CARBIDATION OF Al_2O_3 SUPPORTED Co AND Fe CATALYSTS FOR FISCHER-TROPSCH SYNTHESIS AND THEIR CHARACTERIZATION

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Fischer-Tropsch synthesis is used to produce long chain hydrocarbons and light olefins from syngas, which can be generated from fossil and renewable sources. Light olefins are one of the key chemicals for industry, since a number of their derivates are used daily in our lives. Fischer-Tropsch to olefin (FTO) is a process for direct light olefins production through a reaction often catalyzed by cobalt and/or iron. Iron based catalysts are less expensive than cobalt, have higher selectivity to olefins as well as resistance to contaminants. Alumina support is widely used to improve mechanical and structural properties of such catalysts. In this work, three sets of catalysts are presented with various metal loading and carbidation temperature, to evaluate the differences in characterization. Three precursors (5%Co/Al_2O_3, 5%Fe/Al_2O_3 and 2.5%Fe2.5%Co/Al_2O_3) were prepared in advance by incipient wetness impregnation of Al_2O_3 spheres of 2,5 mm. Prior to the carbidation step, the precursors were pretreated at 200 °C for 12 h under the flow of N_2. To synthesize the carbide catalysts, 4 g of the prepared precursor were exposed to the gas containing 20 % CH_4 in H_2 with the flowrate of 300 cm^3/min for 3 hours at different temperatures in the range of 300 °C to 800 °C by temperature-programmed reduction in a tubular quartz reactor. After the carbidation step, the catalysts were purged with N_2 for 30 min, and the passivated for 2 h under 1% O_2 in Ar. Detailed characterization of these materials was carried out by elemental analysis, X-ray Diffraction (XRD), and Scanning Electron Microscopy (SEM). Catalytic performance in the FTO reaction will be further described in upcoming publications.

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