

CHAPTER I

INTRODUCTION

When the demand for C3 olefin exceeds the amount available as a by product from existing processes, a more selective process is preferred. The development of dehydrogenation processes represents an economical method to produce propylene in high selectivity from propane. The resulting products can be either sold as commodity chemicals or converted into high value chemical products in downstream units. The increasing demand for the lower olefin such as propylene and other propylene derivatives, along with the limited supply of propylene from conventional sources, means that there is great interest in the area of propylene production via the catalytic dehydrogenation of propane. Dehydrogenation of lower alkanes has a great industrial importance because it represents an alternative obtaining alkenes or alkynes for polymerization and other organic syntheses from low cost saturated hydrocarbon feedstocks (Gorriz, 1992).

These days, there will always be several research groups simultaneously striving to perfect new catalytic formulas to serve industrial need and it is necessary the research work proceed quickly if one is to come out the winner in such competitive circumstances (Le Page et al., 1987).

The first choice in the search for a catalyst for a given reaction is the choice of a mineral to selectively activate the reaction. Even at this start of the search one must keep in mind the fact that activity and selectivity are not the only criteria that will bear upon the ultimate industrialization of the catalyst and a process to use that catalyst. One must exclude from the list of contenders

that are not likely to be stable under the anticipated operating conditions because of such things as poisons in the feed, inactivation by one or more of products or loss of activity due to a crystallographic transformation. Others contenders that are too rare or too expensive could be a priori eliminated from the selection because their use would add too much to the price of the catalyst and the cost of the process.

Usually, the catalytic agent is to be on a support and it becomes necessary to select an optimum support material according to the criteria of stability, inertness, cost and whether or not their use is governed by patent rights. For this research platinum supported on alumina is a good dehydrogenation catalyst (Cortright and Dumesic, 1994). Since the dehydrogenation of propane to propylene is an endothermic reaction, high temperature is required to achieve high conversion. However the rates of side reactions, isomerization, hydrogenolysis, and coking reactions become significant at this high temperature (Le Page et al., 1987).

Catalyst systems that employs platinum or tin on neutral support has been reported to exhibit high dehydrogenation selectivity and catalyst stability for dehydrogenation of light paraffins at elevated temperature even if their initial activity is lower (Cortright and Dumesic, 1994 and Dautzenberg et al., 1980). Likewise, addition of tin to a platinum on alumina catalyst is known to promote the desired reaction and inhibit coking reactions which are an unavoidable side reactions in catalytic processing of hydrocarbons and causes severe deactivation (Kirszensztejn et al., 1991). Some Authors have revealed that tin modifies the catalytic behavior of supported platinum catalysts through ensemble and/or ligand effect but many researches have provided evidence that tin in the supported catalyst is mainly present as Sn^{+2} and, according to the

surface model, the platinum clusters locate on the tin aluminate surface (Burch, 1981; Burch and Garla, 1981; and Lieske and Volter, 1984).

Alkali doping in heterogeneous catalyst in order to neutralize the intrinsic acidity of support or improve the catalyst (Afonso et al., 1994). The action of the alkali can manifest itself in various different ways. Alkali can increase the selectivity, activity and prolong the effective lifetime of the catalyst (Mross, 1983). Moreover, alkali promotes the redispersion of platinum in the presence of oxygen which causes platinum removes from the platinum crystallite and disperses on the carrier during regeneration (Lieske et al., 1983).

Although a large amount of work has gone into development and performance evaluations of these catalysts, very little comparison in activity and study in coking performance on the propane dehydrogenation over platinum-tin catalysts which are neutralized by alkali treatment are available. To contribute further understanding, we should more concern on investigation the effect of platinum catalyst modified by tin.