Catalytic properties of $V_aZr_bO_x$ for propane dehydrogenation

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Dehydrogenation of light alkane to alkene is one of the important reactions for the production of higher value chemical intermediates. High cost of platinum and toxicity of chromium oxide requires development of alternative catalysts. We report catalytic properties of $V_aZr_bO_x$ for propane dehydrogenation. To elucidate the effect of vanadium oxide, catalytic properties of bulk-zirconium oxide and co-precipitated $V_aZr_bO_x$ were compared. These were pretreated at 550 °C under reduction condition. The catalytic performance was evaluated for propane dehydrogenation at 550 °C under 1 atm total pressure. The catalysts were characterized by nitrogen physisorption, X-ray diffraction, ammonia-temperature programmed desorption, temperature programmed reduction, X-ray photoelectron spectroscopy, inductively coupled plasma. Both of bulk zirconia and $V_aZr_bO_x$ show high selectivity over 98%. $V_aZr_bO_x$ exhibits volcano plot with respect to molar ratio of vanadium. Optimized $V_aZr_bO_x$ catalyst shows 2 times higher activity than bulk zirconia.