CHAPTER II
BACKGROUND AND LITERATURE SURVEY

2.1 TPO spectra

Querini and Fung (1994) studied the influence of heating rate, reaction order, coke particle size & number of coke particle and finally catalyst mass and oxygen concentration on TPO spectra. These affect the coke oxidation.

The lower heating rate, the lower temperature finishes coke oxidation and the lower percent coke remaining. Moreover, the higher oxygen concentration caused in increasing rate of coke oxidation; consequently, the lower temperature of peak maximum and the increasing of peak's height could be observed. Furthermore, the coke content was separated into 2 cases. In the first case, coke particle size remains unchanged whereas number of coke particles increases with increasing coke concentration. This case could be separated into 2 conditions. For the first condition, there was no change in O_2 partial pressure. The increment of percent coke contributed to the increment of peak height. For the later condition, there was the decrement in O_2 partial pressure. The increment of percent coke caused the increment of temperature at peak maximum (T_m) and oxidation final temperature. For the later case, the number of coke particle remained unchanged whereas coke particle size increased with increasing coke concentration. The percent coke increment lead to the increment of temperature at peak maximum. Additionally, the sample mass could be affected when carbon reaction order was equal to 1 and when there was changing in O_2 concentration. This effect included the rising in temperature at peak maximum (T_m) and the decreasing in reaction rate.

2.2 Influence of catalyst on TPO spectra

Querini and Fung (1997) studied the research in topic of coke characterization by temperature-programmed techniques. Temperature programmed experiment was used to characterize coke deposits by 2 methods. The first method was the use of partial burning experiments to obtain information about the structure of coke. In this experiment, coke catalyst (Pt/Al_2O_3(1.24%coke), Pt-Re/Al_2O_3(4.11%coke) and Pt-Re-S/Al_2O_3(13.0%coke) were exposed to n-heptane and these coke catalyst was heated from room temperature to 450 °C ,490 °C and 500 °C respectively in equal time. The results of them followed this. For Pt/Al_2O_3, the rate of CO_2 production monotonically decreased and the reaction order was equal to 1. For Pt-Re CO_2 production rate /Al_2O_3, the CO_2 production rate was fast decrement. For Pt-Re-S/Al_2O_3, CO_2 production rate was the fastest decrement. On Pt-Re/Al_2O_3 and Pt-Re-S/Al_2O_3 had changed in coke reaction order. In the second method was the study of the interaction of coke with the alumina support of naphtha reforming catalyst, by using temperature programmed gasification technique in an inert carrier gas. For the result, coke reacted with alumina hydroxyl group became CO and H_2.

2.3 Influence of carbon formation TPO spectra

Li *et al.* (2001) found the kinetic of charcoal and graphite combustion by using temperature-programmed oxidation (TPO) with evolved CO and CO_2. They discovered the results followed this. The oxidation temperature of charcoal was smaller than the oxidation temperature of graphite. This reason was coming from the surface-area rate constant of carbon gasification of graphite was less than demineralized charcoals. The activated energy of CO_2 was larger than CO. For the final result, the reaction order of graphite was smaller than charcoal because *C(O_2) on the graphite surface exhibited the lowest activity for O_2.