

传递现象

漏斗型导流内构件对内循环三相流化床流体力学与传质特性的影响

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收稿日期 2006-5-8 修回日期 2006-9-27 网络版发布日期 2007-4-2 接受日期

摘要 通过增加新型内构件来改善内循环三相流化床的流体力学与传质特性,以实现化工、环保领域中追求高氧利用率的过程。针对此过程设计了3种不同结构参数的漏斗型导流内件并设置于导流筒顶端,分别测定反应器内气含率、液相混合时间、液体循环速度、体积氧传质系数的数据并分析其变化规律,以解析内件的作用机制。实验在有效体积39L,以空气为气相、水为液相、多孔泡沫颗粒为固相的反应器中进行,研究发现:漏斗型导流内件的设置使升流区气含率平均增大10%,体积氧传质系数 kLa 提高了15%,液相混合时间下降10%~25%;内件的设置可以改变液体循环速度,当表观气速 $<0.5\text{ cm/s}$ 时,液体循环速度加快,当表观气速 $>0.5\text{ cm/s}$ 时,液体循环速度下降;此外,漏斗型导流内件的结构参数变化对流化床流体力学与传质特性有较大影响。结果表明,流化床内增加新型内构件并合理设置能够实现反应器效能的提高。

关键词 [漏斗型导流内构件](#); [内循环三相流化床](#); [流体力学](#); [传质](#)

分类号

Influence of funnel-shape internals on hydrodynamics and mass transfer in internal loop three-phase fluidized bed

Abstract

The effects of funnel-shape internals on hydrodynamics and mass transfer in an internal loop three-phase fluidized bed were investigated. Three different kinds of internals were designed which were setup on the top of draft-tube in terms of horizontal angle and outer diameter, and gas hold up, liquid mixing time, liquid circulation velocity and mass transfer coefficient were measured respectively. It was shown that the riser gas holdup and mass transfer coefficient increased by 10% and 15% than that without such an internal, liquid mixing time decreased by 10% to 25%. When the superficial gas velocity was less than $0.5\text{ cm}\cdot\text{s}^{-1}$, liquid circulation velocity increased with the setup of such internals. Liquid circulation velocity decreased when the superficial gas velocity was above $0.5\text{ cm}\cdot\text{s}^{-1}$. In addition, the variation of structural parameters of funnel-shape internals had significant effects on hydrodynamics and mass transfer.

Key words [funnel-shape internal](#); [internal loop three-phase fluidized bed](#); [hydrodynamics](#); [mass transfer](#)

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