBRID COMPOSITES

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**Abstract---** *Glass fibers /Drumstick fibers/banana fibers reinforced with epoxy sandwich composites were fabricated. Impact strength, frictional co – efficient and dielectric strength were studied and analyzed. It is analyzed that the impact strength and frictional co-efficient properties were improved with simultaneously improving Glass fiber content. The samples were treated with NAOH solution and non-treated samples are also collected. The variation between the treated samples and non-treated samples were studied. The fabricated composite possess good insulation property.*

**Keywords:** *DFF fiber, impact strength, chemically treated fibers, non-treated fibers, dielectric strength, coefficient of friction and insulating property.*

### I. INTRODUCTION

Epoxy plays a vital role in matrix material for fabrication of hybrid composite, insulation in electrical board, defense equipment because of its excellent co-ordination of bonding and mechanical, dielectrical characteristic to improve the impact strength of the hybrid composite toughening of epoxy resin material. Fiber plays a vital role in all the industries because of its light weight and high strength and more efficient, it is present in both natural and man-made. When fibers are aligned in a matrix it produces concentrated load evenly throughout the composite this hybrid composite can be easily fabricated and provide compressive strength and impact strength. This can be achieved by the combination of different fibers. Man-made fibers possess covalent bond which withstand the wear.

The fabricated hybrid composite have high specific strength, Wear and tear doesn't taken place in the hybrid composite to predict the wear and tear friction test is conducted. Drumstick combined in the composite produces high Strength and glass fiber combined in the hybrid composite possess insulation property. our ultimate aim is to fabricate an advanced composite material, which can be useful for specific hybrid composite which possess high insulation property. Performances of hybrid fiber composite were studied by varying the composition of fiber. The effect of alkali treated hybrid composite is compared with non-treated hybrid composites.

### II. MATERIALS AND METHODS

The glass fiber were supplied by emak glass fiber pvt limited and then banana fiber and drumstick fiber were extracted by our self. The resin used for manufacturing hybrid composite is epoxy resin (Ly 556) and hardener (Hy-951), and the above fibers were soaked in 1/100 volume of NAOH solution for 30 minutes of remove the foreign particles and grease in the material. A mold cavity (200mmX200mmX3mm) was prepared the mold cavity is sprayed by good

releasing agent which is polymer based mold release spray (OKS 1521). The resin and hardener are taken in the ratio of 100:10 parts, respectively. There the glass fiber is randomly distributed throughout the mold and then the epoxy resin is applied over the glass fiber and undisturbed about 20 minutes for each layer become of drying.

Over the glass fiber, banana fiber is randomly distributed and resin is applied sequentially drumstick fiber also randomly distributed over the model and resin is applied. After finishing the above process, the mold is kept in vacuum bagging about 30 minutes. Vacuum bagging plays a vital role in Distributing out the mold. This process improves the stiffness and strength of the composite for curing the errors in the composite. The mold is kept in vacuum oven for about 100°C .It improves the strength of the hybrid composite.

### 2.1 Impact Strength

The fabricated composite is cutted into required dimension of ASTM D256 88 (120mm\*13mm\*3mm).some specimen is treated with NAOH solution and remaining specimens were non treated specimen. The impact strength variation among treated and non-treated specimen is analyses.

### 2.2 Friction Test

To predict the wear and coefficient of friction among the treated and non-treated component. The specimen is verified in friction test experiment. In this experiment, dimension of the specimen is about (40cm\*8cm\*3cm). There are 6 specimens were tested 3 specimens were treated in NaoH and remaining specimen is non-treat. The comparison between the specimens is determined and coefficient of friction is determined.

### 2.3 Di-electric Strength

For dielectric test the specimen is cutted into circular part of diameter 100mm. six specimens were tested among six specimen 3 were treated with the NAOH and remaining specimens were non treated. Test conducted at room temperature. The fabricated components possess good insulation property so from the above dielectric test, the dielectric breakdown is determined and variation among the specimen is studied.

## III. RESULTS AND DISCUSSION

The variation strength of impact strength plotted in Fig.1.the impact strength increased simultaneously by improving the DFF fiber and BANANA fiber ratio. The impact strength observed between the treated and non-treated fiber.in this case impact strength values varied between the 120 to 490 Mpa.

The Di-electric strength of hybrid composites plotted in Fig.2. Dielectric strength is increased with increase in volume of the fiber .this is unbelievable phenomena which is not observed in many natural fibers. Dielectric strength of hybrid fiber composites is verified and it can be considered for electrical insulation application.

For fabricated hybrid composite, the friction coefficient was increased in increase with the load. The frictional co-efficient is reduced by means of higher force. The coefficient of friction is predicted by varying the load 1N, 5N, 10N. The lowering of the friction is predicted at 40/0/0 wt % of glass fiber/banana fiber/drumstick fiber reinforced hybrid composite. The friction value is higher in treated samples then the non-treated samples. Variation of coefficient of friction after 20 minutes of hybrid composite under a sliding speed of 0.5mm/s. it for further noticed that the coefficient of friction is considerably decreased with increased in varying loads.

The strength of the composites increases by increasing the weight ratio of Drumstick fiber and banana fiber. Because of it is improving the stiffness and strength of the composites. The impact strength graph plotted the treated and non-treated fiber composites.

