

分离工程

填充密度对中空纤维膜接触器精馏过程壳程传质的影响

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摘要

探讨了填充密度对新型聚丙烯中空纤维膜接触器精馏过程中壳程传质的影响。中空纤维膜接触器在填充密度为4.7%、9.5%、19%时均可在远离常规填料液泛线以上的气速范围操作。低填充密度下,壳程的Sherwood数理论值大于实验值,但填充密度较高时,实验值大于理论值。高Reynolds数有利于壳程传质,低填充密度时的Sherwood数高于高填充密度时。随着F因子逐步增大,壳程气相传质阻力随之变小,且膜接触器的填充密度越高,气相传质阻力越大。3种不同填充密度膜接触器的气相总传质系数随着接触器填充密度的增大而迅速减小,由 $391.84 \times 10^{-5} \text{ m} \cdot \text{s}^{-1}$ 降低为 $83.28 \times 10^{-5} \text{ m} \cdot \text{s}^{-1}$ 。

关键词

[填充密度](#) [中空纤维膜接触器](#) [壳程传质](#) [Sherwood数](#)

分类号

Effect of packing density of hollow fiber contactors on shell-side mass transfer in distillation

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Abstract

The effect of packing density of hollow fiber contactors on shell-side mass transfer in methanol/water distillation was analyzed. The distillation experiments were carried out with three polypropylene hollow fiber modules whose packing densities were 4.7%, 9.5%, 19%, respectively. The results showed that all the contactor worked well above the limit at which flooding normally occurs in conventional cases at various packing densities of fibers. Experimental Sherwood number was smaller than calculated Sherwood number at a low packing density, but bigger than that calculated at a high packing density. Higher Reynolds number made better shell-side mass transfer. The Sherwood numbers at high packing densities were smaller than those at low packing densities. The resistance on the vapor side decreased with increasing *F* factor. The higher the packing density, the bigger the resistance on the vapor side. The overall mass transfer coefficients of hollow fiber contactors decreased rapidly from $391.84 \times 10^{-5} \text{ m} \cdot \text{s}^{-1}$ to $83.28 \times 10^{-5} \text{ m} \cdot \text{s}^{-1}$ with increasing packing density.

Key words

[packing density](#) [hollow fiber contactor](#) [mass transfer on shell-side](#) [Sherwood number](#)

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