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The Effect of Chemical Treatment on Mechanical properties of Ground Date Pits

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Abstract: This study has been undertaken to investigate Evaluation of mechanical properties of ground date pits epoxy based composite to determine optimum sodium hydroxide (NaOH) concentration. This work involves cleaning and chemical treatment of ground date pits with different concentrations (1% to 7%) of sodium hydroxide (NaOH). The composite plate is made with epoxy and ground date pits powder in a mold is used for preparing the composite specimen. It is found that the 6% NaOH concentration gives the optimum results.

Index Terms – NaOH, ground date pits, chemical treatment.

I. INTRODUCTION

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. 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. Over the last thirty years composite materials, plastics and ceramics have been the dominant emerging materials. The volume and number of applications of composite materials have grown steadily, penetrating, and conquering new markets relentlessly. Modern composite materials constitute a significant proportion of the engineered materials market ranging from everyday products to sophisticated niche applications. While composites have already proven their worth as weight-saving materials, the current challenge is to make them cost effective. The efforts to produce economically attractive composite composites industry. It is obvious, especially for composites, that the improvement in manufacturing technology alone is not enough to overcome the cost hurdle. It is essential that there be an integrated effort in design, material, process, tooling, quality assurance, manufacturing, and even program management for composites to become competitive with metals.





- 1. Natural fibers are used in different manufacturing industries with their good mechanical properties.
- 2. For the automotive industry, where weight reduction always is an issue, this is said to be the original reason for the development of interior parts with natural fibers as fillers.
- 3. Very few researchers only investigated the Ground Date pits epoxy-based composites.

III. LITERATURE REVIEW

Fares D. Alsewailem, et.al In the absence of proper coupling agent systems, fracture surfaces of the polymer/date pits composite systems tested in this study were rough with great degree of debonding and bad adhesion of date pit particles which appeared to be very large. Both coupling agents used in this study, DPMI and

EP-g-MA, were effective in altering the morphology of the polymer/date pits composites and hence improving the mechanical properties.

A. Ghazanfari., et.al**4** investigated that the date pits flour was used as a filling material in composition with high density polyethylene (HDPE). The blending proportions were: (1) 10% date pits, 90% HDPE; (2) 20% date pits, 80% HDPE; (3) 30% date pits, 70% HDPE and (4) 40% date pits, 60% HDPE. The tensile and flexural tests on composite plates, fabricated by compress moulding, indicated that strength and strain values decreased with increase in the percentage of date pits. There was no significant difference between flexural module of elasticity of the composites, but tensile modulus had the highest value at 30% blend.

S. Panigrahi., et.al2 In this research paper pistachio shells and date pits were used as filler for making bio composite plates in conjunction with polyethylene. Both of these agro-materials are produced in large amount as waste products of pistachio or date processing plants. Plates made in these experiments contained 20% by weight either ground pistachio shells or date pits. In similar treatments, 1% flax fiber was also used as a reinforcing material. The results indicated that, in general, the date pit plates had a better appearance, melt flow index, dispersion and bounding.

IV.SELECTION OF MATERIALS

- 1. In India, large amount of ground date pits is available in different states which can be utilized for the preparation of composite materials.
- 2. Cost of the ground date pits is very low.

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- 3. Ground date pits provide advantages of high stiffness and strength to weight ratio as compared to conventional composite materials.
- 4. Epoxy resin (LY-556) cost is low
- 5. Epoxy resin (LY-556)
- 6. Hardener (HY-951)
- 1. Natural Fibers (Ground date pits)





Fig.2

Fig.3

Fig.4

V. TREATMENT OF GROUND DATE PITS

- 1. Ground Date Pits pieces washed thoroughly in water and with distilled water to remove unwanted particulates and dust particles then it should be dried for 2 to 3 days
- 2. After that seeds are dried. The seeds are treated with 1% to 7% NaOH solution and 99 % to 93% GDP with fibre water ratio of 2:3 for 2 hours.
- 3. Then it should be washed with distilled water and be dried.
- 4. Treated ground date pits are powdered using flour mill machine .
- 5. Ground date pits powder sieved for uniform particle size by using sieve of 335 microns.
- 6. Compression molding is a common process used for both thermoplastic and thermoset materials.
- 7. Compression molding is accomplished by placing the material in a mold cavity to be formed by heat and pressure
- 8. The heat and pressure force the material into all areas of the mold. The heat and pressure cycle will harden the material

and then it can be removed.

