中国化学工程学报 2005 13 (1): 54-62 ISSN: 1004-9266 CN: 62-1063/R

REACTION KINETICS, CATALYSIS AND ....

一氧化碳偶联反应器分岔行为

徐悟, 冯新宾, 许根慧

School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, China

收稿日期 修回日期 网络版发布日期 接受日期

摘要 The bifurcation behavior of the CO coupling reactor was examined based on the one-dimensional pseudohomogeneous axial dispersion dynamic model. The method of finite difference was used for solving the boundary value problem; the continuation technique and the direct method were applied to determine the bifurcation diagram.The effects of dimensionless adiabatic temperature rise, Damkoehler number, activation energy, heat transfer coefficient and feed ratio on the bifurcation behavior were investigated. It was shown that there existed static bifurcation and the oscillations did not occur in the reactor. The result also revealed that the reactor exhibited at most 1-3-1 multiplicity patterns within the range of practical possible parameters and the measures, such as weakening the axial dispersion of reactor, enhancing heat transfer, decreasing the concentration of ethyl nitrite, were efficient for avoiding the possible risk of multiple steady states.

关键词 一氧化碳偶联反应器; 分岔行为; 数值方法; 控制; 生产工艺; 气相法;

分类号

DOI:

The Bifurcation Behavior of CO Coupling Reactor

XU Wu, MA Xinbin, XU Genhui

School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, China

Received Revised Online Accepted

Abstract The bifurcation behavior of the CO coupling reactor was examined based on the one-dimensional pseudohomogeneous axial dispersion dynamic model. The method of finite difference was used for solving the boundary value problem; the continuation technique and the direct method were applied to determine the bifurcation diagram.The effects of dimensionless adiabatic temperature rise, Damkoehler number, activation energy, heat transfer coefficient and feed ratio on the bifurcation behavior were investigated. It was shown that there existed static bifurcation and the oscillations did not occur in the reactor. The result also revealed that the reactor exhibited at most 1-3-1 multiplicity patterns within the range of practical possible parameters and the measures, such as weakening the axial dispersion of reactor, enhancing heat transfer, decreasing the concentration of ethyl nitrite, were efficient for avoiding the possible risk of multiple steady states.

Key words bifurcation behavior; CO coupling reactor; multiple steady states; stability;

通讯作者:
徐悟
作者个人主页: 徐悟; 冯新宾; 许根慧