

分离工程

二甲醚精馏塔实验研究与模拟计算

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摘要 建立了用于二甲醚精制的精馏塔实验流程, 实验测定了在操作工艺条件下的精馏结果。以平衡级理论为依据建立二甲醚精馏过程的数学模型, 根据研究体系在通常情况下沸点相差较大、液相非理想性的特点, 建立序贯收敛的循环嵌套迭代计算方法对模型进行求解, 模拟计算结果与实验数据结果吻合较好。对二甲醚精馏塔的模拟分析结果表明: 塔顶要得到含量不小于99 % (mol) 二甲醚产品, 维持操作压力1 MPa、在精馏塔中部进料的情况下, 进料量不超过 $22 \text{ mol} \cdot \text{h}^{-1}$ 为宜; 回流比要根据进料液中二甲醚组分含量控制在一定范围内; 进料液中二氧化碳含量高低对产品二甲醚纯度和收率影响显著, 在进入精馏塔之前尽可能地将二氧化碳除去是必要的。

关键词

[二甲醚](#) [精馏](#) [模拟](#)

分类号

Experiment and simulation of distillation process for dimethyl ether refining

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Abstract

The distillation process is used for purifying dimethyl ether (DME), when one-step synthesis of DME from syngas is adopted. Experimental flow of distillation for DME refining was built and the results were measured under operation conditions. A mathematical model was presented to research the distillation process on the basis of equilibrium stage theory. The cyclical nested-iteration method in sequential convergence was developed for solving the model equations, since the liquid phase was non-ideal and the components had a big difference in boiling point under normal conditions. The model yielded satisfactory results for laboratory data and the simulation results showed that for distillate DME product with concentration no less than 99% (mole), the following operating conditions were recommended. The distillation process is at operating pressure 1.0 MPa, and the feed mass flow rate of less than $8.65 \text{ mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$ is desirable. The distillation mixture is fed into the middle of the packing section and the reflux ratio is rigorously controlled in a certain range according to the DME concentration in feed. It is necessary to keep CO_2 concentration in feed as low as possible in order to improve DME purity and yield.

Key words

[dimethyl ether \(DME\)](#) [distillation](#) [simulation](#)

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