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分离工程

对二甲苯悬浮熔融结晶动力学

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摘要

结晶法是工业上生产对二甲苯的主要方法之一。现有对二甲苯结晶动力学参数均单纯由结晶母液的温度和浓度变化通过非线性优化法而获得，未检测对二甲苯的晶体粒度数据，因而其准确性难以得到保证。本文利用超声在线粒度仪(OPUS)检测对二甲苯晶体的粒度分布，通过添加晶种的间歇悬浮熔融结晶实验，应用矩量变换法测定82%（质量）对二甲苯-间二甲苯体系中的对二甲苯结晶动力学。利用最小二乘法对动力学实验数据进行多元线性回归后得到了对二甲苯结晶动力学方程，研究结果表明，在对二甲苯悬浮熔融结晶过程中，溶液相对过饱和度对对二甲苯晶体成核速率的影响大于对晶体生长速率的影响，搅拌速率对成核过程影响明显，而晶浆悬浮密度对成核速率的影响不大。

关键词

对二甲苯 悬浮熔融结晶 结晶动力学 矩量变换法 多元线性回归

分类号

Suspension melt crystallization kinetics of *p*-xylene

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Abstract

Crystallization is one of the primary processes for producing *p*-xylene. For the existing *p*-xylene crystallization kinetics, parameters were all acquired by regressing the profile data of temperature and concentration changes in the crystallization process with non-linear optimization method. Due to the lack of *p*-xylene crystal particle size distribution information, the accuracy of these crystallization kinetics parameters can hardly be guaranteed. In this paper, the *p*-xylene crystal size distribution data in the crystallization process are collected with an OPUS on-line particle size measure instrument based on ultrasonic spectroscopy analysis principle. The *p*-xylene crystallization kinetics is investigated by the method of moments through seeded batch cooling crystallization experiments with a binary mixture of *p*-xylene and *m*-xylene, in which the original *p*-xylene concentration is 82%(mass). The kinetic equations of *p*-xylene are obtained by regressing the experimental data with the multiple linear least square method. The results suggest that in the melt suspension crystallization process of *p*-xylene, the relative supersaturation has a larger effect on the crystal nucleation rate than the crystal growth rate. The agitation rate also has prominent effect on the nucleation rate, while the magma density does not.

Key words

p-xylene suspension melt crystallization crystallization kinetics method of moments multiple linear regression

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