CHAPTER I
INTRODUCTION

Nowadays, energy demands and the petroleum crisis are causing costs to increase dramatically; and conventional fuel reserves are limited. Finding a new, renewable and sustainable energy source is necessary for substitution of the petroleum-based fuel. One promising renewable source of energy is biodiesel.

Biodiesel is monoalkyl esters of long chain fatty acids derived from renewable feed stocks, such as vegetable oils or animal fats, which are composed of triglycerides. There are many benefits of biodiesel over conventional diesel fuel. It is environmentally friendly, renewable, nontoxic, and biodegradable. Furthermore, biodiesel not only has proper viscosity, boiling point, high cetane number, and less carbon monoxide, but also is simple to use, and free of sulfur and aromatics. The way to produce biodiesel is by the reaction between triglycerides and alcohol, mostly methanol, because of its low cost, in the presence of a catalyst. This process is called transesterification. Transesterification of vegetable oils to biodiesel can be carried out using both homogeneous (acid or base), especially alkaline hydroxide, and heterogeneous (acid, base and enzymatic) catalysts. However, the main problems in the conventional method using homogeneous catalysts are not only the difficult removal of these catalysts from products, but also a large amount of wastewater produced from separating and cleaning the catalyst and the products. Therefore, for the development of an environmentally benign process and the reduction of the production cost, a new process using a heterogeneous catalyst should be introduced. Why is heterogeneous catalysis becoming famous for producing biodiesel? Because these catalysts have many advantages: they are non-corrosive, environmentally benign, and much easier to separate from liquid products. They also can be designed to give higher activity, selectivity, and longer catalyst life.

As already known, there are many advantages using heterogeneous catalyst to produce biodiesel. In this work, $NaOH/ZrO_2$ as heterogeneous catalyst for biodiesel production was synthesized via two different methods, viz. impregnation and mixing, to study its efficiency. The optimum conditions in converting palm oil to

biodiesel was studied using palm oil, one of the alternative fuel sources for preparing biodiesel and readily available in Thailand.