化工学报 2007 58 (6): 1385-1390 ISSN: 0438-1157 CN: 11-1946/TQ

传递现象

小间距两喷嘴对置撞击流流场的数值模拟与实验研究

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收稿日期 2006-9-14 修回日期 2007-2-27 网络版发布日期 2007-6-20 接受日期

摘要 运用热线风速仪和CFD软件对小喷嘴间距下两喷嘴对置撞击流时均流场进行了实验研究和数值模拟，并和文献中的实验结果和近似解析式进行了比较。研究结果表明：由于边界层存在，单股喷嘴出口速度分布为“礼帽”形状分布；在L<2D(L为喷嘴间距，D为喷嘴直径)时，喷嘴出口速度剖面出现中间低、两边高的“双峰”形状， L=2D时，“双峰”形状消失。随着喷嘴间距的增大，相同气速比导致的撞击面驻点的偏移量增大。相同气速比下，喷嘴出口为“礼帽”分布时驻点的偏移量比均匀分布时大。文献中的撞击流流场的近似解析式对喷嘴出口速度分布为均匀分布有很好的精度，当喷嘴出口速度为“礼帽”分布时，文献中近似解析式的预报精度变差。

关键词 两喷嘴对置撞击流 小喷嘴间距 驻点偏移 出口速度分布

分类号

Numerical simulation and experimental study on flow field of two closely spaced opposed jets

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Abstract

Experimental study and numerical simulation were performed for the averaged flow field of two closely spaced opposed jets with hot wire anemometer（HWA）and CFD software and the simulation was compared with the measurement and approximate analytic solution in the literature.The results showed that the exit velocity profile of the single jet was top-hat distribution due to the presence of boundary layers.At L<2D（where L is nozzle separation and D is nozzle diameter），bimodal distribution of exit velocity profile，low in the middle and high on both sides，was present，while such bimodal distribution of exit velocity profile was absent at L=2D.With increasing nozzle separation，the stagnation point offset of the impinging plane increased.With the same velocity ratio，stagnation point offset of the nozzles with uniform profiles was larger than that with top-hat profiles.The approximate analytic solution of the flow field of two opposed jets in the literature was only valid for the nozzles with uniform exit velocity profiles and the prediction accuracy became worse for the nozzles with top-hat exit velocity profiles.

Key words two opposed jets close separation stagnation point offset exit velocity profile

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