

Effects of H₂ partial pressure in syngas activation on the catalytic performance of iron-based catalysts for Fischer-Tropsch synthesis

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Low-temperature Fischer-Tropsch synthesis (LT-FTS) is an attractive technology to convert syngas (CO + H₂) into C₅₊ hydrocarbons. Precipitated iron-based catalysts are highly promising for the LT-FTS. In general, the as-prepared precipitated iron-based catalysts are composed of hematite (α -Fe₂O₃), an inactive phase for FTS. Therefore they need to be subjected to a proper activation pretreatment in a flow of CO or syngas to change the hematite to active iron carbides for FTS. Several researchers have investigated the effects of H₂ partial pressure in syngas activation on the performance of conventional hematite-based LT-FTS catalysts. It is generally accepted that the higher H₂ partial pressure during the activation, the lower the catalytic activity in the FTS, due to the suppressed formation of iron carbides. In this study, we prepared ferrihydrite-based catalysts (FeOOH·nH₂O) and investigated the influence of pressure and H₂/CO ratio in syngas activation on the catalyst performance. We found unique activation behavior of ferrihydrite-based catalysts, that is, positive dependence of catalytic performance on the H₂ partial pressure in the syngas activation.