CHAPTER I
INTRODUCTION

From the discovery of John Boyd Dunlop who invented the first tire in 1888, tires are very popular, and the amount of tire production increases rapidly. Since the complex nature of tires which includes several rubbers, carbon black, steel-cord, and other additives, makes them difficult to be recycles, the large amount of waste tires are generated and accumulated on the landfill sites or stock piles. These created environmental problems, such as breeding sites for mosquitoes and vermin, which cause diseases affecting to human health, and the fire hazard in the large stock pile produced the air pollutant or green house gas (Mui *et al.*, 2004).

There are several technologies to solve these problems including retreading of scrap tire, reusing in original form, using in crumbed tire in sport field playgrounds, and pavement, and being derived to fuel by thermal technologies, for example incineration gasification and pyrolysis. Especially, pyrolysis process has a high potential of transfer waste tire into useful products. The pyrolysis oil can be used as fuel, a source of chemicals and a petroleum refinery feed stock. The pyrolysis gas can be used as the fuel gas whereas the solid residue can be used as a solid fuel or low grade carbon black.

Pyrolysis process can produce the high yield of oil product (William *et al.*, 2003) with a high energy heating value and similar properties as commercial grade light fuel oil or diesel, which can be easily handled, stored, and transported. Moreover, the demand and price of oil are increased with world population. Therefore, high interest has been drawn to liquid or oil products derived from pyrolysis of tire. However, pyrolytic oil consists of a complex mixture of organic compounds of 5 – 20 carbons with a very high portion of aromatic, poly-aromatic and polar-aromatic compounds (Choosuton, 2007).

The aromatic compounds are the precursor of particulates in gasoline and diesel engine exhausts, which release the pollutant or green gas and reduce the quality of fuels. So, these compounds are limited in the gasoline or diesel. Due to the application of pyrolytic oil for fuels, it should be upgraded by reducing the aromatic compounds. The possible ways are hydrotreating, hydrogenation, and ring opening, which need bifunctional catalysts, containing both bronsted acid sites and metal sites. Noble metals loaded zeolites have high activity and selectivity in hydrogenation, ring opening, and isomerization. Especially, Pd metal had the high activity in hydrogenation (Song *et al.*, 2000) and isomerization (Lui *et al.*, 2006). In 2007, Choosuton also reported the effect of noble metals and supports on production a commercial fuel from pyrolysis of used tire. He concluded that Pd/Beta should be the best catalyst for gasoline and kerosene production, and gave the highest gasoline yields. Moreover, several researches showed metal loading and preparation techniques (ion-exchange and impregnation) affected the properties of catalysts, selectivity, and activity in hydrogenation, isomerization, and hydrotreating reactions. In this work, the influence of operating pyrolysis condition, metal loading, and catalyst preparation technique were studied on the quantity and quality of oil product on pyrolysis of used tire.

The goals of this research were to investigate the influences of Pd/Beta, on the liquid and gas products, especially for the role on aromatic compound, and to study the other properties of catalyst such as metal loading and metal dispersion. The used tire pyrolysis was carried out in a bench-scale autoclave reactor with the heating rate of 10°C/min from room temperature to the final temperature of 500°C in the atmospheric pressure. Other parameters; particle size, holding time, N_2 flow rate, the amount of sample and catalysts were fixed at 8-18 mesh, 90 min, 30 ml/min, 30 g and 10 g, respectively.