Pt-Sn catalyst for propane dehydrogenation with HCl treatment

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Traditional cracking of hydrocarbon feedstock such as refinery naphtha cracking were used to produce propylene. In these days, the demand for propylene is growing faster, the net result is shortfall of propylene supply in the market from steam cracking. So that catalytic dehydrogenation of propane has received attention as important

technologies to increase the yield of propylene. Propane dehydrogenation with catalyst belongs to a strongly endothermic reaction, which has received attention [1].

C_3H_8<->C_3H_6+H_2 H=298

It is well known that Pt-based catalysts with alumina used for propane dehydrogenation.

The addition of Sn to Pt supported catalyst which promotes catalytic activity, selectivity and stability has been widely studied in the dehydrogenation process [2]. The roles of tin were suggested that modify the electronic density of Pt.

In this study, we investigate the effect of HCl treatment after pre-calcination on Pt-Sn catalyst for propane dehydrogenation [3].

Co-impregnation method which is widely used in industry was applied for preparing Pt-Sn catalysts with ethanol as solvent [4]. The catalytic activity was measured for propane dehydrogenation after 2, 4, 10wt% of HCl treatment.

2wt% HCl catalysts shows the 20.1% and 21.1% for propane conversion after 5min and 30min, respectively. 22.1% and 26.9% were shown in using 4wt% HCl catalysts. 10wt% HCl catalysts show the highest activity for 24.7% and 29.1%. In the case of propylene selectivity, 94.3% and 94.5% were appeared at 2wt% HCl catalysts, 94.8% and 95.4% were in 4wt% catalysts, and then 95.3% and 95.7% were shown in 10wt% HCl catalysts after 5 min and 30 min, respectively.

XRD and CO-chemisorption was used for analysis of the Pt dispersion to find out the effect of the HCl treatment on catalysts.

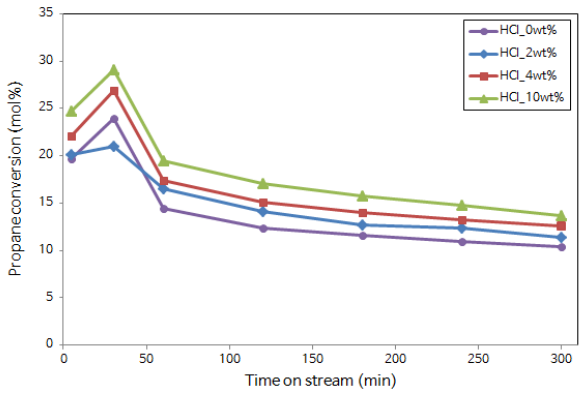

Fig.1 Propane conversion of $PtSn/Al_2O_3$ catalysts with different contents of HCl treatment

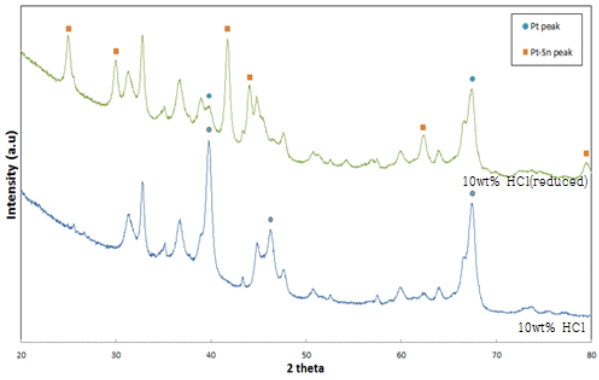

Fig. 2 XRD peak of $PtSn/Al_2O_3$ with different contents of HCl treatment.

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