MECHANICAL PROPERTIES STUDY OF *DURIO ZIBETHINUS* SKIN FIBER REINFORCED POLYETHYLENE COMPOSITE

HOO TIEN NICHOLAS KUAN1*, SAM LAW PEK KEE1, MAHSHURI YUSOF1, TING SIM NEE2 AND NG CHEE KHOON2

1Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia. 2Department of Civil Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia.

*Corresponding author: khtnicholas@unimas.my
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Abstract: Composite materials have been continuously innovated and developed so that they can be improved in almost any criteria as their characteristics are preferable to single-phase materials. Natural fiber reinforced polymer composites can sustainably reduce inorganic and organic wastes, aside from serving as materials with improved mechanical properties. In this study, fiber extracted from *Durio zibethinus* (durian) skin was examined. *Durio zibethinus* (DZ) fiber was fabricated into fiber paper sheets and underwent hot-press lamination to produce a composite. This study investigates the differences between fibers extracted from DZ skin and husk. Tensile and micro Vickers tests were performed on the fabricated composites. The results show that the tensile behaviour of the composite fabricated from DZ skin fiber had a value of 20.1 MPa compared with the composite fabricated from a mixture of skin and husk which had a value of 19.4 MPa. These findings suggest that using durian skin resulted in better tensile strength with a FVF (fiber volume fraction) of 18%, compared with using a mixture of skin and husk which had a FVF range of between 8% and 23%. The hardness, meanwhile, increased with the FVF for the composite fabricated from a mixture of DZ skin and husk. This natural fiber composite has the potential to be used in households, automotive parts, lightweight furniture and many other composite engineering applications.

Keywords: Natural fiber composite, green fiber, polymer composite, sustainable, tensile.

Introduction

The application of natural fiber polymer composite has gained traction in many engineering fields. The aim of composites is to achieve properties that are unique and cannot be displayed by any individual material. Although the strength and stiffness of composites by area may not be as superior as metals, the specific modulus (modulus per unit weight) of composites can compete with metal (Martin, 2006). New bio-composite materials are constantly being researched and developed. The increased application of newly developed bio-composite materials with customised properties shows that the materials are able to meet the required performance in most engineering fields. Furthermore, their properties are better than certain other materials such as alloys and ceramic. Bio-composites have been applied in the automotive industry and in households (Akintayo *et al.*, 2017). The classification of plant-based natural fiber is shown in Figure 1.

Natural fibers derived from plants are formed through the joining and forming of the strong connections of cell walls. Plant fibers may be considered as natural occurring composites, comprising mainly of cellulose that are embedded in an amorphous lignin matrix (Saba *et al.*, 2014). The fibers from the bast stem, leaf and fruit are naturally organised in bundles while those in seeds are single cells (Mwaikambo, 2006). Three organic compounds, cellulose, hemicellulose and lignin are part of the major composition of cell walls (Chen, 2014). Hence, organic natural fibers are extensively used in environmentally friendly