Effect of Moisture Absorption on Hardness of Surface Treated Luffa Cylindrica /Polyster Composite

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Abstract: *The natural fibers have been received much more attention in research due the better compatibility, high strength, easy availability etc. The work addresses the moisture absorption on surface treated luffa fiber reinforced polyester composite. The fibers are treated with NAOH solution. The luffa fiber reinforced polyester composite were prepared by the compression moulding technique with optimum pressure of 17MPa. The composites were prepared for 50% fiber loading condition. The prepared composites are subjected to moisture absorption test for 1hr,5 hr and 10hrs. The result shows that the treated composite possesses the high hardness than the untreated composites.*

Keywords : Luffa, Polyester, surface treatment.

I. INTRODUCTION

The increasing demand of natural fiber as a reinforcement material in the research and industry has been much more received. The natural fiber has turned in to reasonable substitute in synthetic or manmade fibers as a reinforcement material due to their enormous pros such as, low density, low cost, higher strength to weight ratio, recyclability and biodegradability when compared to synthetic fibers [1-2]. The cost of manufacturing the natural fiber reinforced composite with thermosetting polymer is quite low. The increase in moisture abortion is occurred in increasing the fiber lading. Thamos et al [3] analyzed that the relationship between the fiber loading and moisture absorption of pine apple-leaf fibre reinforced low density polyethylene (LDPE) composites. and also reported that the moisture content is increased as the fiber loading increased, Pothan [4]et all studied that hybridization and chemical modification effects on banana fiber/polyester composite and chemical modification was found to have emotional impact for the water absorption in the composites. Rao et al.[5] presented a comprehensive moisture absorption analysis in a jute/epoxy composite. Dhakal et al [6] studied that the effect of water update on mechanical properties of

the hump / polyester composite and also reported that mechanical properties were decreased with increase in percentage of moisture content. Tanobe et al. [7] reported that the chemical modification of luffa fibers can improve their physical properties as to bring the better compatibility with composites. Ghali et al. [8] reported that alkali treatment such as sodium hydroxide and hydrogen peroxide can increase their crystallinity amount by bringing out the most amorphous materials from the luffa fibers. The so many studies have been carried out on the natural fiber reinforced composite by many researches and these moisture update would be done by the utilization of coupling agents and chemical treatment [9-11]

The objective of study that the effect of chemical treatment on hardness of luffa cylindrica polyester composite.

II. MATERIALS AND METHODS

A. Materials used

Luffa fruit fibers were supplied form the Rajapalayam, Tamilnadu, India. The figure 1 shows the image of luffa finer. In this work unsaturated polyester resin was utilized as matix. In this work, the initiator as Methyl ethyl ketone peroxide and accelerator as cobalt naphthenate were used at 1.5 % each for the fabrication of the composite. NaOH, procured from the Modern Scientifics, Madurai, Tamilnadu was utilized to modify the surface of the fiber.

Fig.1. The photo snap of luffa fruit fiber

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B. NaOH treatment

The luffa fiber is treated with Sodium hydroxide (NaOH) to remove the impurities present in it. Sodium hydroxide is in the form of white pellets, 40gm of sodium hydroxide is taken to dissolve in 1litre of distilled water. The luffa fiber is kept immersed for an hour in the in sodium hydroxide solution, then it was washed with distilled water thoroughly. Then it is dried to remove all its moisture content and used for fabrication of composite

C. Composite fabrication

The luffa fiber were stacked on the mold cavity as per requirement. Then the mold is pre compressed in the compression molding machine. Then the wax is applied in the mold cavity. then pre compressed fiber were placed in the mold. Then required unsaturated polyester resin along with catalyst and accelerated with 1.5 % each were poured on the fiber in the mold. The mold is compressed with help of compression molding machine with the optimum pressure 17 Mpa. Then sample was taken from the mold after the 24 hr curing. The required 50% fiber loading composite were cut for hardness testing. Fig 2. Shows that snapshot of prepared composite.

Fig 2. Snap shot of prepared composite

III. MECHANICL TESTING

A. Hardness testing

Shore D hardness test was performed using a durometer as per ASTM D2240. Initially cleaned and dried samples were pinged with the indenter of the Shore D hardness tester. Based on the depth produced, direct measure of hardness

Fig.3. Hardness testing instrument

B. Moisture absorption

The samples (Untreated and NaOH) Treated) were immersed in the sea water for 1 hr, 5hrs and 10 hrs separately. After that samples were subjected in to the hardness test.

IV. RESULTS AND DISCUSSION

The fig 4. Shows that the effect of moisture absorption on the hardness of the prepared composite. The two kind of composite prepared from the compression molding machine. i.e untreated composite and treated composite. Shore D instrument is used to measure the hardness of the moisture absorbed composites. The samples were immersed in the sea water for 1hr, 5 hrs and 10 hrs. It is observed that the treated composites is showing the higher hardness than the untreated composite for all kind of the testing condition. Form the NaOH, the fiber surface roughness was increased. Due to the increasing the surface roughness the better interlocking between the finer and matrix can be achieved
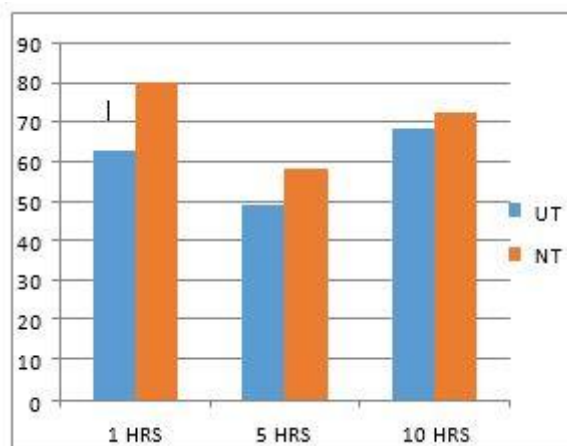

Fig 4. Effect of moisture absorption on hardness of treated and untreated composites,

V. CONCLUSION

The following conclusion were made from this work
• The luffa cylindrica/polyester composites were fabricated using the compression molding machine successfully
• Treated composite possess high hardness compared to untreated composite

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