

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 INTRODUCTION**

Composite materials are the materials that contained more than one phase which is a matrix and a dispersed phase. It is obtained by a combination of varying materials, in order to obtain properties that cannot be achieved by the individual components themselves (Chung, 2002). The composites are being developed to create a product that will be generally having better properties or characteristics than the individual materials properties. Hybrid composite is the combination of two or more type of fibers in one single matrix. In this study, the hybrid composite will be produced by using synthetic fibers and also natural fibers. The synthetic fibers is glass fibers while the natural fibers is empty fruit bunch (EFB) fibers. The properties of the composite will be tested for their physical, mechanical and microscopy characterization.

#### **1.2 BACKGROUND OF THE PROBLEM**

Natural fibers such as jute, kenaf, sisal, hemp, banana, flax, and oil palm, have been in considerable demand in recent years due to their eco-friendly and renewable nature (Hassan et al. 2010; Jawaid et al. 2011; Akil et al. 2011). It includes the usage of the natural fibers in the production of the hybrid composites. This natural fibers had proposed several benefits over glass and carbon fibers such as lower cost, light weight, lower specific weight, renewability, acceptable specific properties, low density, less wear and tear in processing, lower energy requirements for processing, biodegradability, wide availability, and relative non-abrasiveness (Jawaid et al. 2011). Due to this

reasons, natural fibers are preferably to be used in industries. Poor wettability and low thermal stability during processing, including having a poor adhesion with synthetic counterparts.

The combination of two or more reinforcing materials in a single matrix had been produced a hybrid composite. The combination of these materials had given various improvements to the properties of the hybrid composite produced. The hybrid effect is defined as a positive or negative deviation of a certain mechanical property from the rule of mixture behavior (Kickelbick, 2007).

### **1.3 STATEMENT OF THE PROBLEM**

Nowadays, large or increased plantation of oil palm to fulfill human demands and needs have contributes to a high amount of agricultural waste in our country. Besides, they will create substantial environmental problems when simply left on the plantation fields. Therefore, a natural fiber such as empty fruit bunch (EFB) fiber had been fabricated or created using the oil palm waste by curing and processing it until we get our desired product. Besides, the natural fiber is low in strength and stiffness, environmental sensitivity and poor moisture resistance. For glass fibers, it has a high strength to weight ratio, means it is high density and heavy. It also has a good dimensional stability, resistance to corrosion and temperature, and low cost. The hybrid composite also had been produced by using the natural fiber and the glass fiber or carbon fiber. Making a hybrid composite using empty fruit bunch and glass fibers will produce a composite with balanced cost and performance.

## **1.4 OBJECTIVES OF THE RESEARCH**

Objectives of this research are:

1. To produce the hybrid reinforced composite of glass fibers and empty fruit bunch fibers by using RTM process.
2. To study the physical and mechanical properties of the hybrid reinforced composite of glass fibers and empty fruit bunch (EFB) fibers.
3. To characterize the hybrid reinforced composite of glass fibers and empty fruit bunch (EFB) fibers by using Scanning Electron Microscopy (SEM) and Thermogravimetric Analysis (TGA).

## **1.5 SCOPE OF STUDY**

Hybrid reinforced composite is the reinforcing the two or more types of fibers in one continuous matrix. Based on the topic, the materials used for this study are glass fibers and empty fruit bunch (EFB) fibers. The hybrid reinforced composite is produced using resin transfer molding (RTM) process. Before that, the empty fruit bunch fibers mat is prepared. The empty fruit bunch fibers is cut into the desired length, then, a sheet of empty fruit bunch fibers mat were produced. The glass fibers is cut into the same sizes with the empty fruit bunch fibers. The sandwich of both fibers will produced the hybrid reinforced composite. After preparing the samples, it will be cut and undergo for physical, mechanical and characterization testing.