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工程热物理

矩形通道内混合对流入口段阻力特性的实验研究

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摘要：

通过实验研究中心截面沿主流方向带有均匀加热平板的矩形通道混合对流入口段的阻力特性，得到Re数、Gr*数和倾斜角度对阻力系数的影响。实验结果表明：阻力系数随倾斜角度 | q | 的增大而增大，在Re数的不同范围内呈不同的特性。Re数小于1 500时，阻力系数随Re数的增大而减小，随Gr*数的增大而增大。当Re大于1 500时，阻力系数受Re数和Gr*数的影响很小。综合考虑Re数、Gr*数、倾斜角度及管道长径比的影响，对Re数大于1 500和小于1 500分别给得出了阻力系数的关联式，该组关联式与实验数据吻合良好，偏差小于10%。

关键词： 矩形通道 混合对流 倾斜角度 阻力系数 关联式

Experimental Investigation on the Flow Resistance Characteristic of the Entrance Region of Mixed Convection in Rectangular Channel

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Abstract:

The flow resistance characteristic of the entrance region of mixed convection in rectangular channel was studied by the experiment of the air flowed through a rectangular duct with a uniformly heated plate in the middle section. The rules of the friction factors variation connected with the Reynolds number, the Grashof numbers and inclination angles were obtained. The results reveal that when Re is less than 1 500, the friction factor increases with Re and decreases with Gr*. Moreover, when the Re is greater than 1 500, the friction factor is little affected by Re and Gr*. Furthermore, the friction factor increases with inclination angles. Considering the influences of Re, Gr*, inclination angle and length to diameter ratio, correlations of friction factors were fitted when Re was greater or less than 1 500. Comparison of the friction factors calculated from the fitted correlations and the experimental results satisfactory reached agreement, with the deviations being less than 10%.

Keywords: rectangular duct mixed convection inclination angle friction factors correlation

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