

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background of the Study

The oil palm industry in Malaysia, with its 6 million hectares of plantation, produced over 11.9 million tons of oil and 100 million tons of biomass (Abdul Khalil et al., 2010). The amount of biomass produced by an oil palm tree, inclusive of the oil and lignocellulosic materials, is on the average of 231.5 kg dry weight/year (Abdul Khalil et al. 2010).

The types of oil palm biomass include empty fruit bunch (EFBs), shell, wet shell, palm kernel, fronds and trunks (Nasrin et al., 2008). The empty fruit bunch, frond and trunks can be processed to produce fibre as a natural fibre. Natural fibers are naturally-occurring composite consisting mainly of cellulose fibrils embedded in lignin matrix (JOHN & THOMAS, 2008). Natural fibers are also known as biomass or lignocellulosic fibers. The usage of the fibers had been discovered since thousand years ago which had been exploited for textile industry (Mohamad, 1997).

The advantages of natural fibers are cheap, low specific weight, reasonable strength, renewable resources, poor electrical conductor, good thermal insulation and biodegradable (Joseph et al., 2005). The high content of cellulose in OPEFB leads to production of variety of applications. The cellulose from OPEFB can be used to be regenerated into the production of biocomposite films (Hassan, Salema, Ani, & Bakar, 2010). Biocomposites are generally defined as the composite materials made from natural fiber and petroleum-derived polymer like polyethylene (PE), polypropylene(PP) and epoxies or biopolymers like polylactic acid (PLA) and polyhydroxyalkanoate (PHA) (Mohanty, 2005).

Polyethylene (PE) is among the most popular thermoplastics in the world. PE is divided into low density polyethylene (LDPE), high-density polyethylene (HDPE), and linear low-density polyethylene (LLDPE).LDPE is characterized as not reactive at room

temperature and has more branching than HDPE. LDPE is the first grade of polyethylene. LDPE market reached a volume of about US\$33 billion and widely used for production of bottles, containers and plastic bags for computer components.

Currently, there were researchers have been done and found that OPEFB fiber as filler in the polymer composites are equivalent to other natural fibre composites in term of its mechanical performance and environment advantage (Jawaid, Abdul Khalil, & Abu Bakar, 2010). According to Shinoj, Panigrahi, & Visvanathan (2010), which was used LLDPE as a polymer and Oil palm fiber with a different composition. The rate of water absorption is increased with fiber loading. They also study the effect of alkali treatment on the fibres.

In this study, the cellulose which is derived by the treated lignocellulose oil palm bunch fibre will be reinforced with Low density polyethylene to produce a biocomposite. In fact, there are other types of natural fiber that can be used as biocomposites which is oil palm fibre, pineapple leaf fiber, woods, paddy or rice husk, sisal, hemp and jute (Azuan, 2013).

## **1.2 Motivation**

Performance of natural/fibre composite could match the performance of commercial polymer materials in many applications especially in plastic engineering. Reinforcement of natural fibre to the petroleum-based polymer is to enhance the properties and structure of materials as the biocomposite can be commercialize in many applications.

Oil palm industries generate abundant amount of biomass say in millions of tons per year (Rozman et al. 2005) which when properly used will not only be able to solve the disposal problem but also can create value added products from this biomass (H. P. S. Abdul Khalil et al. 2012). Based on previous research, uses of OPEFB fibre as a filler in the polypropylene can increase the tensile strength of the polymer by 15%.

The uses of OPEFB as a filler in the polymer is also to reduce the uses of petroleum-based polymer. As we know that natural fibre is a biodegradable. So the production of biocomposite is an environmental friendly materials and at the same time gain profits from the sale of the products. This is because the natural fibres are inexpensive.

### **1.3 Problem Statement**

Petroleum based plastic has lower tensile strength and difficult to degrade. Besides that, Petroleum is a limited resources. Extracting and burning petroleum create greenhouse gases that add to environmental pollution and global warming. Because of its properties which are difficult to degrade. Petroleum based plastic becoming a big threat to the environment.

In other hand, the fast progress in the research of naturally based fibre composite is caused by the expansion of generated waste like coconut, oil palm and others and they could pose severe environmental problems such as fouling as well as attracting pests if the waste materials are inappropriately dispose(Sreekala, Kumaran, & Thomas, 1997).

The reinforcement of oil palm empty fruit bunch fibre and PE as the biocomposites can overcome both problems.

### **1.4 Objectives**

The following is the objective of this research:

- 1) To study the effect on different fiber ratio of OPEFB fibre/(LDPE) biocomposite.
- 2) To investigate the effect of Chlorite treatment on OPEFB fibre/(LDPE) biocomposite.

### **1.5 Scopes of Study**

The following are the scopes of this research:

- 1) The OPEFB fiber will be treated using 2-stage treatment i.e. 5% NaClO<sub>2</sub> followed by 6% KOH to isolate cellulose.
- 2) Treated and treated fibre will be mixed with LDPE at 10 wt% and 30 wt% using extruder.
- 3) The biocomposite will be tested for its tensile properties and water absorption.