# Effect of Pt/Sn ratio and alumina phase on the propane dehydrogenation to propylene

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## Introduction

Propylene is the principal raw material for the production of many important petrochemicals such as polypropylene, polyacrylonitrile, acrylic acid, cumene and propylene oxide. It is also used in refineries for alkylation and oligomerization reactions to produce high-octane clean fuel alkylate blend. Conventionally, propylene has been produced as a by-product of steam cracking, fluid cracking and visbreaking processes which do not satisfy the growing demand. Consequently, alternative routes such as dehydrogenation of propane have received attention.

The reaction is highly endothermic and equilibrium limited; therefore, higher temperatures and lower pressures are necessary to achieve acceptable conversions.

Higher activity and selectivity of catalyst is essential to environmentally friendly process. The purpose of this research is to make high activity and high selectivity to propylene process in propane dehydrogenation. The supports of propane dehydrogenation catalyst, Θ-alumina ɣ-alumina, was compared. And Pt/Sn ratio was also tested for this reaction.

## Materials and Methods

The catalysts were prepared using impregnation method. The experiments were run in a fixed bed continuous-flow reactor. They were conducted at an hydrogen/propane = 1.0, a WHSV = 10 $h^{-1}$, 620 °C, and 1 atm.

## Results and Discussion

Structural property of each catalyst is given in **Table 1** .

**Table 1.** Surface area , pore volume and pore diameter of each catalysts.

| | Surface area (m2 /g) | Pore volume (ml/g) | Pore size (nm) |
|---|---|---|---|
| Pt0.45-Sn0.22/ Θ | 80.0 | 0.31 | 5.6 |
| Pt0.45-Sn0.50/ Θ | 79.7 | 0.31 | 5.6 |
| Pt0.45-Sn0.75/ Θ | 100.4 | 0.38 | 5.6 |
| Pt0.45-Sn0.22/ ɣ | 190.2 | 0.53 | 4.5 |
| Pt0.45-Sn0.50/ ɣ | 188.0 | 0.52 | 4.5 |
| Pt0.45-Sn0.75/ ɣ | 180.5 | 0.48 | 4.5 |

**Figure 1** shows the propane conversion and propylene selectivity and propylene yield during dehydrogenation experiment at 620°C . , Θ-alumina supported Sn0.75 catalyst shows the highest conversion and , Θ-alumina supported Sn0.50 catalyst shows the highest selectivity.

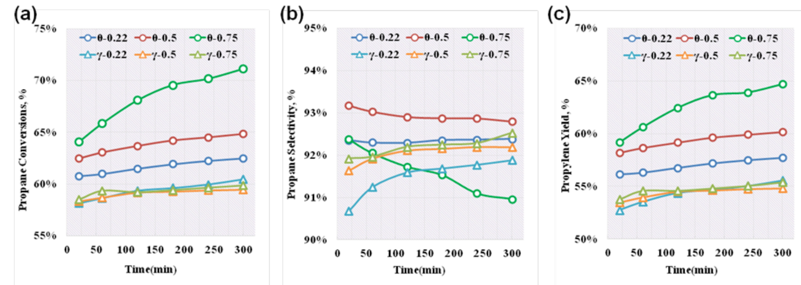


**Figure 1**. ♦), LZ (■), LRZ (▲), LSRZ (●).

## Significance

Pt/Sn ratio in Θ-alumina is about 1.5 in maximum conversion and yield. Θ-alumina supported Pt-Sn catalyst shows superior performance than ɣ –alumina supported catalyst.

## References

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