

# BANANA FIBER REINFORCED POLYMER MATRIX COMPOSITES

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**Abstract:** The effective paper that relates the process and preparation of banana fiber reinforced composites in the field of material science. The composition of polypropylene and the banana fiber are in ratio of 9:1. The addition of NAOH and chopped banana fiber will increase the bonding between the banana and PP. The maleated polypropylene will improve the mechanical properties up to 80%. After the material preparation, the sample is tested for its mechanical properties such as tensile, flexural, impact, hardness and percentage of elongation is tested in the strength of material laboratory. The mechanical properties before and after the results are tabulated and graph is plotted.

**Key words:** banana, NAOH, acidic acid, MAPP and mechanical properties.

## 1. INTRODUCTION

The composite materials play a vital role in our life. These materials are used in aerospace, automobile and also a great alternate for glass fibers. The composite materials are classified according to the strength and mechanical properties of the material which stand at very high temperature. In automobile industries, composite materials are widely used in manufacturing of car body. These kind of composite materials are the reinforcement of natural fibers. These fibers are easily collected from earth with minimum cost and it is easily separated by manual process. These materials are easily degradable and does not pollute the environment. So the preparation process is also Eco friendly. The fiber separation cost is very low when compared to the synthetic fibers.

## 2. FIBER



Fig 2.1 banana fiber

## 3. COUPLING AGENT

The two reactive group of coupling agent are used in this process. The one is to react the fiber surface and other is to polymerize between the banana fiber and matrix. Some of the coupling agents are maleated polypropylene and maleated polyethylene. It will increase tensile strength up to 80%. The resultant material is processed to injection molding machine after the blending process.

#### 4. ACID TREATED BANANA FIBER



Fig 4.1 acid treated banana fiber

#### 5. SAMPLE PREPARATION

The banana fiber is extracted with a thickness less than 2mm and immersed in NaOH solution for 3 hours. Then the banana fiber is treated with the 5ml acetic acid for 20 minutes. Then the banana fiber is washed with distilled water. After that, banana fiber is heated for whole day at 100°C. The moisture content is reduced less than 5%. The maleic anhydride is used to increase the bonding between reinforcement material and matrix.

#### 6. SEM IMAGES OF BANANA FIBER

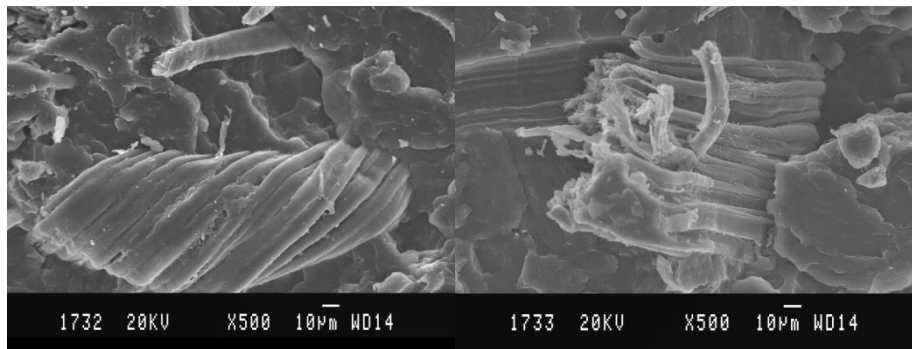


Fig 6.1 and 6.2 SEM images of alkali treated banana fiber

#### 7. PROCESS

The twin extruder machine has the composition of 10% banana and 90% plastic which blends with the help of maleic anhydride. After that, the injection moulding has the molten polymer is mixed with the material under the high pressure.



Fig 7.1 extruder machine



Fig 7.2 injection moulding

The outcome of material is tested for various properties such as tensile, flexural, impact and hardness in the strength of materials laboratory. The outcome material dimension is 15\*20\*3mm. The output specimen is immersed on the ground water for 24 hours.

## 8. RESULTS

### 8.1 Before water absorption

S.N	Blend Ratio	Tensile Strength MPa	Tensile Modulus MPa	% of Elongation	Flexural Strength MPa	Flexural Modulus MPA	Impact Strength J/cm	Hardness	% of Water absorption
1	PP + Banana	45.20	1404.01	66.667	78.627	1457.25	9.89	75	0.02

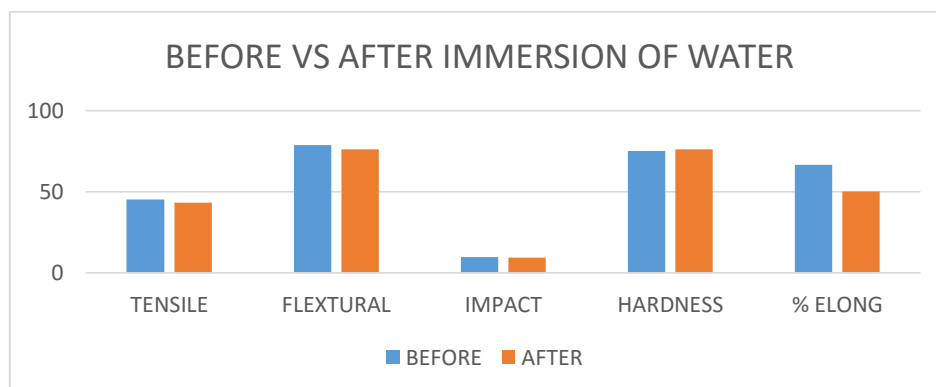
Table 8.1.1 mechanical properties before water absorption

### 8.2 After water absorption

S.N	Blend Ratio	Tensile Strength MPa	Tensile Modulus MPa	% of Elongation	Flexural Strength MPa	Flexural Modulus MPA	Impact Strength J/cm	Hardness	% of Water absorption
1	PP + Banana	43.235	1339.019	50.19	76.568	1506.76	9.5	76	-

Table 8.2.1 mechanical properties after water absorption

## 9. GRAPH



Graph 9.1 mechanical properties before vs after water absorption

## 10. CONCLUSION

The banana fiber reinforced composite have high strength before the water absorption when compared to after water absorption. The hardness value and impact strength is same before and after water absorption. The polypropylene with banana fiber reinforced composite have the maximum strength in that particular preparation.

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