



CHAPTER I INTRODUCTION

Catalytic reforming of hydrocarbon feedstocks is an important catalytic process in a petroleum refinery to produce aromatic intermediates for the petrochemical industry. The demand for aromatics is growing more rapidly than the supply of feedstock for aromatics production. This trend creates a need for more effective reforming processes and catalysts.

The catalytic reforming is generally applied to a feedstock rich in paraffinic and naphthenic hydrocarbons and consists of various reactions: dehydrogenation of naphthenes to aromatics, dehydrocyclization of paraffins, isomerization of paraffins and naphthenes, dealkylation of alkylaromatics, hydrocracking of paraffins to light hydrocarbons, and formation of coke deposited on the catalysts. Increased aromatics have turned attention to the paraffin-dehydrocyclization reaction, which is less favored thermodynamically and kinetically in bifunctional reforming than other aromatization reactions. Consequently, increasing desired product yields from catalytic reforming by promoting the dehydrocyclization reaction over the competing hydrocracking reaction while minimizing the formation of coke must be considered. Interestingly, zeolite-based reforming catalysts, such as Pt/KL, exhibit superior advantages compared to conventional alumina-based reforming catalysts, for instance, Pt/KL has unique aromatization selectivity (Bernard, 1980).

During reforming, catalysts deactivate due to accumulation of coke deposits on the catalyst, and agglomeration of fine catalytic metal particles disperses in the catalyst into larger particles. Therefore, regeneration of deactivated catalysts is of great interest. However, the catalyst regeneration has been less studied than catalysts deactivation because the mechanisms are not always simple and reversible. Only a few studies have been reported. Attention is focused on Pt-based catalysts because they are widely used in reforming reactions. In addition, regeneration only makes sense in cases where deactivation can be reverted, as in the case of coke deposition (Afonso, *et al.*, 1997).

Regeneration of a spent catalyst is influenced by a great number of parameters. For instance, time necessary to remove coke and temperature, which is

probably the most critical parameter in a regeneration process because it influences directly the stability of the metallic phase and of the support. In addition, after regeneration in air, growth of Pt particles outside the channels of the zeolite is generally observed. Therefore, this research focused on studying the effect of experimental parameters on the regeneration of Pt/KL catalysts. This involved the comparison of catalytic activity measurement and characterization of fresh, spent and regenerated Pt/KL catalysts. Moreover, regeneration with Pt redispersion treatment was investigated with which all the catalysts are prepared by vapor-phase impregnation (VPI) method.

This research was divided into two parts. The first part was to study the influence of air flow rate, temperature and time of a continuous regeneration in air after the reaction testing in order to investigate the optimal conditions for the regeneration of the spent Pt/KL catalysts. The second part was preliminary study of Pt redispersion via oxychlorination treatment of the regenerated catalysts. The obtained products were analyzed by a gas chromatograph. The fresh and spent catalysts were characterized by means of infrared spectroscopy, (FT-IR) DRIFTS of adsorbed CO to provide the location of Pt particles. Temperature programmed oxidation (TPO) was also applied to measure amount of coke on the catalysts.