CHAPTER I
INTRODUCTION

Because of an interesting in petroleum demands and environmental concerns, the developments of alternative renewable energies are attracting to reduce the petroleum consumption. One of an interesting substitution for this situation can be biodiesel because of its biodegradability and non-toxicity. Thus, the production of biodiesel is considered to be an advantage to reduce fossil fuel usage due to environmental aspect and petroleum replacement. Biodiesel can reduce carbon dioxide, sulfur dioxide, unburned hydrocarbons, and other toxic emissions generated in combustion process.

Biodiesel can be referred to a mono alkyl ester having a long chain of fatty acid derived from renewable feedstock (e.g. vegetable oil or animal fat). The fatty acid methyl esters can be prepared from triglyceride in vegetable oil by transesterification reaction with alcohol. The reaction of transesterification of vegetable oil can take place with various alcohols (e.g. methyl, ethyl, and other alcohols). Among of these alcohols, methanol and ethanol are widely used as an alcohol.

Currently, commercial process to produce biodiesel uses homogeneous catalyst for transesterification of vegetable oil and alcohol. Homogeneous basic catalysts, sodium hydroxide or potassium hydroxide, are mainly used (D. Darnoko *et al.*, 2000). Although these homogeneous catalysts catalyzed biodiesel reaction fast and provided high conversion rates, they have some serious drawbacks such as catalytic reusability, wastewater treatment, and product separation. Moreover, heterogeneous catalysts not only can be easier separated from the mixtures, but also show less corrosive impact on processional equipment.

To draw attention from homogeneous catalyst to heterogeneous catalyst, there are many things to be concerned with such as activity, selectivity, and reusability. Furthermore, the catalyst ability is considered to develop commercial processes. Thus, montmorillonite, which is one type of clays, can be an interesting solution. Montmorillonite may be defined generally as an impurified clay. It has particle sizes in the micron range and ion exchange capacity (P. Pushpaletha *et al.*, 2005). Therefore, it is likely that montmorillonite is an interesting material for biodiesel at the moment.

However, the desired characteristic of montmorillonite is depended on the applications and using it in biodiesel production by transesterification has little information. In the present work, we focus on the development of solid catalyst for the transesterification of palm oil by finding optimum condition for this material.