"ATTRITION-RESISTANT IRON-BASED FISCHER-TROPSCH CATALYSTS"

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BIOGRAPHICAL SKETCH

Dr. J. Jothimurugesan is an Assistant Professor of Chemical Engineering at Hampton University. His research interests include reaction engineering, catalysis and hot-gas clean up. He has more than 40 articles published in professional journals. His post doctoral studies was at MIT, in chemical engineering.

ABSTRACT

Operation of a Fischer-Tropsch (F-T) slurry bubble column reactors (SBCR) with an Fe catalyst is seriously limited due to attrition of the iron catalysts. The objective of this work is to develop a better understanding of the parameters affecting attrition resistance of Fe F-T catalysts suitable for use in SBCRs and to incorporate this understanding into the design of novel Fe catalyst having superior attrition resistance, activity, and selectivity. The effect of silica addition via coprecipitation and as a binder to a doubly promoted Fischer-Tropsch synthesis iron catalyst (100 Fe/5 Cu/4.2 K) was studied. The catalysts were prepared by coprecipitation, followed by binder silica addition and spray drying. A number of attrition methods including fluidized-bed, jet-cup, and ultrasound were developed for small quantities of catalysts and their results were compared with a standard ASTM method (D-5757-95). Binder silica addition up to a level of 10-12 wt % resulted in increased attrition resistance. Addition of precipitated silica, however, was found to be detrimental to attrition resistance and resulted in increased methane and reduced wax formation. An attrition resistant, active and selective catalyst was prepared that gave 95% CO conversion through 100 hours of testing in a fixed-bed at 250^0C, 1.5 MPa and 1800 per hour space velocity with C_5^+ selectivity of >78% and CH_4 selectivity of less than 5%.