

Propane Dehydrogenation with Better Stability by a Modified Pt-Based Catalyst

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Abstract : The effect of transition metal doping on Pt/Al₂O₃ catalyst used in propane dehydrogenation reaction at 500°C was studied. The preparation methods investigated were sequential impregnation (Pt followed by the 2nd metal or the 2nd metal followed by Pt) and co-impregnation. The metal contents of these catalysts were fixed as the weight ratio of Pt per the 2nd metal of around 0.075. These catalysts were characterized by N₂-physisorption, TPR, CO-chemisorption and NH₃-TPD. It was found that the impregnated 2nd metal had an effect upon reducibility of Pt due to its interaction with transition metal-containing structure. This was in agreement with the CO-chemisorption result that the presence of Pt metal, which is a result from Pt species reduction, was decreased. The total acidity of bimetallic catalysts is decreased but the strong acidity is slightly increased. It was found that the stability of bimetallic catalysts prepared by co-impregnation and sequential impregnation where the 2nd metal was impregnated before Pt were better than that of monometallic catalyst (undoped Pt one) due to the forming of Pt sites located on the transition metal-oxide modified surface. Among all preparation methods, the sequential impregnation method- having Pt impregnated before the 2nd metal gave the worst stability because this catalyst lacked the modified Pt sites and some fraction of Pt sites was covered by the 2nd metal.

Keywords : alumina, dehydrogenation, platinum, transition metal

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