

Analysis of Fixed Bed Reactor for DME Synthesis

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Dimethyl Ether (DME) is considered as one of the most promising candidates for the substitute of LPG and diesel fuel. We analyzed one-step DME synthesis from syngas in a shell and tube type fixed bed reactor with consideration of the heat and mass transfer between catalyst pellet and reactants gas and effectiveness factor of catalysts together with reactor cooling through reactor wall. Simulation results showed strong effects of pore diffusion. By this simulator we compared the experimental data of a pilot-scale DME reactor with simulation results such as temperature profile, CO conversion and DME productivity. Operating condition of the reactor is as follows: GHSV 2000 hr⁻¹, feed temperature 220°C, reactor pressure 50 bar, H₂ : CO ratio 1.5:1, feed temperature of cooling water 180°C. This simulator helps control the temperature of the reactor and prevent the irreversible deactivation of catalyst.