

分离工程

基于化学热泵系统的叔丁醇脱水反应精馏过程

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摘要 采用柱状阳离子交换树脂S-54作催化剂研究了叔丁醇脱水的反应精馏过程. 在实验基础上建立了该过程的数学模型, 采用超松弛法, 并以动态方程逼近计算稳态过程对模型进行了求解, 计算结果与实验结果吻合良好. 在以上研究基础上考察了不同进料流量、进料组成、进料位置以及不同回流比等对反应转化率的影响, 进行了上述工艺操作参数的模拟寻优, 得到以下结论: 反应精馏操作实现了水从反应体系中的有效移除, 减小了水对反应的阻害作用, 使叔丁醇接近完全分解; 同时改变操作压力可以适用不同温度热源的热量回收要求.

关键词

[化学热泵](#) [反应精馏](#) [脱水](#) [叔丁醇](#) [数学模拟](#) [超松弛法](#)

分类号

DEHYDRATION OF *tert*-BUTYL ALCOHOL IN REACTIVE DISTILLATION ADAPTED TO CHEMICAL HEAT PUMP

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Abstract

The liquid-phase dehydration of *tert*-butyl alcohol to isobutene and water was researched in a reactive distillation column with a catalyst-bed filled with cation exchange resin S-54 in pellet form. A mathematical model for simulating the steady-state characteristics of this process was developed based on the experimental results. The rapid solution for this model can be obtained by the modified overrelaxation method and simulation results agreed well with the experimental data. The effects of feed flow rates, feed composition, feed location and reflux ratio on reaction conversion were investigated by program simulation. It can be concluded that dehydration of *tert*-butyl alcohol was facilitated by avoiding strong inhibition of water via reactive distillation. Various heat sources at a lower temperature level below 373K can be transformed to a higher level heat by adjusting the operation pressure. All these support the applicability of this reaction system to a chemical heat pump.

Key words [chemical heat pump](#) [reactive distillation](#) [dehydration](#) [tert-butyl alcohol](#) [mathematical simulation](#) [overrelaxation method](#)

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