

fluctuations result which was increase from 108.67 MPa at 4.12 J to 134.33 MPa at 8.24 J then drop until 116.33 MPa at 12.36 J. This fluctuations results is due to the several error during the experimental conducted for instance the locations of honeycomb structure core was not positioned properly on the movable point bend support. On the other hand, the fabrications process also contribute to the error during the preparation of honeycomb structure core. During the preparation, the materials sample not clamped properly and the sample have been moving a little. The consequence of this problem is when the materials sample moved, the origin positioned to fabricate the honeycomb core has been moved and become retard honeycomb structure. Retard honeycomb structure consists of cell wall thickness decrease about a few percent and the honeycomb structure not completely through the materials sample. Besides that, when the value of energy increase the deformation occur also increase or it can be says that the deformation directly proportional to the value of energy as shown in the Figure 6. When the value of energy increase the deformation become bigger. The deformation can be clearly seen at the Al 6061 core but not at the thermoplastic core which is PE and PS core. Thermoplastic core tends to come back to its original shape because of the elasticity properties.

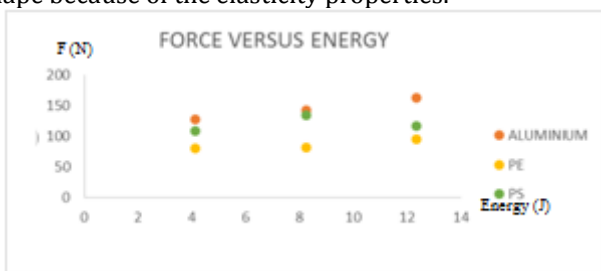


Figure 5: Graph for LVI test

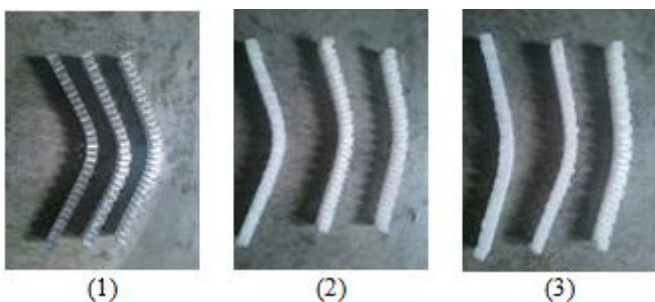


Figure 6: Results of three different materials after impact of energy with different height from 0.2m, 0.4m and 0.6m (1) Aluminium 6061 (2) Polyethylene (3) Polystyrene

7.2 Compression test

Figure 7 shows the relationship of stress (MPa) and strain for three types of honeycomb structure core which were Al 6061, PE and PS. Highest value of stress contributed by Al 6061 core with 3.15 MPa while thermoplastic shows low value of stress which are 0.26 MPa for PE and 0.27 MPa for PS. The behaviour of the graph can be explained by using the samples results. The early part of the figure, it shows linearly increase because of the cell wall materials deformed linearly until it reach the maximum stress. At this maximum stress, the sample starts to experience buckling at the edge due to the

stress loading[19][18]. After the maximum stress, the value of stress will decrease due to the increase of strain. In addition, the figure shows large differences of stress value between Al 6061 core and thermoplastic core. This is because Al 6061 core come from precipitation hardening alloy with heat treatment of T6[20] besides it have high value of yield stress while thermoplastic core have low value of yield stress. It shows that thermoplastic deform at low value of stress. Figure 8 below shows the result of honeycomb core structure after the test was carried out. Al 6061 core still in the same condition after the test done while for thermoplastic core, it can be found that these type of material can be rebound back after contain amount of time. This is due to the material properties of thermoplastic which has low value of yield strength compared to the Al 6061.

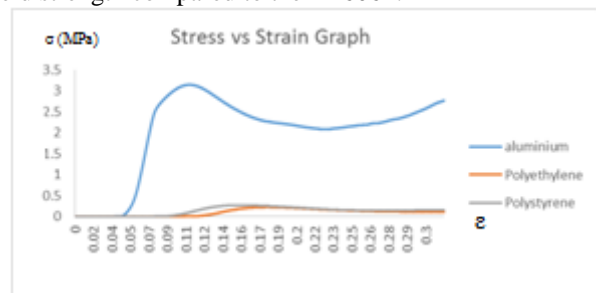


Figure 7: Graph for Compression test

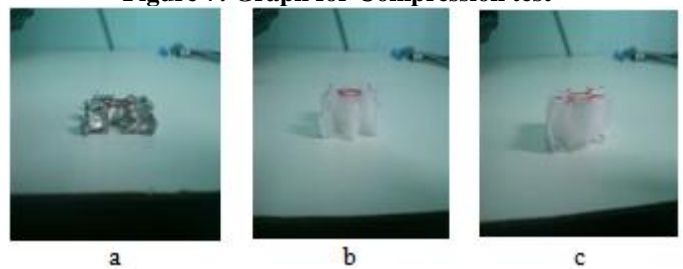


Figure 8: Results of three different materials after compressive loading. (1) Aluminium 6061 (2) Polyethylene (3) Polystyrene

8. Conclusions

The effect of cell wall material were studied by fabricating the honeycomb core structure by using three different materials which are one metal alloy element and two thermoplastic. Metal alloy used in the fabrication is Aluminium 6061 while thermoplastic used are Polyethylene and Polystyrene. The fabrication of the core maintained the cell wall thickness which is 0.5 m for all materials and samples. To study the mechanical properties of these core, two tests were conducted which are Drop-weight Impact test and Compression test. From the test, the behaviour of the cell wall materials can clearly be observed that Al 6061 have the highest value of stress and force for both testing while thermoplastic shows the lowest value. In addition, Al 6061 face the high deformation and buckling compared to the thermoplastic materials.

9. Future Scope

There are various testing can be made on the honeycomb structure core with difference of cell wall material. On test that can be done during next experiment is tensile and

flexural test. These two types of testing can be done to analyze the properties of the cell wall material and more observation can be seen. These two testing supposedly can be done on Universal Testing Machine (UTM) but in this project involved the fabrication process which took very long time especially when using Computer Numerical Control (CNC) milling machine. Then only one test have been accomplished which is Compression test. In addition for future study, include various more types of material to construct the cell wall material and varies the cell wall thickness. A lot of information can be gain on that.

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