CHAPTER 1.0

INTRODUCTION

1.1 Background of the study

In recent years, there have a great interest toward development of natural fiber as reinforcements for polymeric biocomposite. This is because natural fiber reinforced composites have the advantages of low cost, widespread availability of fiber, biodegradability, renewability and reasonable mechanical properties. There have various types of natural fibers such as jute, sisal, sugarcanes, abaca and coir have been studied as reinforcement in biocomposite. Among various natural fibers, coir fiber has been considered a better choice reinforcement in polypropylene biocomposite due to presence of high level of hemicellulose and cellulose in fiber. Coir fiber can obtained from coconut husk which routinely disposed from coconut factories.

However, the main drawback of coir fibers /polypropylene biocomposite is their water sensitivity. The main constituents of coir fibers are 5.25% water soluble, 3.00% pectin and related compounds, 0.25% hemicellulose, 45.84% lignin, 43.44% cellulose and 2.22% ash (Mir et al., 2002). Coconut fibers has hydrophilic properties due to present of hydroxyl group (-OH) and carboxyl group (-COOH) in hemicellulose and cellulose resulted to incompatibility of coir fibers with hydrophobic polypropylene Alkali treatment can be an alternative treatment method for reducing hemicellulose content to make the fibers less hydrophilic and enhance the compatibility of treated fibers with polypropylene. During alkali treatment, the fiber (-OH) group will be reacted with sodium hydroxide to produce salt and water (Carvalho et al., 2010). Morphology of alkali treated fibers is rougher than untreated fibers viewed under SEM which will enhance the physical interaction of fibers and polymer.

The aim of this research was to study the effect of alkali treatment on the tensile and water absorption of coir / PP biocomposite.

1.2 Motivation

Polymers are made of petroleum-based materials which have play significant role in our daily life. However, polymers are non-biodegradable materials consequence pollutions to the environment. To overcome the problem, natural fibers have been used as reinforcements for polymeric composite due to advantages of low density, low cost, renewable and biodegradability. Influence of physical and chemical treatments for the surface modification of fibers have been investigated. Alkali treatment is widely used for surface modification of natural fibers due to effectiveness to improve the characteristics of the fiber (Rokbi et al., 2011). Alkali treatments can improved hydrophobicity of coir fibers and improved the adhesion with hydrophobic polymer. In this present study, the duration time of alkali treatment and concentration of sodium hydroxide is important parameters to improve the hydrophobicity of coir fibers which lead to improve tensile strength and water absorption properties of PP reinforced coir fibers biocomposite. This research aims to utilize the abundant biomass from agricultural waste to value added product and purpose a simple treatment method to improve the characteristics of coir fibers (Rodríguez and Vázquez 2006).

1.3 Problem Statement

Malaysia was estimated to produce 47402 dry kiloton/ year of agricultural waste (Goh et al., 2010). Coconut fibers consider as agricultural waste materials after the coconut scrape out from coconut factory which resulting environmental concern. Other than that, the demand of usage of polypropylene was increasing. Generally, plastics made of petroleum based materials and not easily to degrade, thus it will produce a solid waste which lead to environmental pollution. Coconut husk can be recycled as reinforcement in a plastic matrix to form biocomposite. This can decrease amount of waste accumulated in landfills, and at the same time may solve problem of biodegradable of polymer plastics. However, there are poor mechanical properties of coir/ polypropylene biocomposite due to weak a poor bonding between coir fibers which have hydrophilic characteristics with the hydrophobic polymer matrix. (Wong and Yousif., 2010). Most of the previous work studies the effect of fibers treated with different NaOH concentrations for 24 hours at room temperature. In this present study, it will focus on duration time for alkali treatment on coir fibers which for 2, 4 and 6 hours on two different (3 wt% and 5 wt %) of NaOH concentrations.

1.4 Objectives

The main objectives of this study are:

1. To study the effect of alkali treatments on tensile strength and water absorption of Coir/ PP biocomposite.

1.5 Scope of study

The scopes of this research are as follow:

1. To study the effect of soaking duration (2, 4, and 6 hours) for alkali pre-treatment on coir fibers.
2. To study the effect of different concentration of NaOH at 3% and 5 % on coir fibers.
3. The characterization of the treated fiber will be analysed by:
    a. Chemical Composition
    b. Scanning Electron Microscope (SEM)
    c. Thermogravimetric Analysis ((TGA)
4. The best alkaline-treated coir fibers will be used to produce biocomposite. Tensile strength and water adsorption test will be conducted.