CHAPTER I

INTRODUCTION

Introduction

Alkyl esters can be produced from transesterification reaction between vegetable oils or animal fat and alcohol. This reaction is catalyzed by homogeneous or heterogeneous catalyst. The products of this reaction are desirable alkyl esters and the by-product is glycerol. Methyl esters are used extensively as intermediates in manufacture of emulsifier, textile treatments and other applications. The raw materials for producing methyl esters is provided from renewable natural resources such as oil plants i.e., palm, rapeseed, soybean, sunflower, cotton seed, coconut, canola, Jatropha, and animal fats, i.e., beef tallow and pork lard. Used cooking oil from restaurants can also be converted into methyl esters. Choice of vegetable oil for Thailand is palm oil and coconut oil which have a high productivity and low cost compared to the other vegetable oils.

The conventional homogeneous acid catalysts are sulfuric acid (H_2SO_4) and hydrochloric acid (HCl). On the other hand, the conventional base homogeneous catalysts are potassium hydroxide (KOH) and sodium hydroxide (NaOH). The problems of these catalysts are the separation of catalysts from the product and the formation of stable emulsion and the great amount of wastewater (Xie, 2006 and Liu, 2008). The heterogeneous catalysts are not disposed but rapidly separated from the reaction mixture by filtration. Therefore, heterogeneous catalysts such as calcium oxide (CaO) and magnesium oxide (MgO) have been increased in interest (Gryglewicz, 1999). Vicente et al., (1998) explained the reaction of refined sunflower oil and

methanol was carried out over different types of catalyst. The conventional homogeneous catalyst was NaOH and heterogeneous catalyst was MgO. The temperature chosen for the reaction was 60°C. The reaction time for all experiments was 8 hours. The 1% (wt/wt of oil) concentration of catalyst was chosen. The result showed that NaOH gave 80% conversion at 5 min. On the other hand, it gave approximately 8 hours to have 80% conversion from MgO.

The disadvantages of using heterogeneous catalysts are low yield and long reaction time to complete the conventional process. This proposes of this study are problems solving and development of heterogeneous catalysts for the highest activity.

The heterogeneous catalysts have been developed by improvement of the pore size and surface area of catalyst. One reasonable strategy is the increase of catalyst activity by modifying the active surface with alkaline metal (Gryglewicz, 1999). Huaping et al. (2006) studied the catalytic activity of modified CaO catalysts with ammonium carbonate solution in order to increase high surface area. The results showed that the base strength of CaO had more than 26.5 after modified with ammonium carbonate solution gave the highest conversion of 93 % for soybean oil.

The objective of this study is investigation of CaO and MgO catalysts. The advantages of this catalyst are higher activity, mild reaction condition, long catalyst lifetimes and low catalyst cost. This research developed the CaO and MgO catalysts by impregnation incipient wetness of ammonium carbonate $(NH_4)_2CO_3$ and potassium carbonate K_2CO_3.