CHAPTER V

CONCLUSION AND SUGGESTION

5.1 Conclusion

In this research, the effect of palm oil methyl ester on polycyclic aromatic hydrocarbons (PAHs) of diesel exhaust was investigated. Palm oil methyl ester was prepared from transesterification of crude palm oil with methanol in the presence of sulfuric acid at temperature 65 °C for 6 hours. The crude palm oil was 73-85 % transesterified. PAHs exhaust emissions from the 4JA 1L ISUZU diesel test engine consisted of different levels of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, benz(a)anthracene, pyrene, chrysene, benzo(k) fluoranthene and benzo(ghi)perylene were found.

Those PAHs found in diesel exhaust may be divided into three classes. The first class in major PAHs such as naphthalene, acenaphthylene and acenaphthene, which are found approximately 90 % of total PAHs. The second class is carcinogenic PAHs such as phenanthrene, fluoranthene, pyrene, benz(a)anthracene, benzo(k)fluoranthene, and chrysene, which are found approximately 3 % of total PAHs. The third class is minor non-carcinogenic PAHs such as fluorene, anthracene and benzo(ghi)perylene.

The optimum engine speed given, the lowest emission of PAHs was found to be 1600 rpm. The highest amount of PAHs was found at engine speed of 800 rpm. Therefore, during traffic congestion, vehicles with engine speed of 800 rpm may be one of the major causes the highest amount of PAHs emission.

The palm oil methyl ester blended with diesel also influences on the emission of PAHs from the diesel test engine. The greater the concentration of palm oil methyl ester, the greater the reduction of total PAHs emission. A percentage decrease of PAHs in diesel exhaust was found to be approximately equal to a percentage increase of the amount of palm oil methyl ester blened in diesel fuel. This suggests that palm oil methyl ester may be completely combusted and not produce PAHs.

The comparison of the amount of total PAHs in diesel exhaust, obtained from use of palm oil methyl ester, refined palm oil and crude palm oil blended with diesel fuel at 20 % by volume, indicated that the amount of PAHs emission is lowest with palm oil methyl ester blended fuel. This owing to higher viscosity of refined and crude palm oil blended with diesel fuel than the maximum limit for using in diesel engine may be caused incomplete combustion. The results of this study point out that palm oil methyl ester was found to be more suitable for using in diesel engine than refined palm oil and crude palm oil, though that more long term studies are necessary for commercial utilization to become practical.

5.2 Suggestion

1. Transesterification of crude palm oil, the ester yields were reduced because of gums and extraneous materials present in the crude oils. However, the relatively high cost of refined oils may be made biodiesel produced from these materials more expensive than conventional diesel fuel.

2. For most technical applications, methyl esters are produced because methanol is readily available and relatively inexpensive. However, it may be preferable to prepare ethyl esters because ethanol is less toxic than methanol. Moreover, because ethanol can be produced from grain or biomass, ethyl ester biodiesel is a fuel that can be totally derived from renewable resources.

3. The exhaust emission from the car which tested at steady state conditions and on road test should be compared.

5.3 Suggestion for future work

1. The utilization of palm oil methyl ester in the future needs more studies in engine performance tests to support, such as fuel comsumption, engine power and torque, and injector coking.

2. The crude glycerol, which is a by-product from transesterifying palm oil, is then removed alcohol and is reacted with an etherifying agent, such as isobutylene or isoamylene, in the presence of a strong acid catalyst to produce glycerol ethers. The glycerol ethers are then added back to transesterified palm oil, as a cloud-point reducing agent or an oxygenated compound, to provide an improved biodiesel fuel.