

CHAPTER I

INTRODUCTION

Platinum supported on potassium form of L-zeolite exhibits the best activity and selectivity over the other nonacidic zeolite catalysts. There are many research work investigated the reasons of the excellent performance of this monofunctional catalyst. Several work groups believed that zeolite geometry have influenced on the increased selectivity and activity in one-six-ring closure that led to benzene formation. Furthermore, L-zeolite support lacked of any acidity and able to stabilized the formation of extremely small platinum clusters. However, the most important feature of zeolite is to inhibit bimolecular interactions that lead to coke formation. Besides, the presence of K^+ can be related to both the high aromatization activity/selectivity and the high sensitivity to sulfur poisoning in n-hexane conversion. The K^+ on L-zeolite can stabilize an intermediate of the aromatization and K^+ loses this property by its interaction with sulfur.

Unfortunately, Pt/KL have very sensitive to trace amount of sulfur resulted in the loss of active sites and pore blockage. Therefore the various developments in preparation method of Pt/KL were applied to increase sulfur resistance. The proper metal loading method have significantly effect to the dispersion and location of platinum particles in zeolite that result to the catalytic activity and stability of Pt/KL. The preparation method used in this work was the chemical vapor deposition (CVD) method. This method can provide the small Pt clusters that locate inside the L-zeolite channel. Moreover the CVD method in this work can be done under helium flow that preferable for economic upscale.

In recently, the promotion of rare earth elements to Pt/KL as a promoter was widely investigated. One advantage of the rare earth promoter

such as Tm on Pt/KL is increasing the sulfur resistance of Pt/KL because Tm can act as sulfur getter. Another advantage is that Tm can increase the degree of Pt dispersion in KL so that PtTm/KL have more active sites resulting in higher activity than unpromoted catalyst. The decreasing in the agglomeration rate of Pt on PtTm/KL between the reaction testing was also observed. Rare earth element used in this work was ytterbium (Yb).

The n-hexane aromatization reaction was used as the catalytic testing reaction to study the activity, selectivity and stability of the catalysts using sulfur-free and sulfur containing feedstocks at sulfur concentrations of 0.6 and 2.5 ppm. The experiment was done under the reduction and reaction temperature of either 400°C or 500°C. Although the catalyst has low conversion at 400°C, the catalyst has more stability and selectivity than at 500°C. Thus the focus on the catalytic performance at 400°C may be the advantage.

The catalysts were characterized by diffusion reflectance infrared fourier transform spectroscopy (DRIFT) of adsorbed CO and hydrogen chemisorption to provide the dispersion and location of Pt particles. Temperature program oxidation (TPO) was also applied to measure the amount of coke on Pt/KL after the reaction.