CHAPTER I
INTRODUCTION

As energy demands increase, a supply of fossil fuels is limited and environmental concerned. So, the research has been carried out to find a new renewable and sustainable energy sources to substitute the fossil fuel. For example, fuel cell, energy from hydrogen, and biodiesel.

Biodiesel is a non-toxic, biodegradable fuel and essentially free of sulfur and aromatics. On the other hand, biodiesel is defined as the monoalkyl ester of long fatty acid derives from renewable lipid feedstock, such as vegetable oil or animal fat. 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 stickening since vegetable oil and animal fat have high viscosity.

Many researchers have been studying alternative fuels that have properties and performance as the petroleum-based diesel fuel, such as blending with petroleum-based diesel fuel and alternative flue from transesterification. Transesterification has been defined as the reaction between oil or fat with an alcohol to form ester (biodiesel) and glycerol. The advantage of biodiesel from this process is its viscosity close to petroleum-based diesel fuel, its good lubricant property that extend 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 buthanol. The widely used alcohol in transesterification reaction is methanol because it is available and cheap.

In general, transesterification reaction can be catalyzed by both homogeneous catalysts (acid and basic catalysts) such as NaOH and KOH and heterogeneous catalysts (acid and basic catalysts) such as KNO_3/Al_2O_3, KOH/NaX. However, heterogeneous catalyst would have more advantages than homogeneous catalysts because of its simplicity to separate the catalyst from products and its reduction of environment pollutants.

In this work, the variables for transesterification of palm oil using KOH/ZrO_2 and KOH/mordenite as a heterogeneous catalyst were studied such as reaction time, amount of K loading on the support, molar ratio of methanol to oil, amount of catalyst, and calcination temperature. Moreover, both catalysts were used to study the catalyst lifetime.

In addition, both fresh and spent catalysts were characterized by XRD, SEM-EDS, and XRF. The potassium leaching in the reaction was investigated on KOH/ZrO_2 and KOH/mordenite.