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多相流和计算流体力学

液液雾化特性与粒径分布规律

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摘要

液液雾化过程是液液循环流化床的关键技术之一，在流化床常态实验装置上，采用快速摄像与图像处理相结合的方法，获得了实验流量范围内液滴形成过程的图像以及形成液滴的粒径信息，运用数学分布函数对液滴的粒径分布进行了研究。研究结果表明，各流量工况下，液滴的粒径分布与Rosin-Rammler分布符合得较好;在实验流量范围内，形成液滴的区域有单液滴形成区域、过渡区域和多液滴形成区域，且液滴中位径的总体趋势是减小的，当水的流量为50 ml·min-1时，形成液滴的粒径主要集中在0.7～1.0 mm之间;在单液滴形成区域和多液滴形成区域，液滴粒径的均匀性先减小后增大，中位径呈减小趋势，但在多液滴形成区域两者的变化幅度较小，在过渡区域，液滴粒径的均匀性与中位径基本不变。研究结果可为液液循环流化床基于设计粒径的要求合理选取运行流量提供可靠依据。

关键词

液液循环流化床 液液雾化 液滴 粒径分布

分类号

Atomization and drop-size distribution of liquid-liquid systems

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Abstract

Drop formation in liquid-liquid atomization processes is one of the key techniques of liquid-liquid circulating fluid bed (CFB).A high resolution digital camera and image processing were used to investigate the process of drop formation in a normal CFB experimental system. The photos and sizes of drops in the whole flux range were obtained from experiments, and the distribution function was used to analyze the drop-size distribution (DSD).Experimental results indicated that DSD from a specific flux was in good agreement with Rosin-Rammler distribution function, and the areas of drop formation were divided into single drop formation section, transition section, and multiple drop formation section. It was found that with increasing flux, the uniformity of drops decreased at first and then increased and the median diameter of drops always decreased in both single drop formation section and multiple drop formation section. The uniformity and median diameter of drops in the multiple drop formation section changed insignificantly, whereas they remained unchanged in the transition section. And the diameters of drops formed were mostly between 0.7 mm and 1.0 mm while the flux of water was 50 ml·min-1.The research results provide a reasonable flux range of drop formation for practical operation of CFB based on the design demand of particle-size.

Key words

liquid-liquid circulating fluid bed liquid-liquid atomization drop drop-size distribution

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