

Low temperature Fischer-Tropsch synthesis using iron-based catalysts in slurry bubble column reactor

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In this work, modified iron-based catalysts were developed with enhanced reducibility at low temperatures. Modified iron-based catalysts were prepared by conventional co-precipitation method with the addition of small amount of precious metal and transition metal for enhancing the reducibility of the catalysts at low temperature. Catalyst was suspended in mineral oil and introduced to the reactor using high pressure pump. Catalyst slurry was bubbled with the synthesis gas purged from the gas distributor specially designed for proper control of bubble size. Addition of small amount of precious metal and transition metal was effective for increasing the reducibility of iron-based catalysts at low temperature of 220°C. In the reaction condition without mass transfer limitation, modified iron-based catalyst with enhanced reducibility was effective for producing higher waxy hydrocarbons. The chain growth probability of the modified iron-based catalysts, based on the A-S-F distribution, was higher than the conventional iron-based catalyst, showing high potentials for catalyst design to produce longer chain length hydrocarbons.