

Fischer-Tropsch Synthesis: a Comparison of Iron and Cobalt

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Of the potential elements for a Fischer-Tropsch catalyst, only iron and cobalt have sufficient supply and properties to be considered for a commercial operation today. The early interest in Germany focused on the cobalt catalyst and this was the only metal used commercially through 1945. Following 1945, iron catalysts were utilized in commercial operations in both the United States and South Africa. The discovery of large quantities of oil in the Middle East led to the abandonment of the U.S. effort but Sasol successfully used iron catalysts to expand their production to about 150,000 bbl/day today. PetroSA currently produces about 35,000 bbl/day using iron catalysts. On the other hand, Shell utilizes cobalt catalysts to produce about 15,000 bbl/day and the Sasol operation in Qatar will also utilize a cobalt catalyst. Shell is nearing completion of a commercial plant in Qatar that will also utilize cobalt catalysts. Today the perception is that, at least for a natural gas based plant, cobalt is the preferred catalyst. Based on our lab data, we will compare the two catalysts on the basis of their catalytic activity and lifetime as well as their production of undesirable gaseous products ($\text{CO}_2 + \text{C}_1\text{-C}_4$ alkanes) and high-molecular weight products

Bio Sketch:

Dr. Burtron H. Davis obtained his Ph.D. in Physical Chemistry from the University of Florida and was a Research Associate under Professor Paul H. Emmett at The Johns Hopkins University. Dr. Davis is responsible for catalysis, Fischer-Tropsch Synthesis and direct coal liquefaction research at the Center for Applied Energy Research, University of Kentucky. He developed a program that involved both academic research and cooperative research with industry. He has developed a laboratory with extensive capability in use of radioactive and stable isotopes in reaction mechanism studies and materials characterization and developed research programs in: Fischer-Tropsch Synthesis, surface science studies, heterogeneous catalysis, materials science, organic analysis, 1/4 ton per day direct coal liquefaction pilot plant operation, liquefaction mechanistic studies, clean gasoline reforming with superacid catalysts, and upgrading naphthas. Dr. Davis has held various offices and membership in several professional societies including the American Chemical Society, The Catalysis Society, and the Materials Research Society. Dr. Davis is the recipient of the H. H. Storch Award for 2002. Dr. Davis is the author of more than 570 technical publications.