

流体力学与传递现象

旋转填充床中伴有可逆反应的气液传质

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收稿日期 2009-9-15 修回日期 2010-1-14 网络版发布日期 2010-4-12 接受日期

摘要

应用CO₂-MDEA气液吸收体系, 对旋转填充床中伴有可逆反应的气液传质过程进行了定量的模型研究。在所有反应都可逆的情况下, 根据Higbie渗透理论建立了旋转床中CO₂-MDEA体系的扩散-反应传质模型。通过模型对传质过程的定量描述以及实验结果对模型的验证, 超重力旋转床的强化作用可进一步被揭示为: 由于不断更新的液膜使得可溶性气体在液膜内形成较大的浓度梯度, 从而极大地增大了传质系数, 强化了传质;旋转床的强化作用是在动态的传质过程中完成的, 液膜的寿命越短则传质系数越大。在不同转速、温度、MDEA浓度和气液流量条件下进行了实验, 本文模型的模拟值和实验结果吻合较好。

关键词

[液膜寿命](#) [浓度梯度](#) [动态传质](#) [超重力旋转床](#)

分类号

Gas-liquid mass transfer accompanied by reversible reaction in rotating packed bed

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Abstract

A quantitative study on the absorption of CO₂ by aqueous solutions of *N*-methyldiethanolamine (MDEA) in a rotating packed bed (RPB) was presented in this paper.The diffusion-reaction process for CO₂-MDEA mass transfer in the RPB is modeled according to Higbie's penetration theory with the assumption that all reactions are reversible.The results from both experiment and model show that the intensification within the RPB is mainly achieved by the larger concentration gradient of the dissolvable gas in the liquid film.The frequent renewal of the film results in short lifetime of liquid film on packing surfaces and increases the mass transfer coefficient significantly.The mass transfer within the RPB is a dynamic process. The shorter the lifetime of liquid film, the larger the mass transfer coefficient.Experiments are carried out at various rotating speeds, MDEA concentrations, temperatures and gas/liquid flow rates.The validity of this model is demonstrated by the fact that the simulated values agree well with the experimental data.

Key words

[lifetime of liquid film](#) [concentration gradient](#) [dynamic-state mass transfer](#) [rotating packed bed](#)

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