

EFFECT OF ADDING POLYSTYRENE INTO COCONUT MEAT HUSK FIBER REINFORCED POLYESTER COMPOSITES ON THE TENSILE PROPERTIES

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Abstract

The purpose of this study is to compare the tensile strength between additional polystyrene into coconut meat husk reinforced fiber composite. Composite were produced by using hand layup technique. It is seen that with the additional of polystyrene into the coconut meat husk reinforced polyester composites showed the increment tensile strength value compared to the non added polystyrene which indicates that effective stress transfer between the fiber, matrix and polystyrene .

Keywords : Tensile properties, Coconut meat husk fiber, Polyester, Polystyrene

Introduction

Nowadays, campaign about environmental awareness is spread around the world. Effect from environmental awareness, new rules, and legislation are forcing industries to seek new materials that are more eco green (Yusran & Natinee, 2009). Over a past year, natural fibers have been receiving considerable attention as substitutes for synthetic fiber reinforcement. In this day, natural fibers have a potential alternative to replace glass fibers in fiber-reinforced plastics (Walter *et al*, 1996). One of the abundantly natural fibers is coconut meat husk fiber. Coconut or in a scientific name, *Cocos nucifera* come from family Arecaceae.

Polystyrene is an aromatic polymer made from the monomer styrene where the source is from petrochemical fluids. As polystyrene properties are thermoplastic polymers which polystyrene in the solid form at room temperature and will transform to liquid when heated to more than 100⁰C (Kan & Demirgoba, 2009). Waste polystyrene from the packaging material normally been thrown away, and it will harm the environment. Therefore, in this paper, waste polystyrene has been used by adding into the matrix where the purpose is to reduce the resin consumption. The objective is to investigate the effect of adding the polystyrene into the coconut meat husk fiber reinforced polyester composites by conducting the tensile testing.

Materials and Methods

In this study, the raw material that has been selected is coconut meat husk and polyester resin is used as the natural fiber and matrix, respectively. The coconut meat husk and polystyrene was obtained from markets around Bandar Baru Bangi area. The coconut meat husk fibers were dried under direct sunlight for 24 hours. After that the coconut meat husk fiber dried for 24 hours under the room temperature in shady conditions. This coconut meat husk fiber polyester composite was produced by using vacuum bagging (Chawla, KK., 1987). The flat molds for preparing the composite panels was made of aluminum sheet with the dimension of 200 mm(L) x150mm (W) x3 mm (T). Coconut Meat Husk and polyester resin will be mixed with a ratio 5:95 and coconut meat husk fiber with polystyrene is a fix polystyrene volume 5% from total of resin ratio. The coconut meat husk fiber was placed into the molds manually based on the volume percentage. Polyester and hardener were mixed together based on the weight to form a matrix. Then, the matrix was poured over the fiber by using two techniques which are vacuum bagging and hand layout process. Lastly, the panels will left for 24 hours under room temperature for cooling and conditioning process.

The fully cured composite panel was cut into the desired standard dimensions for the tensile testing according to ASTM D 638 Type 1 Standard by using band saw machine. The tensile tests were performed at the Fibre and Biocomposite Development Centre (FIDEC), Olak Lempit, Banting.



Fig. 1 Coconut Meat Husk

Results and Discussions

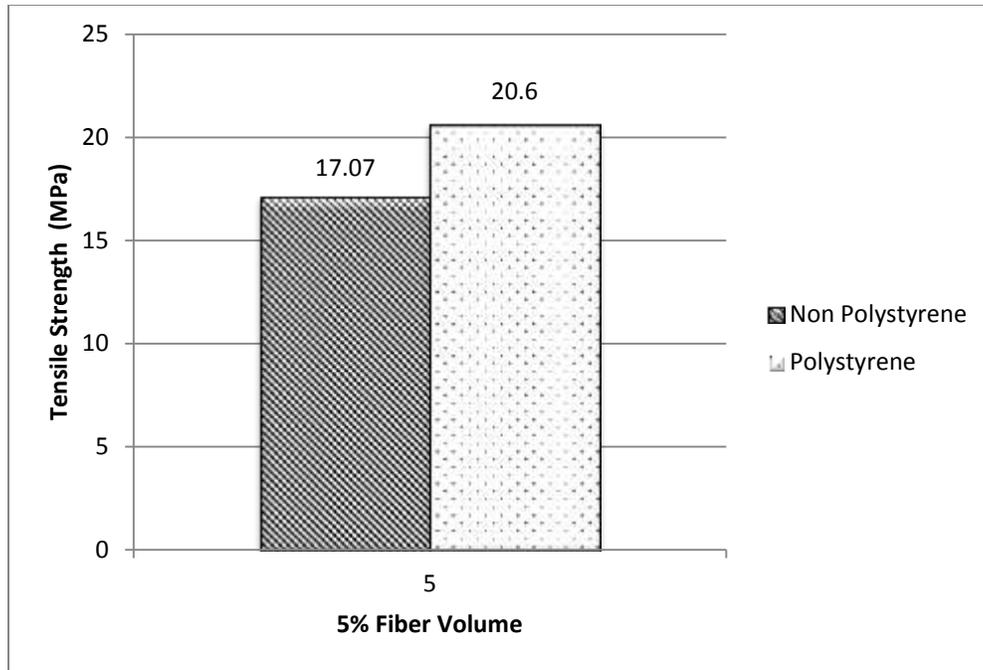


Fig. 2 Effect of 5% volume into coconut meat husk fiber reinforced Polyester

Fig. 2 showed the results of tensile strength with the additional 5% of polystyrene, respectively. For non - added polystyrene showed the tensile strength was 17.07 MPa and by adding the 5% polystyrene, the tensile strength was increased to the 20.6 MPa. The result showed that the tensile strength of pure polyester is much lower rather than of additional polystyrene. From this study, it gave the first indicator that polystyrene can act a matrix after been dissolved and mixed together. By adding the polystyrene it has improved the interfacial bonding between resin and fiber surface.

Conclusion

Tensile properties of coconut meat husk reinforced polyester composites was investigated and presented. The result showed that tensile increased as the additional of polystyrene. That prove the additional is helping the increasing value of tensile strength. It can be seen that the most of tensile strengths coconut meat husk fiber are increased after the volumes of polystyrene are added. It is because the melting of the polystyrene act as a binder together with resin polyester. Therefore, more studies are needed to determine the beneficial and cost effective of application of polystyrene as a filler in fabricating the composites.

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