CHAPTER I

INTRODUCTION

Fatty acid methyl esters are aliphatic organic esters primarily prepared by the reaction of a carboxylic acid derived from natural fats and oils and methanol. Methyl ester is alternative fuel for diesel engines. It is primary advantages are that it is one of most renewable fuels currently available and it is also non-toxic and biodegradable. It can also be used directly in most diesel engines without requiring extensive engine modifications. The most cursory look at the literature relating to methyl ester will soon reveal the following relationship for prediction of methyl ester from fats and oils. Palm oils their derivatives such as methyl ester production. Palm oils including palm fatty acid and palm stearin are obtained from process palm oil. This process is established mainly to add value to by byproducts from the refinery. They have been used directly as about 80% of palm oil find its way into food products, leaving about 20% for non-applications. The food products include trans-free vanaspati, santan powder, Trans-free margarine, pourable margarine, microencapsulated palm oil-based products, non-dairy ice cream, shortenings, cocoa butter substitute, reduced fat spread, Trans fatty acid free food formulation, palm olein salad dressing, etc. The production into methyl ester for use as biodiesel and feedstock for the oleochemicals industry. Commercially, methyl esters of fatty acids can be produced either by esterification of fatty acids or transesterification of fatty triglycerides. The predominant process for production of methyl esters are esterification and transesterification of fats and oils with methanol.

Esterification consists of a sequence of consecutive reversible reactions where in the palm fatty acids (FFA) is successively transformed finally into methyl ester and water. Methyl ester is prepared from palm fatty acid with methanol in excess as compared to stoichiometric proportion. The

stoichiometry ratio of this reaction thus requires 1 mol of alcohol per 1 mol of FFA to give 1 mol of fatty alkyl ester and 1 mol of water.

Transesterification consists of sequence of consecutive reversible reactions where in the triglyceride is successively transformed finally into ester and glycerol. The stoichiometry of this reaction thus requires 3 mol of alcohol per 1 mol of triglyceride to give 3 mol of fatty alkyl ester and 1 mol of glycerol. The products of the process are ester of triglycerides with glycerine as a by-product. The by-product, glycerol, may be used in the soap industry.

The alcohols used most frequently are methanol and ethanol while the catalyst may be basic or acidic. Several parameters including the type of catalysts (alkaline or acid), amount of catalyst, amount of alcohol, temperature, and time.

There are different processes that can be applied to synthesize fatty acid methyl ester (FAME): (1) base-catalyzed transesterification (J.A. Almeida et al., 2002), (2) acid-catalyzed transesterification (M. Mittelbach et al., 1996), (3) integrated acid- catalyzed pre-esterification of FFA and base-catalyzed transesterification (M. Canakci et al., 2001), (4)enzyme- catalyzed transesterification (D. Wei et al., 2004), (5) hydrolysis and acid- catalyzed esterification, (6) pyrolysis (A. Demirbas, 2003), and (7) supercritical alcohol transesterification (S. Saka et al., 2001).

The base catalysts are most of the commercial methyl ester produced from transesterification using base catalysts (KOH or NaOH). The base catalyzed process is less corrosive than the acid (H_2SO_4) catalyzed one and proceeds at a much higher rate.

The acid catalysts are good for the transesterification of the palm stearin mix palm fatty acid at ratio other with a high FFA content. Catalytic activities of sulfuric acids (H_2SO_4) for the transesterification. However, other than the slow reaction and high temperature, separation of the catalyst and leaching of the catalyst can be serious issues with homogeneous acid catalysts.

Hence, the use base and acid catalysts such as potassium hydroxide (KOH) and sulfuric acids (H_2SO_4). Advantages the base and acid catalysts is

not expensive, transesterification use base catalysts are fast the reaction and at high fatty acids the reaction are use acid catalysts in esterification.

The objective of the thesis is to give the methyl ester from palm fatty acids (FFA) and triglycerides (palm stearin) use sulfuric acid and potassium hydroxide as catalysts.