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# Fischer-Tropsch Products as Feedstock for Petrochemistry

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## Abstract

The Fischer-Tropsch technology was invented in the 1920´s by Franz Fischer and Hans Tropsch at the Kaiser-Wilhelm Institut für Kohlenforschung in Mülheim an der Ruhr, Germany. Until today this catalytic synthesis was predominantly used to produce fuels like diesel, kerosene, or gasoline. But the product stream from a Fischer-Tropsch synthesis is a whole variety of hydrocarbons, that is formed within the process. The yield of a certain hydrocarbon chain is mainly influenced by the composition of the used catalysts and process parameters like the $H_2$:CO ratio, temperature, and pressure. The dispersal of formed hydrocarbon chains follows a so called Schulz-Flory distribution.
Iron and cobalt catalysts with titanium-dioxide or aluminum-oxide as support material are used, whereas iron catalysts are used in high temperature (~300-350°C) applications, producing mostly short hydrocarbon-chains up to about C10. Cobalt catalysts are usually operated in low temperature (~250°C) processes yielding also longer hydrocarbon chains.
Basically, the products from Fischer-Tropsch synthesis can be classified according to their hydrocarbon-chain length into methane, LPG (C2-C4), naphtha (C5-C12), kerosene (C12-C16), diesel (C16-C21), and heavier components like waxes (~ >C22). If the main desired products from a Fischer-Tropsch process are fuels, it is possible to convert longer hydrocarbon chains in a hydrocracker. Short chain hydrocarbons can be converted in a steam reformer recirculating the yield back into the feed of the synthesis process. Since all of these steps are capital intensive it is wise to think about alternative outlet markets for (in the first step) undesired products.
Therefore it was investigated how Fischer-Tropsch products could be used in the petrochemistry. The focus was on heavier hydrocarbon fractions. Tests in laboratory crackers have been performed with waxes. Additionally cracking yields of Fischer Tropsch Naphtha where calculated applying Spyro ® simulation software.
It turns out, that Fischer-Tropsch products are very interesting feeds for applications in the petrochemistry. This is not only of importance for today, but also for a future supply of crackers with hydrocarbons from renewable energies, waste streams or alternative feedstocks like lignite. Renewable energies like biomass, residues from agriculture, sewage sludge or hydrogen form renewable power as well as lignite can be converted in a gasification process, delivering synthesis gas as input for a Fischer-Tropsch process.