Mold of dimensions 200x200x6mm was prepared for making composite material.



Fig.5 mold

VI.COMPOSITE PREPARATION

- Mixing of ground date pits powder, epoxy resin and hardener should be carried on the following basis for making the composite plate.
- Calculation for plate preparation:
 - volume of the mould $= 200 \times 200 \times 6$ mm $=240000 \text{ mm}^3$ $= 0.00024 \text{m}^3$ as we know $1m^3 = 1000$ litres $0.00024m^3 = 0.24$ litres as we know 1 litre = 1000 gms 0.24 litres =240 gms Capacity of the mold = 240 gms 30% of ground date pits powder $= 240 \times 30/100$ ⁼ 72gms 70% of Epoxy resin and Hardener $= 240 \times 70/100$ = 168 gms



=151.2gms(epoxy)+16.8gms(10% hardener)

Fig.6 molded sheet

- •After thorough mixing the mixture should be poured in the mold uniformly.
- •Then mold should be closed with lid on the top for uniform distribution of the load.
- •Mold should be placed in the compression molding machine and be compressed.
- •Keep it in the molding machine for 2 hours for curing.
- Finally the composite plate is fabricated by removing it from the mould.

VII. TESTING

- Specimens prepared from the plate as per ASTM Standard and subjected for Testing.
- For tensile test ASTM-D638 standard of dimensions 165x19x6mm is used.
- For Flexural test ASTM-D790 standard of dimensions 110x20x6mm is used.
- For impact test ASTM-D256 standard of dimensions 55x10x6mm is used.

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- For water absorption test, dimensions of 76.5 x 25.5x 6mm is used.
- For Thermal conductivity test square specimen of 50mm is used.

Testing specimens as per ASTM standard for Tensile, Flexural and Impact tests



Fig.7 Testing specimens

TESTING PROCESS



Fig.10 Impact testing

VIII.TESTING RESULTS

Treated with NaOH	Tensile Strength (MPa)	Flexural Strength (MPa)	Impact Strength (J)	Water Absorption Test(%)
1%	8.2	25.215	2.74	1.7
2%	9.9	27.675	2.62	1.6
3%	12	29.5	2.56	1.5
4%	14	31.5	2.47	1.4
5%	17.5	35.5	2.29	1.2
6%	19.25	39	2	0.75
7%	17.4	37.4	2.19	1.19

Table.1

Table.1 shows fibers are treatment with NaOH in 1 to 7 percentages and mechanical properties like tensile strength, Flexural strength, Impact strength and water absorption test.

TENSILE TEST



The variation of tensile strength of composite materials is shown on the graph1. It exhibits the variations of tensile strength of Treated composite materials. The composite of 6% has high tensile strength of 19.25 MPa.

FLEXURAL TEST



Graph.2

The variation of Flexural strength of the composite materials is shown on the graph.2. The Treated 6% composite has high Flexural strength of 39 MPa.



IMPACT TEST

The variation of Impact strength of the composite materials is shown on the graph.3. The composite has low Impact strength for 6% and also the individual has high Impact strength for treated 1%.



WATER ABSORPTION TEST



The variation of water absorption test of the composite materials is shown on the graph.4. The composite has high absorption for 1%. The composite of 6% has lower water absorption.

IX.CONCLUSION

The effect of NaOH concentration (1% to 7%) for treating Ground date pits reinforced composite concluded that maximum tensile and flexural strength resulted from the 6% NaOH treatment because of increased interface adhesion between particle and matrix and decrease in impact strength and the water absorption of the material.

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