CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Malaysia is the world’s second largest palm oil producer with 38% of the global market, and is the largest palm oil exporter, consisting of about 88% of the market’s palm oil in 2011 (Aghamohammadi et al., 2016). Oil palm plantations have turned into the most important economic contributor in Malaysia. But at the same time, palm oil mills produce a large amount of solid waste. Right now, the largest solid biomass generated in Malaysia originated from oil palm plantations (Farhana Harun et al., 2013).

Annually, a minimum of 168 million tonnes of biomass waste is generated in Malaysia. In general, palm oil waste accounts for 94% of biomass feedstock while the remaining contributors are agricultural and forestry by-products, such as wood residues (4%), rice (1%), and sugarcane industry wastes (1%) ("Malaysia's biomass potential," 2012). If this biomass is used properly, it will not only solve the waste problem but also can create value added product. Lignocellulosic biomass which is produced from the oil palm industries include oil palm trunks, oil palm fronds, empty fruit bunch and palm pressed fibres, palm shells and palm oil mill effluent palm (Abdullah & Sulaiman, 2013).

Typically, most of the agricultural lignocellulosic biomass is comprised of about 10-25% lignin, 20-30% hemicellulose, and 40-50% cellulose. Cellulose is a highly stable polymer consisting of glucose and attached with linear chains up to 12,000 residues. It is majorly composed of (1,4)-D-glucopyranose units, which are attached by b-1,4 linkages with an average molecular weight of around 100,000 (Anwar, Gulfraz, & Irshad, 2014). Cellulose is aligned parallel to each other in fibrils, which are surrounded
Cellulose is commonly converted into useful derivatives by etherification. Among these microcrystalline cellulose (MCC) that has generated much attention and interest during these few last decades in both academic and industrial fields. Microcrystalline cellulose (MCC) gained major interest in various applications, such as stabilizer, fat replacer and texturing agent in food industry (Singh, Kanawjia, Giri, & Khetra, 2015), binder and water retainer in pharmaceutical industry (Johansson & Alderborn, 2001), and reinforcing agent in plastic industry (Wittaya, 2009).

1.2 Motivation

The global microcrystalline cellulose (MCC) market in terms of revenue, the global microcrystalline cellulose (MCC) market was valued at US$ 632.9 Mn in 2013 and is projected to reach US$ 936.3 Mn by 2020, expanding at a CAGR of 5.8% from 2014 to 2020. Pharmaceutical was the largest segment of the global microcrystalline cellulose (MCC) market, accounting for more than 35% share in 2013 ("Microcrystalline Cellulose (MCC) Market- Global Industry Analysis, Size, Growth and Forecast 2014-2020," 2016). The increased acceptance of microcrystalline cellulose as an excipient in food industry coupled with the growth of the global pharmaceutical industry is expected to drive the demand of global microcrystalline cellulose (MCC) market during the forecast period. Moreover, increasing demand for low fat food and processed food is also expected to fuel the growth of microcrystalline cellulose market over the forecast period. Rising demand for microcrystalline cellulose (MCC) in rapidly growing end-user segments such as pharmaceutical and food and beverage is likely to drive the global microcrystalline cellulose (MCC) market in the next few years. Production of microcrystalline cellulose (MCC) from eco-friendly raw materials is predicted to act as an opportunity for the MCC market in the next six years.

In addition, in Malaysia there is no company that produces microcrystalline cellulose (MCC). If we can develop more company in Malaysia, we can turn the value-
less biomass waste from the oil palm can be turned into a valuable product. At the same time, there will be no problem in getting the raw material to produce microcrystalline cellulose (MCC) because of the free abundance of oil palm biomass resource. Cheap and easy availability of raw material, regulatory support, and increasing huge demand for pharmaceutical products in the region is expected to be the driving factor for microcrystalline cellulose (MCC) production in Malaysia. We can meet the increasing demand microcrystalline cellulose (MCC) in the near future and improve the downfall economic performance of Malaysia.

1.3 Problem Statement

Currently the main raw material of cellulose derivative is cellulose from wood and cotton linter. However, deforestation and acceleration of greenhouse affects gradually grown interest on agriculture products and by-products as alternative cellulose resources (Bono et al., 2009). Thus, we need to change our raw material for cellulose derivative such as oil palm biomass. The oil palm empty fruit bunch (EFB) is one of the oil palm biomass product. The empty fruit bunch (EFB) traditionally are being burnt in simple incinerators, as a means of disposal and the ash recycled onto the plantation as fertilizers. But, this process causes air pollution and has now been banned in Malaysia. Furthermore, under this route of disposal, no energy is recovered. Alternatively the empty fruit bunch (EFB) has been composted and returned to the plantation. But disposing of empty fruit bunch (EFB) back to oil palm plantation without recovering remnant oil in the EFB contributes to oil spills. Empty fruit bunch (EFB) is a resource which has huge potential to be used for cellulose production, currently not being utilized (Abdullah & Sulaim, 2013).

In Malaysia there is no company that produces microcrystalline cellulose (MCC). Therefore, consumer in Malaysia had to import microcrystalline cellulose (MCC) from outside Malaysia such as China. The demand of microcrystalline cellulose (MCC) had increased from years to years.