CHAPTER I
INTRODUCTION

The demand for the aromatics is growing dramatically throughout the world. Therefore, strong market pushes the production to be developed, and as a result, new processes and sophisticated catalysts are required. Ethylbenzene (EB) and ortho-xylene (OX) are significant raw materials in petrochemical industry. Those materials could be alternatively derived from n-octane abundant in petroleum refining plants by aromatization. This reaction has many industrial applications and can be carried out on both bifunctional (acid-metal) and monofunctional (only metal) catalysts. The advantage of using monofunctional catalysts is the elimination of the isomerization paths, which are typical in the bifunctional catalysts and result in lower selectivity to aromatization.

A monofunctional catalyst consisting of platinum supported on potassium form of zeolite L (Pt/KL) catalyst has shown excellent activity and selectivity for n-hexane aromatization (Ko *et al.*, 1999). Although Pt/KL catalyst has been accepted for n-hexane aromatization, it exhibited lower catalytic activity when applying with n-octane. In addition, the dominant products from the reaction are benzene and toluene with small quantities of EB and OX, which are the expected products from the direct closure of the six-member ring (Jongpatiwut *et al.*, 2002). Different formulations were proposed in order to achieve a better stability and increase the selectivity to the traditional Pt/KL catalyst. One of them is the bimetallic Pt-Sn catalyst in which the second element (Sn) acts as metal promoters.

Platinum based bimetallic catalysts are extensively used in naphtha reforming processes. The three major bimetallic systems (in current use) are Pt-Re, Pt-Ir, and Pt-Sn. Since, Re and Ir have catalytic properties on their own while Sn is catalytically inactive. Industrially, Pt-Re and Pt-Ir systems are used for semi-regenerative reforming processes or cyclic reforming processes. Because the Pt-Sn catalyst can be regenerated easily, it is preferred for low-pressure continuous catalyst regeneration (CCR) reforming processes (Sutton *et al.*, 1972). The reaction of n-octane aromatization on Pt-Sn catalyst by varying supports and preparation methods has been focused on many publications. Pt-Sn bimetallic catalysts lead to

pronounced changes in properties of catalytic activity and selectivity. This research was focused on the effect of Sn, the percentage of Sn loading and the metal loading methods on n-octane aromatization. The appropriate amount of Sn in Pt/KL catalyst was investigated by varying Sn loading at 0.3, 0.6 and 1%. The Pt-Sn/KL catalyst was prepared by a vapor-phase impregnation (VPI) method in which the both metals were loaded on the KL zeolite by coimpregnation and sequential impregnation method. To test the prepared catalysts the catalytic activity was performed by using n-octane as a feed. The obtained products were analyzed by a gas chromatograph. Fresh and spent samples were characterized by Atomic Adsorption Spectrometer (AAS), Fourier Transform Infrared Spectroscopy (FT-IR) with DRIFTS of adsorbed CO, Hydrogen Chemisorption, Temperature Programmed Reduction (TPR), Temperature Programmed Oxidation (TPO), and Transmission Electron Microscopy (TEM).