Mechanical Properties of Betel Nut Husk Fibre Reinforced Oxo-HDPE Composite

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Abstract

The mechanical properties of oxo-biodegradable high-density polyethylene (oxo-HDPE) composites reinforced betel nut husk (BNH) fibre were studied in this research. A neat oxo-HDPE laminate and four betel nut fibre reinforced oxo-HDPE composites were fabricated using hot press compression moulding method. The composites contain 7%, 12%, 17%, and 22% fibres volume fraction respectively. The cross section of the composite was observed under scanning electron microscopy (SEM) and all five laminates are put through tensile test and hardness test. The result of the study shows that adding betel nut husk (BNH) fibres as reinforcement increases its tensile strength, specific tensile strength, and hardness of the composites. The good lamination observed under scanning electron microscopy (SEM) enable good transfer and distribution of stresses from the matrix to the fibres.

Keywords: *Betel nut, Areca catechu, HDPE, Biodegradable, Composite*

1. Introduction

For centuries, mankind has been studying natural fibres from different kind of plants and fruits to be used in composite material. Bagasse, cereal straw, palm, corn stalk, sago, cotton stalk, hemp and rice husk are just some of the examples of the more popular natural fibres that have been studied by researchers and scientists alike. Polymer composites are replacing many conventional materials due to their superior advantages [1]. For instance, glass fibres have high strength due to the fact that usually during fabrication process, the internal or surface flaws that normally decrease the quality of the glass are avoided. As for the likes of aramid, its near to perfection alignment of molecular chains with the fibres axis contributes to its high strength and stiffness. These synthetic fibres are man-made, and are usually petrochemical based or derived from nylon, polyester, or polyacrylonitrile fibres. Generally, the use of these synthetic fibres alone is not practical. They are usually "glued" together by a matrix material which also transfers all the loads and stresses exerted to them [2]. The matrix also acts as a protection from abrasion as well as from environmental attack. The interface between the reinforcing agent and the matrix plays an essential role in determining the mechanical properties of composite materials [3].

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