

综述与专论

CFD方法在固定床反应器传热研究中的应用

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摘要

固定床反应器是一种常见的化学和生化反应器, 由于内部结构十分复杂, 固定床内的局部流动和传热过程研究一直是一个颇具挑战性的问题。有效参数法是长期以来固定床传热研究的常用方法, 但是由于对固定床内温度场缺乏准确的了解, 目前为止许多基于有效参数法的传热模型的普适性仍然存在问题。计算流体力学(CFD)的数值模拟方法是近年来应用于固定床流动和传热研究的一种新的研究方法, 它通过数值方法求解流动和传递的微分方程组而获得流场和温度场。CFD数值模拟方法能够提供精确的局部流动和传递信息如速度分布、压力分布、温度分布、组分浓度分布等。本文综述和分析了CFD方法在固定床反应器的流动和传热研究领域的最新进展, 讨论了CFD方法在该领域的应用前景。

关键词

[固定床](#) [CFD](#) [传热](#)

分类号

CFD modeling of heat transfer in fixed bed reactors

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Abstract

Fixed bed reactors (FBRs) have been widely used in chemical and bio-chemical processes. However, local flow and heat transfer in fixed bed reactors have challenged researchers for a long period. Although the effective parameter methods have been applied extensively to modeling local heat transfer in fixed beds, the general validity of effective parameters modeling is still questionable due to the lack of full understanding of local temperature fields in fixed beds. The computational fluid dynamics (CFD) technique is a new alternative to experimental approaches to investigate flows and heat transfer in fixed beds. It numerically solves the flow and/or transport governing equations and obtains local information like flow and temperature fields. In contrast to the averaged values acquired with the conventional theoretical and experimental methods, the results of CFD simulation are accurate local distributions of velocity, pressure, temperature, specie concentration and so on. The latest work and progress in the field of CFD modeling of heat transfer in fixed bed reactors were reviewed and analyzed, and also the perspectives of CFD application in fixed bed modeling were discussed.

Key words

[fixed beds](#) [CFD](#) [heat transfer](#)

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