

Supaphorn Palitsakun 2011: Fischer-Tropsch Fuel Synthesis using Silica Xerogel Supported Iron-Cobalt Catalysts. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Assistant Professor Kandis Sudsakorn, Ph.D. 149 pages.

This research studied the synthesis of hydrocarbons via Fischer-Tropsch reaction using Fe-Co catalysts supported on SiO₂ which was prepared by the sol-gel method. The metal loading of 20 wt% was added to the support having different Fe:Co mass ratios as followings: 100Fe, 80Fe:20Co, 60Fe:40Co, 50Fe:50Co, 40Fe:60Co, 20Fe:80Co and 100Co. From XRD, it was found that the fresh 100Fe and 100Co catalysts were in forms of Fe₂O₃ and Co₃O₄, respectively. Other catalyst compositions were shown to have only these 2 metal oxides. After reaction, it was found that Fe-Co alloy and Fe₃C₂ were appeared on the catalysts with both Fe and Co metals. The results from SEM-EDX mapping confirmed a well dispersion of both metals on the catalysts. All catalysts had high surface areas about 300-400 m²/g with pores size ranging between 7.86 and 8.87 nm which were suitable for the synthesis of liquid hydrocarbons. For the Fischer-Tropsch reaction tests, the 60Fe:40Co catalyst under H₂-pretreatment had the highest activity with CO conversion of 84.56% and selectivity to liquid hydrocarbons C₅₊ of 74.80% under the condition at 280 °C, 5 bar, and H₂:CO of 2:1. Mostly, the main liquid hydrocarbon products were C₅-C₉, with the selectivity up to 54.32%.

Student's signature

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