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THE STUDY OF MECHANICAL PROPERTIES OF LAMINATED BAMBOO (BMB) STRIP/EPOXY COMPOSITES

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Abstract

This study about laminated bamboo strip with epoxy composite can very useful in a lot of way such as replace the use of plastic because plastic is generated from petroleum extract that is not unlimited and will be depleted very soon, this bamboo strip epoxy composite or its similar experiments may prove to replace plastic in this upcoming future. In this study, the bamboo strip reinforced with epoxy was processed through hand lay-out method. BMB strips are combined with epoxy for a total sample thickness of 3mm. This study is performed using the impact test that is charpy (ASTMD-6110) and izod (ASTMD-256). The 0, 60 and 90 degree of laminated bamboo strip epoxy composite with two types of load 7 kg and 14 kg has been tested. It is found that the 0 degree specimen charpy test give the best value as 5.4 Joule energy absorbtion for 14 kg load. While for the izod test, the best composition is 0 degree with 3.62 Joule energy absorbtion for 7 kg and 14 kg load. It is shown that when the degree of bamboo laminate configuration increases the impact absorbtion will be decrease. The result also shown that, when the load is increase the impact also increases.

Keywords: Bamboo strip, epoxy, laminate composite, impact

1. Introduction (Bold, 12 TNR)

Polymer composite is a two or more material combination at the atomic level where the applications, such as in fibers, films, packaging, membranes, resins engineering, biomedical uses, adhesives, emulsions, coatings, and elastomers, cannot be denied. The values added of composite materials are to replace synthetic fiber, such as carbon or glass fiber with natural fiber. In addition, the advantages of natural fiber composite are due to as non-abrasive to equipment, cost, biodegradability, renewability, low specific gravity, abundancy, high specific strength, nonabrasiveness, and freedom from health problems due to skin irritation during handling and processing the use of natural fiber composites [1&2].

2. Literature Review

The bamboo is in its size, lightness and strength an extreme product of nature. It is stable and because of its cavities an extreme light and elastic building material. The reinforcement by diaphragms and its physical conditions cause its enormous superiority compared to other building materials. Natural fibers with high availability is bamboo; a residue of the agricultural by-product material. Among the various lignocellulosic fibers, bamboo was recognized that has a high percentage of lignin (32%) and its microfibrillar angle is relatively small (2^0-10^0) [3]. The utilization of bamboo fiber as a reinforcement of a polymeric material is provided several advantages, such as improved strength and durability properties, reduced materials costs, and environmental benefits related to the disposal of waste materials and to reduce carbon dioxide emissions [4].

This study aim to investigate and understanding the properties of laminated BMB strip composites as strong fiber in composite. In this work, the charpy and izod impact properties of three different degrees with two weights were analysed.

3. Material and methods

The materials used in this study are epoxy as the matrix material and bamboo fiber (BMB) in strip form.

3.1 Epoxy

The type of epoxy specification is EPOLAM 2008/S RESIN and the type of hardener is

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EPOLAM 2008/S HARDENER with ratio 10:1 (Figure 1).

Figure 1: Epoxy and hardener

3.2 Bamboo

The bamboo species used in these test were Gigantochloa Scortechinii (*Buluh Semantan*) collected from the Bukit Larang village in Melaka (Figure 2).

Figure 2: Gigantochloa Scortechinii (*Buluh Semantan*)

3.3 Specimens preparation

The bamboo strips were then subjected to the hand lay-up process until sample preparation as shown in figure 3 to figure 6.

Figure 3: Laminating process

Figure 4: Sample of laminate composites

Figure 5: Weighing plate in top of sample

Figure 6: Specimen of 0^0, 60^0& 90^0

3.4 Charpy/Izod Test

According to ASTM D-6110 and ASTM D-256 the figure 7 & 8 shown charpy/izod test configuration for the specimens 63.5mm x 12.7mm x 3mm.

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Figure 7: Charpy test configuration

Figure 8: Izod test configuration

4. Result and discussion

4.1 Charpy test

Figure 9 demonstrates the effect of different configuration bamboo strip on the impact property of laminate bamboo strip composite for 7 kg and 14 kg load. It can be seen from the result obtained that 0 degree of laminated bamboo strip composite increase when loading increased. This result shows that reaction between increments of degree decrease the impact strength property of composite. The highest charpy impact value of bamboo strip with 14 kg load is 5.4 Joule and meanwhile the highest value for 7 kg load is 4.3 Joule. The lowest average charpy impact strength of bamboo strip with 14 kg load is 4.4 kg and meanwhile the lowest value for 7 kg load is 3.6 kg. The highest range of percentage different for 14 kg and 7 kg is 20.37%. The composite materials consist of cellulose fibers embedded in a lignin that is aligned along the length of the bamboo providing maximum mechanical properties [5, 6].

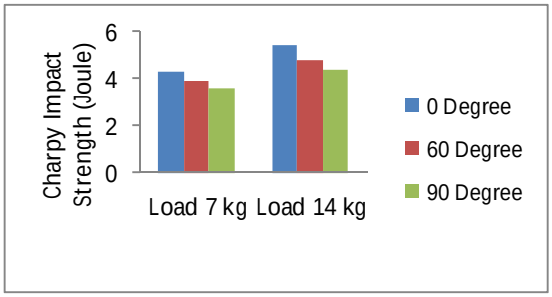

Figure 9: Graph of charpy impact strength against load 7 kg and 14 kg

4.2 Izod test

Figure 10 demonstrates the effect of different configuration bamboo strip on the impact property of laminate bamboo strip composite for 7 kg and 14 kg load. It can be seen from the result obtained that 0 degree of laminated bamboo strip composite increase when loading increased. This result shows that reaction between increments of degree decrease the impact strength property of composite. The highest izod impact value of bamboo strip with 14 kg load is 4.2 Joule and meanwhile the highest value for 7 kg load is 3.9 Joule. The lowest average izod impact strength of bamboo strip with 14 kg load is 3.5 kg and meanwhile the lowest value for 7 kg load is 3.4 kg. The highest range of percentage different for 14 kg and 7 kg is 7.14 %. The composite materials consist of cellulose fibers embedded in a lignin that is aligned along the length of the bamboo providing maximum mechanical properties [5, 6].

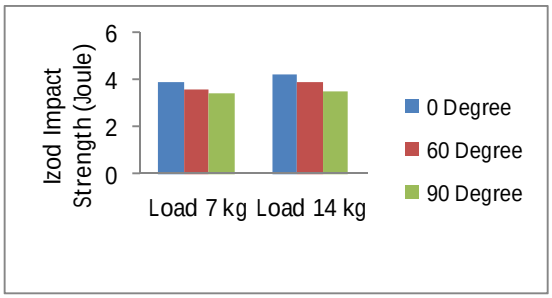

Figure 10: Graph of izod impact strength against load 7 kg and 14 kg

5. Conclusion

The possibility of using various degree bamboo strip laminate in epoxy was studied by 7 kg and 14 kg load. In this study, the performance of the 0 degree laminate bamboo strip composite improves with increasing load. It means that got relative significant between bamboo strip configuration and load. The impact properties relate to the loading weight.

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