CHAPTER I
INTRODUCTION

Nowadays, polyamine 6,6 (Nylon-6,6) plays an important role as feedstock of materials used in everyday life such as ropes, threads, clothes, parts of machinery, gears, cover of wires, etc. In production of nylon 6,6, the important intermediate is 1,6-hexamethylenediamine (HMDA) which can be produced by several routes. One of the important reactions is hydrogenation of adiponitrile over catalysts. This reaction yields 6-aminohexanenitrile (AHN) used in the preparation of caprolactam (precursor of nylon-6).

In production of HMDA, various metals on supported catalysts can be used such as Ni and Co. Since a product distribution depends on the type of supported catalysts, the main problem arises in which type of supported catalysts would yield the maximum desired product on the optimum reaction condition.

Supported catalysts for the hydrogenation of the nitrile group are based on the use of Co, Ni, Fe, and precious metals (Ru, Rh, Pt, and Pd). Raney-Ni and Co catalysts widely applied in the hydrogenation of adiponitrile have low mechanical resistance and are pyrophoric as well as difficult to completely remove from the process fluid. In a previous work (Pasek *et al.*, 1986), catalytic hydrogenation of the nitrile group, indicated that supported Ni, Co, and Ru catalysts were among the most active catalysts in producing primary amines, while Rh was suggested if a high selectivity to secondary amines was desired. It was apparent that not only did catalysts affect the product distribution, but also the reaction conditions including temperature, hydrogen-to-adiponitrile mol ratio, gas hourly space velocity, and catalyst acidity did.

Despite the industrial importance of adiponitrile hydrogenation, there are very few scientific publications dealing with such a topic as well as the main sources of data and information on this process are undisclosed in the form of patents. Nevertheless, the nature of different supports needs to be further investigated. Hence, this work presents the effects of temperature, hydrogen-to-adiponitrile mol ratio, gas hourly space velocity, and catalyst acidity on the gas phase adiponitrile

hydrogenation over nickel supported on ceria-zirconia and ceria-zirconia-magnesia mixed oxide catalysts.