JOURNAL OF CATALYSIS 7, (1967)

Abstracts from *Shokubai* (*Catalyst*), Vol. 8, No. 2, 1966

On the Mechanism of Acetone Hydrogenation

YOSHIHISA KANEKO, HIROIE KASHIWAZAKI, AND TADASHI AYUZAWA

From Utsunomiya University, Utsunomiya, Japan

For the purpose of elucidating the mechanism of the acetone hydrogenation in the presence of a Pt-black catalyst, the hydrogenation of acetone was investigated at different temperatures.

The hydrogenation of isopropyl alcohol and the decomposition of isopropyl alcohol were also followed under the same conditions.

In the case of the acetone hydrogenation, the isopropyl alcohol yield was constantly about twice as much as that of propane. However, the reaction rate of the isopropyl alcohol hydrogenation was slower than that of acetone.

The decomposition of isopropyl alcohol in the helium gas, propane, yielded as much as acetone.

The presence of water did not prevent these reactions, and propylene was not detected in these reactions.

On the basis of the experimental results, a mechanism of acetone hydrogenation is proposed in which isopropyl alcohol and propane are directly formed from acetone and hydrogen according to Farkas and Farkas' mechanism.

Received November 26, 1965

A Critique on the Activity Tests of Commercial Catalysts. V_2O_5 Catalysts

TADAO ISHII

From the Faculty of Engineering, Hokkaido University, Sapporo, Japan

For the activity test of the commercial catalysts, it is important to consider the correlation between the catalystic activity and its working conditions. From this standpoint, in this paper the author has criticised the activity-test methods now being used, such as direct comparisons of the conversion degrees, the reaction rates, and the rate constants.

In order to compare the activities of the catalysts, the catalytic oxidation rates of SO_2 on two commercial Japanese V_2O_5 catalysts, *A* and *B*, and a Monsanto V_2O_5 catalyst, *M*, were determined by analyzing the diagram of the fractional conversion, x, against the time factor, V/F, at temperatures (T) between 400° and 600°C and at x values of 5–98%. The calculated values of the reaction rate, r_A, were used to determine its working conditions (i.e., the temperature and the concentration distribution in the catalyst beds worked adiabatically), and the optimum operating conditions for each catalyst were estimated.

The following results were obtained:

(*1*) The catalytic activity was compared by using the conversion degree at one designated time factor, V/F. At $V/F = 11.2 \times 10^3$ m^3 hour/kg-mol, for example, $A = 51.5\%$, $B = 61.0\%$, $M = 43.0\%$ ($B > A > M$) at 425°C; $A = 88.5\%$, $B = 81.5\%$, $M = 83.5\%$ ($A > M > B$) at 450°C, and $A \fallingdotseq B \fallingdotseq M \fallingdotseq 86\%$ at 550°C.

(*2*) The kinetic results show that one and the same mechanism does not prevail under all working conditions, so Weller's empirical rate equation was used in order to estimate the reaction rate constant, k. A comparison of the activity by using k values at one designated temperature did not always apply to all other temperatures.

(*3*) The ultimate outlet conversion, x_1, estimated from the concentration distribution in the catalyst beds at the inlet temperature (T_0) of 420°C and with a catalyst-bed value (V) of 1.0 m^3, showed $x_1 = 75$, 68, and 71% for Catalysts *A*, *B*, and *M*, respectively. However, no marked difference could be found at $V > 2.0$ m^3, because x_1 approaches the equilibrium conversion, x_e. At $T_0 = 480$°C, there is little to choose between the catalysts.

(*4*) The optimum operating conditions for each catalyst were analyzed and used as the most reasonable activity-test conditions. By this method, it was concluded that the catalytic activities of all these commercial catalysts are approximately the same.