CHAPTER I

INTRODUCTION

Polycyclic Aromatic Hydrocarbons (PAHs) are widespread pollutants in the atmosphere, produced by high temperature reactions such as incomplete combustion and pyrolysis of fossil fuel and other organic materials.

Epidemiological studies and studies on animals have shown very strong carcinogenic and mutagenic action of many PAHs. Also, it was found that the products of PAH photooxidation or of PAH reactions with other atmospheric pollutants are more toxic than the original PAHs[1].

PAHs can either be man-made or occur naturally. A few of the PAHs are used in medicines and to make dyes, plastics and pesticides, while others are contained in asphalt used in road construction. They are found throughout the environment in the air, water and soil. There are more than 100 different PAH compounds. Although the health effects of the individual PAHs are not exactly alike, the following 17 PAHs are considered as a group in Figure 1.1.

These 17 PAHs were chosen to be included in this profile because (i) more information is available on these than on the others; (ii) they are more harmful than many or most of the others; (iii) there is a greater chance of exposure to these PAHs than to the others; (iv) they were the ones most frequently identified at NPL hazardous waste sites[2].

In order to improve the quality of diesel fuel, research over the past few years was focused on studying the aromatic content, sulfur content, increasing cetane number, addition of cetane improver, and decreasing boiling point of diesel fuel. However, the combustion process of the diesel engine is more complex than that of the gasoline engine. Much is yet to be learned about the detailed mechanisms leading to emission from diesel engines.

The major source of PAHs in air pollution in urban areas, especially in Bangkok and other cities, is vehicles. Several factors that influence PAHs in exhaust emission are fuel composition, air to fuel ratio, lubricants, driving conditions, and vehicle types[3]. Diesel cars are one of the most important sources of PAHs and other pollutants such as HC, CO, NO_x, and SO_x. Many workers have concluded that higher cetane numbers provide lower emission, some of them found that it could decrease NO_x and UHC (Unburnt Hydrocarbon), increase smoke emission, but not resulted in PAHs emission[4].

Objective and Scope of the Research

The objective of this research was the reduction of the amount of PAHs in diesel exhaust by using environmental friendly techniques for improving diesel fuel.

The scope of this research is (i) to determine the quality and quantity of PAHs in diesel exhaust, (ii) to study the effect of cetane number and cetane improver on the amount of PAHs in diesel exhaust, (iii) to study the effect of engine load and engine speed on the amount of PAHs in diesel exhaust.

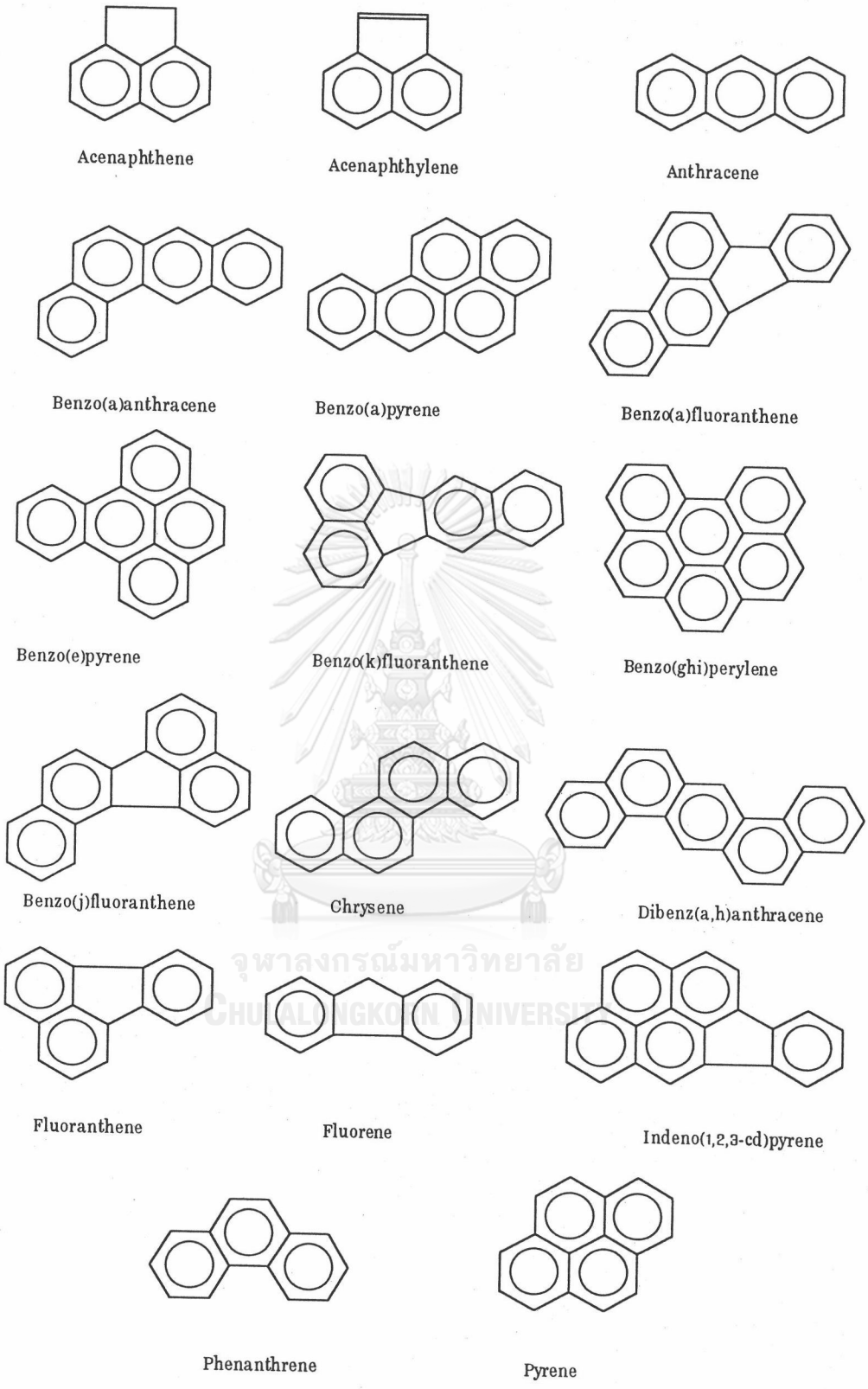

Figure 1.1 Structures of Selected PAH