

工程热物理

旋转横流中侧边射流偏斜和扩散的实验研究

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摘要:

为研究旋转横流中侧边射流的偏斜和扩散特性, 搭建了横向射流流动显示实验台架, 采用可调同步激光器和CCD摄影技术获得了不同射流速度比率时(r=15、30、45、60、75)横向射流的流场结构, 基于横流槽道特征尺寸和射流速度的雷诺数Re介于22 537和112 683之间。实验结果表明, 旋转横流中侧边射流的射流速度比率较大(r>30)时, 射流深度基本不变, 异于均匀横流中侧边射流的气流偏斜特性。另外, 并非越大的射流速度比率就能获得越大的射流扩展宽度, 当r=60时, 系统的射流扩展宽度最大, 而且在较大的射流深度区域内维持较大的扩展宽度, 有利于物质的混合扩散。

关键词: 旋转横流 侧边射流 中心轨迹 扩展宽度

Experimental Study on the Bending and Mixing in a Lateral Jet Issuing Into a Swirling Crossflow

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Abstract:

In order to study the bending and mixing characteristics in a lateral jet issuing into a swirling crossflow, a flow-visualization based experimental setup was built. A phase tunable laser and CCD system was employed, and several jet to crossflow velocity ratios (r=15, 30, 45, 60, 75) were investigated. The Reynolds number Re based on the characteristic length of the crossflow tunnel and the jet velocity lies between 22 537 and 112 683. Experimental results showed that the penetration depth of the lateral jet maintains nearly unchanged when the jet to crossflow velocity ratio is large enough (r>30), which is different from the results from the jet injected into uniform crossflow. On the other hand, the larger jet to crossflow velocity ratio is not the greater access to the spread width. In this work, the case of r=60 obtained largest spread width, and the spread width maintains relatively large in a large penetration zone, which is good for the mass diffusion and species mixing.

Keywords: swirling crossflow lateral jet central trajectory spread width

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