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ENVIRONMENTAL CHARACTERISTICS OF JUTE FIBER REINFORCED WITH E-GLASS

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Abstract:

A composite is a heterogeneous material created by the synthetic assembly of two or more components constituting reinforcing matrix and a compatible matrix to obtain specific characteristics and properties. In this project we Selected jute fiber, E- Glass and it is embedded in a primary resin matrix system (Thermosetting), the task of which is to hold the fibers together, this provides and stabilizes the shape of the composite structure, transmits the shear forces between the mechanically high-quality fibers, and protects them against radiation and other aggressive media and the specimen is prepared. The component is conditioned and prepared for testing and subjected to tensile test, hardness, water absorption and temperature at 120^0C to determine the characteristics of the composite. The main aim of this project is to reduce the impact on the environment, by preparing specimen using recyclable natural fibers. The resulting fibers microstructures from water absorption and exposed to temperature are studied under SEM analysis

Key Words: Jute, E-Glass, Thermosetting & Characteristics

1. Introduction:

India endowed with an abundant availability of natural fiber such as Jute, Coir, Sisal, Pineapple, Ramie, Bamboo, Banana etc. has focused on the development of natural fiber composites primarily to explore value-added application avenues. Such natural fiber composites are well suited as wood substitutes in the housing and construction sector. The development of natural fiber composites in India is based on two pronged strategy of preventing depletion of forest resources as well as ensuring good economic returns for the cultivation of natural fibers. The developments in composite material after meeting the challenges of aerospace sector have cascaded down for catering to domestic and industrial applications. Composites, the wonder material with light-weight; high strength-to-weight ratio and stiffness properties have come a long way in replacing the conventional materials like metals, wood etc. The material scientists all over the world focused their attention on natural composites reinforced with Jute, Sisal, Coir, Pineapple etc. primarily to cut down the cost of raw materials.

2. Experimental:

Materials: E-Glass(density 2.44gm/cm^3,Tensile strength 2000Mpa), Jute(density 1.3gm/cm^3, tensile strength 393-793Mpa), Epoxy(Density 1.44gm/cm^3, tensile strength 2860-3750Mpa).

Compounding: Wax is applied to frame and as well as to GI sheet of 200mmx100mm with a thickness of 5mm in the ratio of 60:40 of jute and E-glass fibers alternatively. Then GI sheet is placed in the frame and resin is mixed with hardener with required proportions and adhesives are applied.

Specimen Preparation: The mould sample for testing were compression moulded using compression moulding at 150^0c and 50mpa for 10mins. After Pressing the sheet is removed from the press and cooled by water.

3. Characterization Techniques:

Tensile Strength: Tensile Properties are evaluated according to FIE-40 and UTN-40 of universal tensile machine subjected to hot and wet conditions

Shore Hardness: Hardness test is carried out by ASTM D 2240:2003 of Shore Hardness Tester. A tensile test is conducted for a specimen that is subjected to temperature at 1200c for 3 days after it is subjected to water absorption for 3 days.

4. Results and Discussions:

Tensile, compression and hardness tests are conducted to the specimen. The results are:

Table 1

Tensile Test(N)	Compression Test(N)	Shore Hardness Test(N)
1520	900	88

Weight: When specimens are subjected to water absorption, the jute in the matrix absorbs some water and gradually increases its weight.

Table 2: Increased weight %

S.No	Initial Weight (Gms)	Immersion Time (No. of days)	Final Weight (Gms)	Water absorption for days (% of Increase)
1	13	2	13	0
2	13	3	13.2	1.5

3	13	4	13.6	4.6
4	13	5	14.0	7.7
5	13	6	14	7.7

Figure 1: Graph showing immersion time with respect to % increase in water absorption

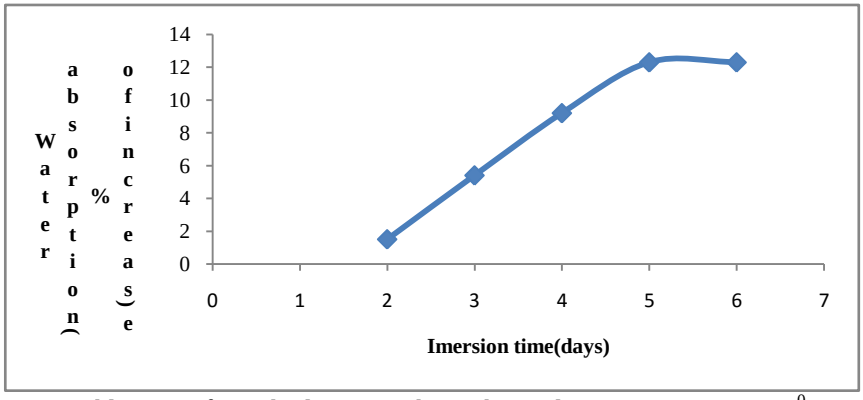


Table 3: % of weight decrease when subjected to temperature at 120^0c

S.No	Initial Weight (Gms)	No. of Days	Final Weight (Gms)	Temperature at 120^0c (%of decrease)
1	13	2	12.8	1.5
2	13	3	12.3	5.4
3	13	4	11.8	9.2
4	13	5	11.4	12.3
5	13	6	11.5	12.3

