Sinee Kraokaw 2009: Selective Production of Higher Hydrocarbons over Cobalt Support SBA-15 Mesoporous Silica Catalysts. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Metta Chareonpanich, D. Eng. 121 pages.

Fischer-Tropsch synthesis (FTS) is one of the most promising ways for the conversion of syngas to hydrocarbon products. Supported cobalt is the preferred catalyst for FTS due to its high selectivity to heavy hydrocarbons, low activity for water-gas-shift reaction and comparatively low price. Cobalt loaded SBA-15 catalysts were prepared by two different metal loading techniques including post-synthesis and direct-synthesis methods. For the post-synthesis method, the conventional wetness impregnation and solvothermal technique were applied. In order to prepared uniform dispersion of cobalt catalyst on silica support, the direct-synthesis method was applied by using pH-adjusting approach. Also, the FTS catalytic performances of Co/SBA-15 catalysts prepared by different metal loading techniques were comparatively investigated. It was clearly observed that the pH value of synthesis solution affected the structural order of direct-synthesis catalysts. The degree of cobalt incorporation was increased when pH value of synthesis mixture was increased. The optimum cobalt loading (ca. 10 wt. %) with well-ordered mesostructure of SBA-15 silca was obtained at pH of 7.5. Direct-synthesis catalysts with highly distributed cobalt particles significantly promoted the selectivity towards long-chain hydrocarbons, especially the diesel-range products (C_{12}-C_{20}). The undesired methane product, normally occurred over cobalt catalysts prepared by the conventional impregnation method, was distinguishly reduced. Nonetheless, the reactivity of direct-synthesis catalysts were noticeably decreased due to the lower accessibility of reactants to cobalt active sites, resulting in the decrease of reduction degree of cobalt species.

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