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甲烷空气部分氧化制合成气喷动床反应器的研究

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摘要 On the basis of hydrodynamic and scaling-up studies, a pilot-plant-scale thermal spouted bed reactor (50 mm in ID and 1500 mm in height) was designed and fabricated by scaling-down cold simulators. It was tested for making syngas via catalytic partial oxidation (CPO) of methane by air. The effects of various operating conditions such as operating pressure and temperature, feed composition, and gas flowrate etc. on the CPO process were investigated. CH₄ conversion of 92.2% and selectivity of 92.3% and 83.3% to CO and H₂, respectively, were achieved at the pressure of 2.1 MPa. It was found that when the spouted bed reactor was operated within the stable spouting flow regime, the temperature profiles along the bed axis were much more uniform than those operated within the fixed-bed regime. The CH₄ conversion and syngas selectivity were found to be close to thermodynamic equilibrium limits. The results of the present investigation showed that spouted bed could be considered as a potential type of chemical reactor for the CPO process of methane.

关键词 [spouted bed](#) [methane](#) [catalytic partial oxidation](#) [syngas](#)

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Catalytic Partial Oxidation of Methane with Air to Syngas in a Pilot-Plant-Scale Spouted Bed Reactor

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Abstract On the basis of hydrodynamic and scaling-up studies, a pilot-plant-scale thermal spouted bed reactor (50 mm in ID and 1500 mm in height) was designed and fabricated by scaling-down cold simulators. It was tested for making syngas via catalytic partial oxidation (CPO) of methane by air. The effects of various operating conditions such as operating pressure and temperature, feed composition, and gas flowrate etc. on the CPO process were investigated. CH₄ conversion of 92.2% and selectivity of 92.3% and 83.3% to CO and H₂, respectively, were achieved at the pressure of 2.1 MPa. It was found that when the spouted bed reactor was operated within the stable spouting flow regime, the temperature profiles along the bed axis were much more uniform than those operated within the fixed-bed regime. The CH₄ conversion and syngas selectivity were found to be close to thermodynamic equilibrium limits. The results of the present investigation showed that spouted bed could be considered as a potential type of chemical reactor for the CPO process of methane.

Key words [spouted bed](#); [methane](#); [catalytic partial oxidation](#); [syngas](#)

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