

Highly selective iron-based catalysts for production of synthetic waxes via Fischer-Tropsch synthesis

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Fischer-Tropsch synthesis (FTS) is a technology to convert syngas, into sulfur free fuels and chemicals. Iron-based catalysts are highly promising due to their low cost and low methane selectivity. Furthermore, iron-based catalysts are favored when using hydrogen-deficient syngas ($H_2/CO < 2$) due to its ability promote WGS reaction. Synthetic waxes produced via FTS are high value products that can be used in variety of applications. The global market size of FTS waxes exceeded 750 million USD in 2018 and is expected to grow at about 7.6% CAGR from 2019 to 2025. In this study, we report iron-based FTS catalysts that exhibit highly selectivity for wax production. The FTS was carried out over the precipitated iron-based catalysts activated by various conditions. The lowest selectivity of gaseous products (C_1-C_4) was lower than 10 wt%, and the highest selectivity of wax (C_{19+} hydrocarbons) was higher than 70 wt%. We attribute the advantageous catalytic performance to the enhanced reducibility and carburizability of the catalysts, probably induced by higher dispersion of potassium.