CHAPTER I
INTRODUCTION

Majority of the world energy needs is supplied through petrochemical sources, coal and natural gases, with the exceptive of hydroelectricity and nuclear energy. Of all these sources are finite and at current usage rates will be consumed shortly. As energy demands increase, a supply of fossil fuels is limited and environmental concerned; therefore, the recent research has been carried out to find new renewable sources to substitute the fossil fuel such as fuel cell and biodiesel.

Biodiesel is a liquid fuel and its properties are very similar to petroleum diesel in combustion properties, but essentially free of sulfurs, non-toxic, biodegradable fuel, and low emission; therefore, it is a cleaner burning fuel than petroleum diesel. Biodiesel is defined as the monoalkyl ester of long fatty acid derive from renewable lipid feedstock, such as vegetable oil or animal fats. However, the direct use of vegetable oil or animal fat in diesel engine can lead to many problems, for example, incomplete combustion, poor cold engine start-up, and oil ring stickenings because these oils have high viscosity.

Many researchers have been trying to develop alternative fuel that has properties and performance similar to the petroleum-based diesel fuel, such as biodiesel produced by transesterification. Transesterification has been defined as the reaction between oil or fat with alcohol to form ester (biodiesel) and glycerol. The advantages of biodiesel from this process are its viscosity close to petroleum-based diesel fuel, its good lubricant property that extends the engine life, its high cetane number, its high flash point, and its acceptable cold plugging point. There are many types of alcohol used in transesterification, such as methanol, ethanol, and butanol.

In general, transesterification reaction can be catalyzed by both acid and basic homogeneous catalysts, such as NaOH and KOH. Although they showed greater performance toward transesterification to obtain biodiesel, but the problems of homogeneous catalysts are high consumption of energy, unwanted soap byproducts, expensive separation of the homogeneous catalyst from the reaction mixture, and large amount of wastewater during separation and cleaning of the catalyst and the products.

Thus, the use of heterogeneous catalysts should be an attractive solution. The heterogeneous catalyst has more advantages than homogeneous catalysts for examples; can easily to separate the products, practically reused and reduction of environment pollutants. However, vegetable oils or animal fats with high contents of FFAs, (such as deep-frying oils from restaurants and food processing) can be used for biodiesel production.

In this work, transesterification was carried out using KOH loaded on bentonite. The effects of reaction parameters, such as reaction time, reaction temperature, molar ratio of methanol to oil, and amount of catalyst, were optimized for the production of biodiesel. In addition, effects of KOH loading and calcination temperature on the biodiesel yield were also studied.