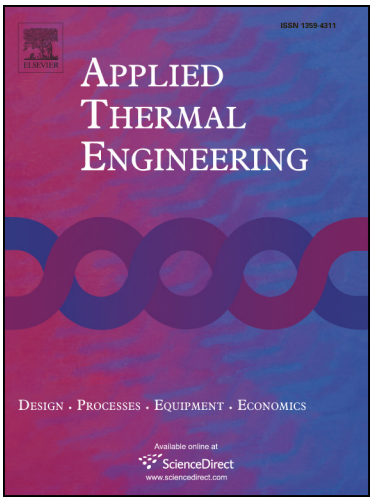

Research Paper

Investigation of Fluid Flow and Heat Transfer Characteristics of Parallel Flow Double-Layer Microchannel Heat Exchanger

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Investigation of Fluid Flow and Heat Transfer Characteristics of Parallel Flow Double-Layer Microchannel Heat Exchanger

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Abstract: The fluid flow and heat transfer characteristics in parallel flow double-layer microchannel heat exchanger are investigated both numerically and experimentally. The effect of microchannel height, width and spacing on fluid flow and heat transfer performance is comprehensively studied. The numerical results are firstly validated by comparing the Nusselt number, pressure loss and friction factor with the experimental data. Subsequently, the velocity and temperature profiles from simulation results are obtained to study the fluid flow and heat transfer characteristics. The results show that the increasing height and width have an appreciable contribution to the velocity profile. The dimensionless hydrodynamic entrance length does not depend on microchannel size. Moreover, average Nusselt number increases with increasing width and decreasing height for simultaneously thermally and hydrodynamically developing flow. The friction factor is found to decrease slightly with increasing spacing and decreasing height and width. Taking the average Nusselt number, friction factor and the thermal performance index as an evaluation criterion, the heat exchanger with microchannels of 1-1.5mm in height, 0.4-0.6mm in width and 0.6-0.8mm in spacing shows better heat exchange performance.

Keywords: Microchannels heat exchanger; Fluid flow characteristic; Heat transfer performance; Microchannel size

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