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Calcium phosphates as a novel support material for catalysis in Fischer-Tropsh synthesis

Rajesh Munirathinam, Doan Pham Minh, and **Ange Nzihou**
Centre RAPSODEE, France

Increasing global demand for a decreased dependence on petroleum for the production of fuels and chemicals in recent years has called for the revival of interest towards Fischer-Tropsch synthesis (FTS). FTS is a heterogeneous catalytic process for the production of hydrocarbon fuels or chemicals from synthesis gas ($CO+H_2$). Synthesis gas (syn gas) is generally derived from non-petroleum feedstocks such as natural gas, coal, or biomass. Growing awareness towards the valorization of biomass for sustainable environment has augmented the production of syn gas, which can be further processed using FTS to produce value added biofuels and chemicals. FT catalysts usually consist of Co or Fe nanoparticles, which are dispersed on a support material such as alumina, silica, titanium oxide, zirconium oxide, niobium oxide, SiC, or carbon. Tuning of acid - base properties of these conventional supports is not very trivial. In recent years, calcium phosphates (CaP), has been investigated as porous support. The presence of phosphate groups in CaP not only stabilize the structure of active sites, but also allow for easy tuning of acid-base properties by varying the calcium/phosphate ratio. This property of CaP would enable to tune the selectivity of the product distribution in FTS. Further, industrially used conventional supports like alumina and silica display strong-metal support interactions (SMSI); as a result, the reducibility of metallic oxide (e.g. Co_3O_4) to metallic state (Co) is hindered. However, using CaP as a support SMSI can be minimized drastically. In this study, we investigate for the first time, the textural, structural chemistry and catalytic behavior of a series of CaP-supported cobalt samples in the FTS process. The results of catalytic CO conversion and product selectivity in the FTS obtained by tuning the acid-base properties of the CaP support will be discussed.

Biography

Rajesh Munirathinam has completed his PhD from University of Twente and his postdoctoral studies from IFP Energies Nouvelles. Presently, he is working on developing efficient Fischer-Tropsch catalysts as a research engineer in the group of Prof. Ange Nzihou at RAPSODEE Reserch Centre in Ecole des Mines d'Albi. He has published about 9 papers in reputed journals and he is very passionate about the catalysis research field.

rajesh.munirathinam@mines-albi.fr

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