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基于场协同原理的横排锯齿翅片湍流传热强化机理

Heat transfer enhancement mechanism of transverse direction type serrated fin in turbulent flow based on field synergy principle

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中文关键词: 横排锯齿翅片 场协同 传热强化 湍流 纵向涡流

英文关键词: transverse direction type serrated fin field synergy heat transfer enhancement turbulence flow longitudinal vortex

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中文摘要:

通过数值模拟方法分析了横排(TD)锯齿翅片在板翅换热器通道内传热与流动特性.研究了湍流条件下横排锯齿翅片的温度场、速度场以及两场协同性,探索其强化传热机理.在此基础上获得了翅片高度、翅片间距和翅片宽度对传热与流动的影响规律,并给出了横排锯齿翅片的综合传热性能因子.结果表明:横排锯齿翅片通道内流体扰动强烈,形成了周期性纵向涡流,改善了通道内速度与温度梯度场之间的协同作用,强化传热效果,提高了综合传热性能因子.

英文摘要:

The heat transfer and flow characteristics of TD (transverse direction) type serrated fin in plate-fin heat exchanger were studied numerically. To explore the heat transfer enhancement mechanism of TD type serrated fin, three dimensional numerical model was established to examine the temperature gradient field, velocity field and fields synergy in turbulence flow. Furthermore the effect of fin height, fin space and fin width on the heat transfer and flow characteristics were analyzed respectively. The integrated heat transfer performance factor were calculated. Results show that: the temperature field and velocity distribution was uniform periodic longitudinal vortex was formed because of the fin strong disturbance the synergy of velocity field and temperature gradient was improved owing to vortex enhancing the heat transfer efficiency and improving integrated heat transfer performance factor.

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