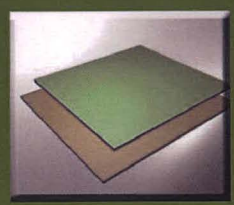
ADVANCES IN COMPOSITE MATERIALS



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Chapter 018

Mechanical Properties of Wood Plastic Composites

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Keywords: Wood fiber, plastic, composite, tensile strength, impact, fiber adhesion, orientation.

Abstract: Wood fiber reinforced plastic composite properties have been assessed by processing the samples with 100 and 250 micron size fiber and its amount varied to 30, 50 and 60 wt%. Some samples were prepared with unmilled fibers. The composite samples revealed fiber orientation in the flow direction of the raw material during processing and the fiber concentration was found more in the centre region of the sample. The strength of the composite is more with milled fiber sample and it reduces with increasing the amount of fiber content.

Introduction

A composite in essence, is a material that takes advantage of each of its constituent's superior quality and performs better than any of its constituents alone. Natural fibers are cheap and come in many varieties such as peanut hulls, straw, sisal, flax, bamboo, sun hemp, pineapple, jute, etc. [1, 2].

Wood plastic composites are natural fiber composites that have gained popularity for the past few years. It is an engineered composite, consisting of a plastic matrix and natural wood fibers. Examples of these cellulosic fibers are hardwood, softwood, wood flour and sawdust. Plastics normally used for this composite are typically thermoplastics such as polypropylene, polyethylene and poly (vinyl) chloride. This is because thermoplastics by nature are heat-formable, meaning they can be melted and reformed again. This property is particularly useful in wood plastic composite processing since the plastic matrix is usually melted first during compounding and melted again during molding.

Wood plastic composites are normally produced by extrusion and injection molding. As a possible replacement for wood timber products, wood plastic composites have tremendous potential in industry and should be developed in the future. It is one of the fastest growing sectors of the plastic industry in the world. As demand and competition continue to grow, compounders, processors and molders are pressured to produce faster, better and cheaper products for the end users. As such, research in wood plastic composite has been intense throughout the world, where countries are focusing on wood fiber as it is easily obtainable.

The market for wood plastic composite is extensive and is gaining recognition and preference in many aspects. One third of the wood plastic composite industry consists of motor vehicle interior components in the automotive industry. 20% of the wood plastic composite are found in the construction industry such as bridges, decking and fencing. Other applications of wood plastic composites include electronics and aerospace industry [3, 4]. Wood plastic composites are used for decking, railing, cladding, park benches, mini fencing, as well as docks, siding and other architectural purposes. They are environmentally safe, efficient and water proof. In China, the demand for windows and doors is projected to increase by 11.3% per annum from 75.3 billion Yuan (USD 9.4 billion) in 2006 to 129 billion Yuan (USD 16 billion) in 2009 [5].

The objectives of this work are to establish the mechanical properties of the wood plastic composite reinforced with different amount of sawdust fibers and compare its performance.

Experimental

The rubber wood fibers collected from a local industry were sieved into three sizes 500 to 250 μm, 250 to 100 μm and 100 to 50 μm. After sieving, the sawdust was oven dried at 100 °C for 20 minutes. Careful mixing was carried out during the first 10 minutes of the drying process. The sawdust and polypropylene block co-polymer