

Effect of Direct Reduction Treatment on  
Pt-Sn/Al<sub>2</sub>O<sub>3</sub> Catalyst for Propane  
Dehydrogenation

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Pt-Sn/Al<sub>2</sub>O<sub>3</sub> catalysts were prepared by the direct reduction method at temperatures from 450 to 900 °C, denoted as an SR series (SR450 to SR900 according to reduction temperature). Direct reduction was performed immediately after catalyst drying without a calcination step. The activity of SR catalysts and a conventionally prepared (Cal600) catalyst were compared to evaluate its effect on direct reduction. Among the SR catalysts, SR550 showed overall higher conversion of propane and propylene selectivity than Cal600. The nano-sized dispersion of metals on SR550 was verified by transmission electron microscopy (TEM) observation. The phases of the bimetallic Pt-Sn alloys were examined by X-ray diffraction, TEM, and energy dispersive X-ray spectroscopy (EDS). Two characteristic peaks of Pt<sub>3</sub>Sn and PtSn alloys were observed in the XRD patterns, and these phases affected the catalytic performance. Moreover, EDS confirmed the formation of Pt<sub>3</sub>Sn and PtSn alloys on the catalyst surface. In terms of catalytic activity, the Pt<sub>3</sub>Sn alloy showed better performance than the PtSn alloy.