Figure 2: Graph showing No. of days with respect to % decrease in temperature

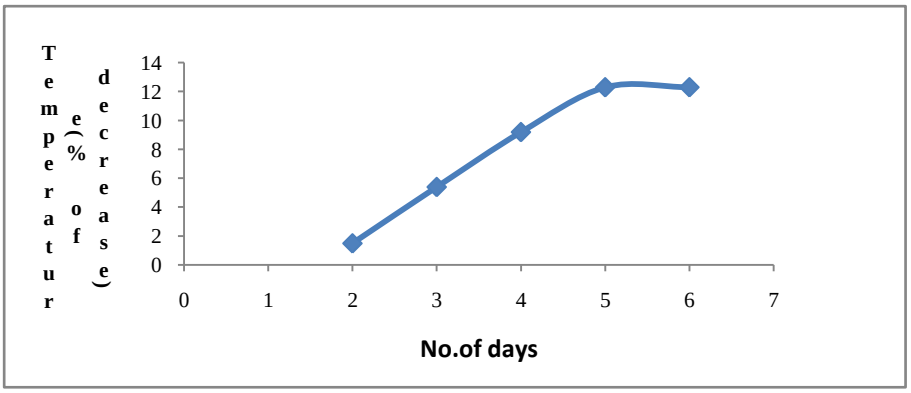
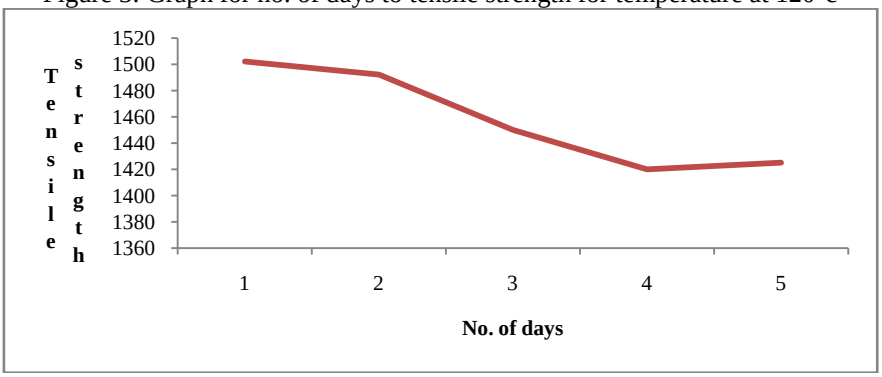


Table 4: Tensile tests before and after water absorption and hot conditions:

S.No	Tensile Test (N)	Tensile test after Water absorption for days (N)	Tensile test after Temperature at 120^0c (N)
1	1520	1520	1502
2	1520	1544	1492
3	1520	1553	1450
4	1520	1566	1420
5	1520	1570	1425

Figure 3: Graph for no. of days to tensile strength for temperature at 120^0c



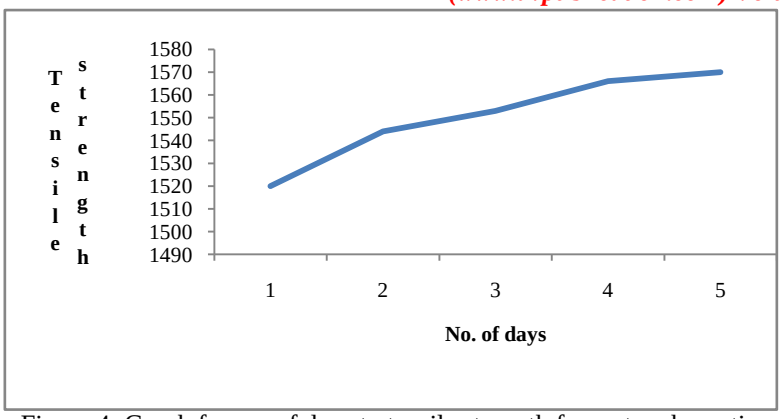


Figure 4: Graph for no. of days to tensile strength for water absorption

When the tensile test is conducted for a specimen that is subjected to temperature at 120^0c for 3 days after it is subjected to water absorption for 3 days, the result is 1500N. There is no much change in the tensile strength.

5. Surface Morphology:

Sem Tests are conducted for water absorption and exposed to temperature at 120^0c. Fibers are expanded is shown in figure 5 and loss of binding property between fibers when exposed to temperature at 120^0c are shown in figure 6.

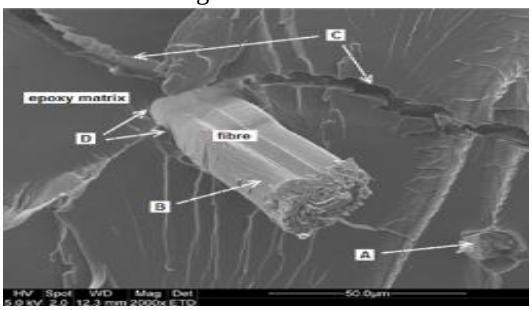


Figure 5: Water Absorption

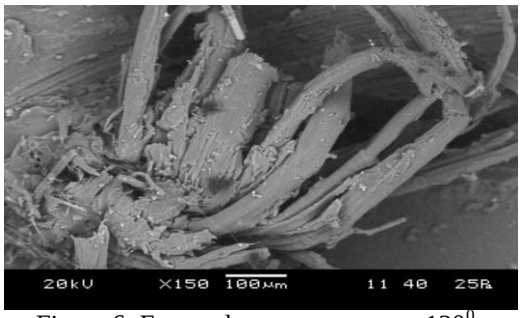


Figure 6: Exposed to temperature at 120^0c

6. Conclusion:

The following conclusions are drawn from the present work. There will be increase in weight when subjected to wet conditions due to presence of jute fibers. This may result in weakness of resins. There is no much weight loss when subjected to temperature at 120^0c. When the specimen is subjected to both hot and wet conditions, there is no much difference in its weight loss. Hence it can be used in outdoor applications also.

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