

CFD-based study of heat transfer in a microchannel reactor for Fischer-Tropsch synthesis

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Fischer-Tropsch Synthesis (FTS) is a well-known effective process for the conversion of carbon monoxide and hydrogen into liquid hydrocarbon mixtures of variable molecular weight. The FTS is significantly exothermic, so it is necessary to remove the heat to avoid hot-spots in the catalysts that causes formation of light hydrocarbons and deactivation of catalysts. Taking into account lots of small parallel channels to enhance heat transfer, the microchannel reactor applied in FTS enables isothermal operation of the highly exothermic reaction. In this study, heat transfer in a microchannel reactor for FTS is simulated using computational fluid dynamics (CFD). The CFD model was developed to analyze the effects of variables (such as catalyst packing type, fluid space velocity) on the performance of the reactor. The simulation illustrates local deviations in temperature and composition in the microchannel.