Temperature programmed study of NOx reduction with H_2 on Pt/Al_2O_3 catalyst in the presence of excess oxygen

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The reduction of NOx by H2 was studied over a 0.3 wt% Pt/Al2O3 catalyst as a function of temperature. The formation of N2O began at low temperature due to the chemisorption of NO on the Pt metal and the resulting oxidation of the Pt active sites. The formation of N2 was possible at higher temperatures, because the energy state of the reactants was high and the oxidized Pt active sites were reduced again by H2. The formation of NO2 was predominant above 150 oC, due to the excessive oxidation activity of the catalyst. The effects of the Pt loading and reaction conditions on the reductive activity were also investigated. The formation of N2O at low temperature was strongly related to the Pt loading, and that of N2 at high temperature was related to the temperature range in which the reductive activity was obtained. Therefore, for the selective formation of N2 resulting from the reduction of NO on the Pt catalyst, both reductive conditions and an adequate reaction temperature were found to be important factors.