CHAPTER I

INTRODUCTION

The demand for diesel fuel in Thailand consumed about 43 million liters per day of diesel in recent year, which was 46.6 % of total consumption of petroleum product. The consumption of diesel fuel in Thailand is being continuously increased. The increasing demand for energy has prompted a lot of research to produce alternative fuels from renewable resources. Alternative fuels should be easily available, environment friendly and technoeconomically competitive. One of such fuels is triglycerides (vegetable oils/animal fats) and their derivatives. Vegetable oils, being renewable, are widely available from a variety of sources and have low sulphur contents close to zero, and it can reduce the emission of noxious combustion products to the atmosphere, and hence cause less environmental damage (lower greenhouse effect) than diesel. Besides, vegetable oils and their derivatives are produced widely in the country for food and other purposes [1]. Biodiesel can be blended at any level with petroleum diesel to create a biodiesel blend. It can be used in compression-ignition (diesel) engines with little or no modifications. Biodiesel not only has proper viscosity, boiling point, and high cetane number [2], but also is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics [3].

Transesterfication of oil with methanol yield methyl esters of trigylceride, it is usually catalyzed by acid or base catalysts. Reaction using basic homogeneous catalysts is faster (only 30 min. compared to 1-8 h for the acid catalysts). Conventional base catalysts are soluble sodium and potassium hydroxide [4]. However, in this conventional method removal of these catalysts was technically difficult and a large amount of waste water was produced to separate and clean the catalyst and the product [5]. These catalytic systems have some technological problems, the basic one with emulsification. In fact, the soaps formed when using basic catalysis are known to emulsify the biodiesel with glycerin, specially if ethanol is used. Besides, these catalytic systems are less active or completely inactive for ethanol and high molecular weight alcohols [6].

Therefore, conventional homogeneous catalysts are expected to be replaced in the near future by environmentally friendly heterogeneous catalysts mainly because of environmental constraints and simplifications in the existing processes. More recent research has focused on the use of heterogeneous catalysts [7].

Although solid base, such as clays, zeolites, alumina oxides, were widely explored, the reaction temperature seemed to be high. Hydrotalcites $[M^{2+}_{(1-x)}\ M^{3+}_{x}\ (OH)_2]^{x+}\ (A_{x/n})^{n-}\ yH_2O$ were interesting basic materials. It was reported to give higher yields in transesterification reaction. Its acid/basic properties could be easily controlled by varying their composition. Hydrotalcites have been used as precursors of catalyst and have attracted much attention during the development of new environmentally friendly catalyst.

1.1 Objectives of the research

- To synthesize and characterize metal loaded-hydrotalcites.
- To study transesterification of tributyrin with methanol catalyzed by the metal loaded-hydrotalcites.
- To utilize the suitable catalyst for the transesterification of refined palm oil.