Kinetic Modeling of Steam CO_2 Reforming Reaction of Methane for Application in GTL-FPSO Process

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A gas to liquid (GTL) process for the production of clean alternative petroleum from natural gas has been one of the most promising projects in the energy industry. In these processes, there are some key issues to produce syngas with adequate H_2/CO ratio required for Fischer–Tropsch synthesis (FTS). Steam CO_2 reforming (SCR) of methane is an available process for the direct control of the H_2/CO ratio which would be suitable for the Fischer–Tropsch process by adjusting the feed ratio of steam and carbon dioxide. SCR reaction is composed of various reactions such as carbon dioxide reforming, steam reforming, water gas shift, and etc. In this study, a kinetic model for the SCR reaction of methane is presented. Consider the main three reactions and sub-reactions. The kinetics of the SCR over an industrial catalyst (57-4Q) was investigated as per temperature and total pressure change in a flow reactor. Experiments are performed by varying the inlet partial pressure of methane, carbon dioxide, and steam. Especially, the experiments operate at high pressure as SCR reacts at high-pressure condition (20atm) in the system differently general reforming kinetics.