

其它

螺旋槽管内流动换热场协同分析

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摘要:

运用数值模拟结合场协同原理,对螺旋槽管内充分发展湍流的流动和换热进行了分析。模拟以空气为工质,管壁温度恒定,分别选取了4种不同的螺纹节距和螺纹高度组成的16组结构参数。讨论了螺纹凸起,以及螺纹节距、螺纹高度变化对螺旋槽管场协同性能和强化传热能力的影响。结果表明:利用场协同原理,可以解释结构参数的变化对螺旋槽管传热效果的影响,并能够对强化传热元件的结构优化提供指导。通过对比,模拟所得Nu数与实验所得Nu数关联公式的计算结果基本一致。

关键词: 螺旋槽管 强化传热 场协同理论

Field synergy analyses on inner flow and heat transfer characteristics of spirally corrugated tubes

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Abstract:

A numerical study combined with the field synergy principle was performed to investigate the flow and heat transfer of fully developed turbulent flow in a spirally corrugated tube. Air was selected as the working fluid and constant temperature was applied to the tube wall. Sixteen different structural parameters consisting of four different corrugation pitches and depths were considered. The effects of helical corrugation and changes of corrugation pitch and depth on field synergy performance and heat transfer enhancement of the enhanced tube were discussed. It indicates that the field synergy principle is efficient in explaining the effect of structural parameter changes on the heat transfer performance of spirally corrugated tubes and also is a guide to structural optimization of enhanced heat transfer elements. By contrast, the Nusselt number acquired from the numerical calculation is in relatively good agreement with the results of experimental correlation.

Keywords: spirally corrugated tubes heat transfer enhancement field synergy principle

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