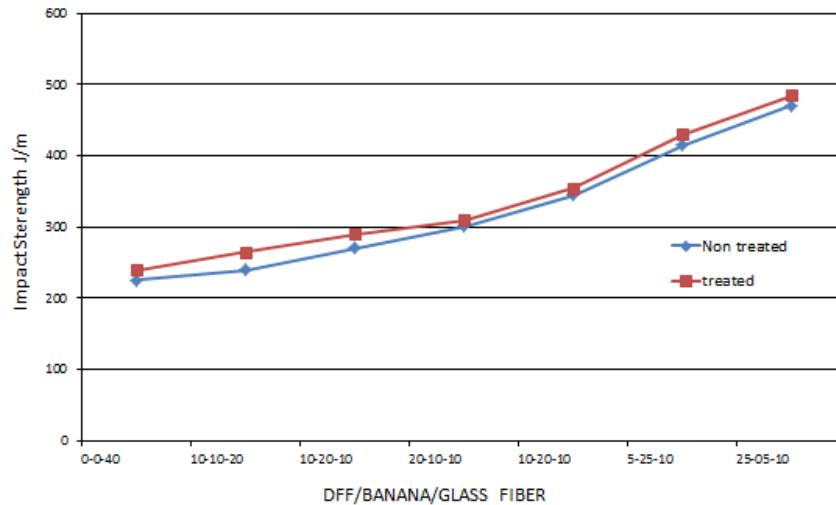


Fig.1. Impact strength of DFF / BANANA / GLASS Fiber

The dielectric breakdown voltage increases by increasing the weight ratio of the drumstick and glass fibers in the composite fiber. The break down voltage of the non-treated fiber composites higher than the treated fiber. The di-electric voltages are measured at five point of each specimen.

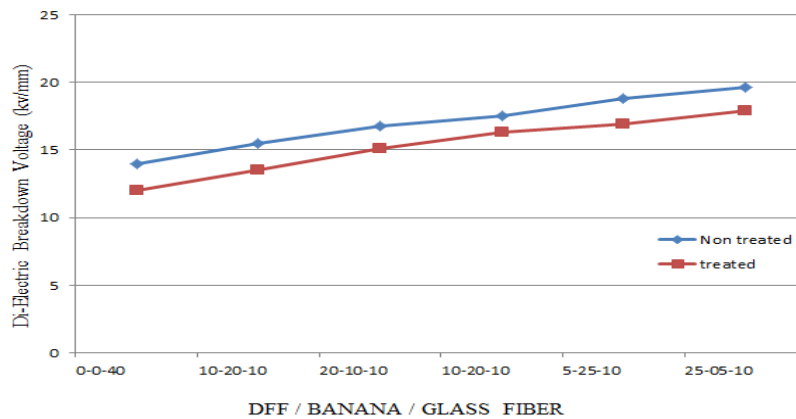


Fig 2. Dielectric Breakdown Voltage

### 3.1 NON-TREATED FIBER



Fig 3.Co-efficient of Friction  
applied load = 1N



Fig 4.Co-efficient of Friction  
applied load =5N



Fig 5: Co-efficient of Friction  
applied load=10N

### 3.2 TREATED FIBER

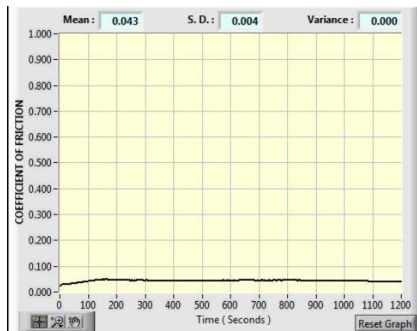


Fig 6.Co-efficient of Friction  
applied load = 1N

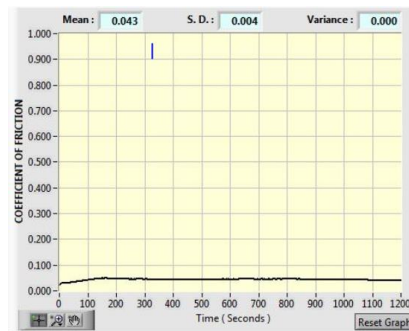


Fig 7.Co-efficient of Friction  
applied load =5N

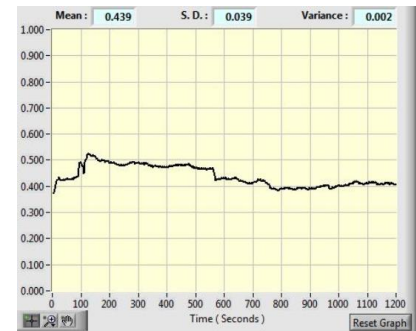


Fig 8.Co-efficient of Friction  
applied load=10N

## IV. CONCLUSION

The hybrid composites glass fiber/banana fiber/drumstick fibre reinforced epoxy composited were fabricated in order to examine the impact strength, coefficient of friction, dielectric strength and the chemical treated composites comparison with non-treated composites. The chemical treated drumstick fibers were found to be increasing the impact strength. Treated composite possess 40/0/0(GF/BF/DFF) wt. ratio, coefficient of friction is reduced by increasing the varying loads. The dielectric properties were studied and verified that the fabricated composites possess good insulation property and it can be applicable for electrical insulation. the chemical treatment of hybrid composite is to eliminate the amorphous cellulose property from the drumstick fiber which may be the responsible for the results.

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