

Catalytic performance of Co/zeolite in Fischer-Tropsch synthesis.

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Nowadays Fischer–Tropsch synthesis (FTS) has received great interest as an alternative route to produce clean fuels, chemicals and other value-added products. FTS is based on the vast reserves of natural gas, coal as well as renewable carbonaceous feedstock such as agricultural wastes. Supported Co catalysts are currently preferred over Fe-based systems due to their superior intrinsic activity, higher group selectivity, enhanced stability against deactivation by water and low activity in water gas-shift reaction. Cobalt catalysts provide formation long chain *n*-paraffins almost selectively. These products are excellent base for manufacturing sulphur-free, high cetane number diesel. On the contrary, gasoline fraction of synthesised hydrocarbons can not be used as motor fuel due to low octane number of straight paraffins formed in conventional FTS. However, bifunctional Co-zeolite catalysts are responsible to produce hydrocarbons rich in *iso*-paraffins. Our group have been studying Co-zeolite FTS catalysts since 1970th. First catalysts prepared by co-precipitation were patented in 1973.

We tested the catalytic activity and product selectivity of a series of Co catalysts, supported on zeolites Y and ZSM-5 (Davicat®). The samples were prepared by impregnation of support with aqueous cobalt nitrate. FTS was performed in fixed-bed stainless steel reactor under pressure of 0.1–2.0 MPa and temperature of 200–260°C. High selectivity to C₅–C₁₀ fraction was found at atmospheric pressure runs. Products are essentially restricted to the C₁–C₁₂ range. Remarkably, the yield of C₁₁₊ fraction was low than that predicted by ASF distribution. This could be attributed to shape-selective effect of zeolite support or its cracking activity. Percentage of branched paraffins in the products correlates with catalyst acidity determined by NH₃ TPD. Increasing pressure results to increase chain growth probability almost linearly. Isomerisation activity decreases upon pressure increasing and octane number of synthesised liquid hydrocarbons falls down, accordingly.